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Intensive Care Medicine Experimental

MEETING ABSTRACTS

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# ESICM LIVES 2024

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**Best abstracts**

## 000200

## Protective mechanisms of CPAP on lungs and diaphragm in experimental Patient Self-Inflicted Lung Injury

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**Introduction:** Strong respiratory effort is recognized as a potential "second hit" in acute lung injury (ALI), introducing the concept of "patient self-inflicted lung injury" (P-SILI). We have previously reported that continuous positive airway pressure (CPAP) attenuates lung and diaphragm injury in P-SILI model.
**Objectives:** We aimed to investigate the effects of CPAP on respiratory distress symptoms, regional lung strain, and diaphragmatic contraction kinetics, in a preclinical ALI model.
**Methods:** Lung injury was induced in Sprague Dawley rats by surfactant depletion (saline lavage), followed by 3 h of unsupported or supported spontaneous breathing (Unassisted- and CPAP-groups). Respiratory distress symptoms, gas exchange, diaphragmatic ultrasound, micro-CT scans, and morphometric analysis of lungs and diaphragms were assessed.
**Results:** Compared with Unassisted-group, CPAP-group had: (1) Lower respiratory rate, nasal flaring, sternocleidomastoid and abdominal muscles use, minute ventilation (VE) and higher SpO2 at the end of the study (all $p < 0.05$). (2) A trend towards less volumetric strain progression in basal regions of the lungs. (3) A trend towards longer expiratory time and lower diaphragm contraction velocity. (4) Higher morphometric lung aeration ($p < 0.05$). (5) Higher morphometric diaphragm muscle area, and lower interstitial area ($p < 0.05$).
**Conclusions:** Unassisted spontaneous breathing induced lung and diaphragm structural damage, consistent with P-SILI and load-induced diaphragm injury models. CPAP reduced lung and diaphragmatic injury and improved respiratory distress symptoms and oxygenation. The reduction in respiratory distress symptoms and VE, the decrease in strain progression in juxta-diaphragmatic regions, and better diaphragm contraction kinetics, suggest that CPAP effectively reduced the respiratory drive.

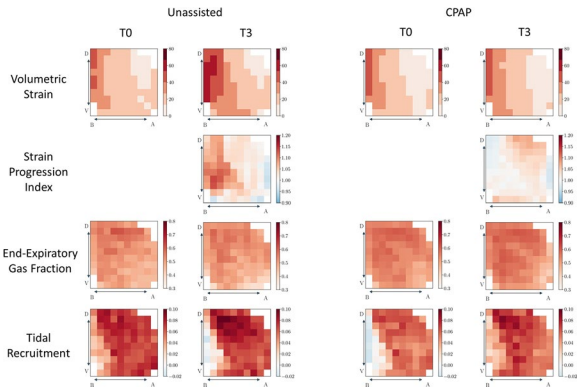


**Fig. 1 (abstract 000200)** Regions-of-interest (ROI) array heat maps in the apical–basal (A-B) and ventral–dorsal (V-D) directions at the beginning (T0) and the ending (T3) of the study. A) Regional volumetric strain. B) Strain progression index. C) Regional end-expiratory gas fraction. D) Regional tidal recruitment

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3. Fondecyt 1220322
4. FONDEQUIP EQM150010

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**Topic:** Acute respiratory failure and mechanical ventilation

**000201**

## Hypoxia inducible factor prolyl hydroxylase inhibitor alleviates heatstroke induced acute kidney injury by activating BNIP3 mediated mitophagy

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**Introduction:** Heat stroke (HS) is a life-threatening disease comprising central nervous system dysfunction, disseminated intravascular coagulation, systemic inflammatory responses, and multiple organ dysfunction syndromes (MODS). Acute kidney disease (AKI) is one of the most serious complications of HS, which significantly increases the mortality and hospitalization expenses of inpatients with HS. The incidence rate of heat stroke induced acute kidney injury (HS-AKI) is as high as 36–43.9% and the mortality rate of severe AKI requiring dialysis is as high as 50–80%. Furthermore, recent studies have shown that HS-AKI can increase the risk of chronic kidney disease. Despite decades of research, the exact pathogenesis of HS-AKI remains unknown. Consequently, there are no specific and effective drugs to treat HS-AKI in clinical practice, and only symptomatic treatment is available.
**Objectives:** To investigate whether hypoxia inducible factor prolyl hydroxylase inhibitor (HIF-PHI) can enhance thermal endurance and reduce acute kidney injury induced by heat stroke(HS) in mice.
**Methods:** First, C57BL/6J mice were placed in a climate chamber at 39 ± 0.5 ℃ and a relative humidity of 60% ± 5% to induce HS model. HIF-PHI was dissolved and then diluted to a concentration of 1 mg/ml. All mice were continuously intraperitoneal injected with 0.01 ml/g body weight saline or HIF-PHI for 5 days before heat exposure. The human kidney cells (HK2) were placed in a culture incubator with an environmental temperature at 43 ℃ and 5% $CO_2$ concentration for 2 h to induce HS cell model. HK2 cells were pretreated with or without HIF-PHI (30 mM). Thereafter, thermotolerance, renal function, pathological changes, mitochondrial damage, inflammation, and apoptosis were evaluated in vitro and in vivo. Finally, mitophagy inhibitors Mdivi-1, 3-MA and Baf-A1 were applied to regulated mitophagy. BNIP3 small interfering RNA transfected HK-2 cells to silence BNIP3. The underlying mechanisms of HIF-PHI were further verified through western-blot, immunofluorescence staining and apoptosis assays.
**Results:** Our results showed that HIF-PHI pretreatment significantly improved renal function, enhanced thermotolerance, and increased the survival rate of mice in the context of HS. Moreover, HIF-PHI could alleviate HS-induced mitochondrial damage, inflammation, and apoptosis in renal tubular epithelial cells (RTECs) by enhancing mitophagy in vitro and in vivo. By contrast, mitophagy inhibitors Mdivi-1, 3-MA, and Baf-A1 reversed the renoprotective effects of HIF-PHI. Mechanistically, HIF-PHI protected RTECs from inflammation and apoptosis by enhancing Bcl-2 adenovirus E18 19-kDa–interacting protein 3 (BNIP3)-mediated mitophagy, while genetic ablation of BNIP3 attenuated HIF-PHI-induced mitophagy and abolished HIF-PHI-mediated renal protection.
**Conclusions:** HIF-PHI protects renal function by upregulating BNIP3 mediated mitophagy to improve HS-induced inflammation and apoptosis of RTECs, suggesting HIF-PHI as a promising therapeutic agent to treat HS-AKI.

**Topic:** Acute Kidney Injury and haemofiltration

**000376**

## A hyperinflammatory transcriptomic endotype is associated with a poor outcome in the acute phase of sepsis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000376

**Introduction:** The host response in sepsis is highly heterogeneous and incompletely understood. This hampers the identification of high-risk patients eligible for targeted immunomodulatory therapy. We aimed to resolve this heterogeneity by deriving endotypes based on the expression levels of key genes that reflect the magnitude of the host response during experimental human endotoxemia, a standardized controlled model of systemic inflammation induced by bacterial lipopolysaccharide (LPS). Next, we applied these endotypes to cohorts of patients with sepsis.
**Methods:** LPS (1 ng/kg) was administered intravenously to 110 healthy volunteers (54 female, 56 male, age 23 [21–25] years). Blood was serially sampled to determine plasma cytokine kinetics. Furthermore, circulating CD14+/CD16− monocytes were isolated at two time points: before ($T=0$) and 4 h after ($T=4$) LPS administration, and RNA sequencing was performed. The area under the in vivo plasma cytokine concentration–time curve (AUC) of nine pro- and anti-inflammatory cytokines served as an integral measure of the magnitude of the inflammatory response. To identify the most discriminatory genes, these AUC values were integrated with the RNAseq profiles at $T=4$ in a sparse partial least squares-discriminant analysis (sPLS-DA). Subsequently, using these genes, stable transcriptomic inflammatory endotypes were identified by performing consensus clustering using the partition around medoids (PAM) algorithm on 1 minus Spearman correlation distances. To assess the clinical relevance of the identified endotypes, we applied them to a cohort of 65 patients with CAP and to a cohort of 522 patients with sepsis of mixed origin enrolled in the MARS study [1, 2].
**Results:** Three inflammatory endotypes, defined by 46 genes, were identified in the endotoxemia cohort: LPShypo, LPSinter, and LPShyper. Each endotype had a distinct transcriptomic and cytokine response pattern, with the LPShyper endotype displaying the most pronounced inflammatory response (Fig. 1A). When these endotypes were applied in the CAP cohort, patients with the LPShyper endotype at hospital admission also displayed significantly higher plasma cytokine concentrations compared with the other endotypes (Fig. 1B). Applying the identified LPS endotypes to patients of the MARS cohort at ICU admission also revealed significant associations with outcome: patients with the LPShyper endotype had the worst prognosis, with a 28-day mortality rate of 42%, vs. 24% and 19% for LPSinter and LPShypo, respectively ($p<0.001$, Fig. 1C). Hazard ratios [95% CI] for 28-day mortality were 2.04 [1.36–3.1], $p<0.001$ for LPShyper vs. LPSinter and 0.76 [0.49–1.2], $p=0.201$ for LPShypo vs. LPSinter (Fig. 1C). The higher mortality rate for the LPShyper endotype was primarily due to deaths in the acute phase, as 20 out 88 patients (23%) died within 4 days, compared with 22 out of 265 (8%) and 6 out of 169 (4%) for the LPSinter and LPShypo endotypes, respectively ($X2$ (2, $N=522$) = 26.0, $p<0.001$).

**Conclusions:** Our study highlights the remarkable variability in the host response, even within a highly homogeneous experimental endotoxemia cohort in healthy volunteers. Endotypes based on the expression levels of key genes associated with (hyper)inflammation were identified, potentially providing insight into the underlying mechanism of immune dysregulation. Importantly, applying these endotypes to patient cohorts also identified patients with a heightened inflammatory state who are at increased risk for adverse outcomes, especially in the acute phase of sepsis. This subgroup of patients might benefit from early initiation of immunosuppressive treatment. As such, our results hold promise in facilitating a precision medicine approach to improve the outcomes of these vulnerable patients.

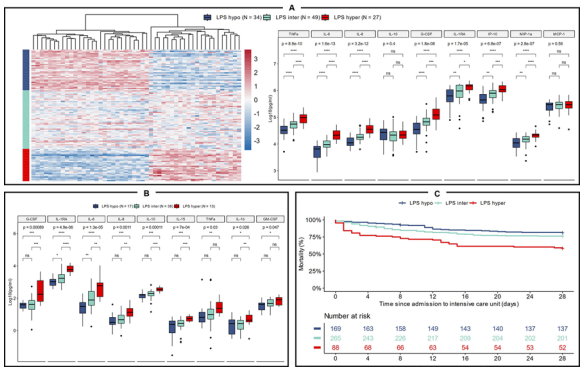

**Fig. 1 (abstract 000376)** Experimental endotoxemia-derived transcriptomic endotypes applied to community acquired pneumonia and sepsis patients. **A** Distinct transcriptomic and cytokine response patterns of each endotype in the experimental endotoxemia model. **B** Plasma cytokine concentrations of community acquired pneumonia patients at hospital admission stratified by endotype. **C.** Kaplan–Meier survival analysis of sepsis patients of mixed origin stratified by endotype. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, ****$p < 0.00001$

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**Topic:** Sepsis

## 000379

### Continuous on-demand phrenic nerve stimulation to maintain diaphragm activity during mechanical ventilation for acute respiratory failure: The STIMULUS clinical trial


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**Introduction:** Diaphragm inactivity is an important mechanism of iatrogenic injury from mechanical ventilation [1–4]. The feasibility of using phrenic nerve stimulation (PNS) to prevent diaphragm inactivity during the first week of mechanical ventilation has not been investigated [5, 6]. Additionally, it is unknown whether preventing diaphragm inactivity can prevent diaphragm atrophy and improve diaphragm function in humans.

**Objectives:** To establish the safety and feasibility of continuous on-demand PNS to maintain diaphragm activity during the first week of mechanical ventilation and to assess associated changes in diaphragm structure and function.

**Methods:** STIMULUS was a phase 1 clinical trial performed at Toronto General Hospital between February and October 2023. Patients were eligible for enrolment if they required mechanical ventilation for acute hypoxemic respiratory failure (AHRF) or after pulmonary thromboendarterectomy (PTE) or lung transplantation (LuTx). Transvenous PNS delivered via a specially equipped central venous catheter (Lungpacer Medical) was titrated to achieve a diaphragm electrical activity level (Edi) consistent with an expiratory occlusion pressure (Pocc) between − 5 and − 10 cm $H_2O$. Stimulation was delivered "on demand" in synchrony with controlled ventilator breaths and inhibited when the patient triggered the ventilator. On-demand PNS was maintained for up to seven days or until a spontaneous breathing trial (SBT) was passed. Diaphragm thickness was measured at baseline and daily, and diaphragm function was assessed by measuring maximal diaphragm thickening fraction at the first SBT. These measurements were compared to values for historical control patients matched for diagnosis, age, P/F ratio, and baseline diaphragm thickness.

**Results:** Twenty patients were enrolled and 19 (8 AHRF, 8 PTE, 3 LuTx) underwent study procedures. Catheter placement and initial diaphragm activation were successfully achieved in 19 (100%) patients. Diaphragm activity was maintained on target during stimulation for at least 50% of hours on the first day of intervention in 18 (95%) patients (primary feasibility endpoint) and in 88% of hours over the seven-day study period (Fig. 1). Atrial ectopy at initiation of stimulation occurred in four patients; this was readily resolved by modifying catheter position or electrode selection. Two serious adverse events (SAEs) were related or possibly related to study procedures (venous or esophageal catheter placement); there were no serious adverse events related to stimulation. In comparison to matched historical controls, diaphragm thickness tended to increase over time and maximal diaphragm thickening fraction was increased (Fig. 2, $p < 0.0001$ for comparisons).

**Conclusions:** Continuous on-demand PNS to prevent diaphragm inactivity during mechanical ventilation is feasible and well-tolerated. This strategy may prevent diaphragm atrophy and dysfunction.

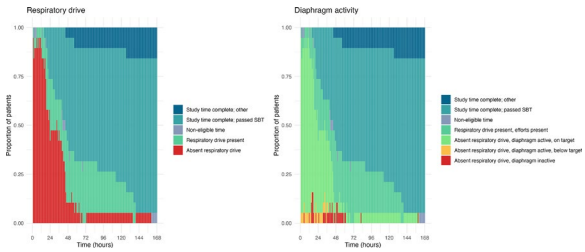


**Fig. 1 (abstract 000379)** Respiratory drive (left) and diaphragm activity (right) in the presence of continuous on-demand phrenic nerve stimulation over seven days of mechanical ventilation in 19 patients with acute respiratory failure. SBT = spontaneous breathing trial

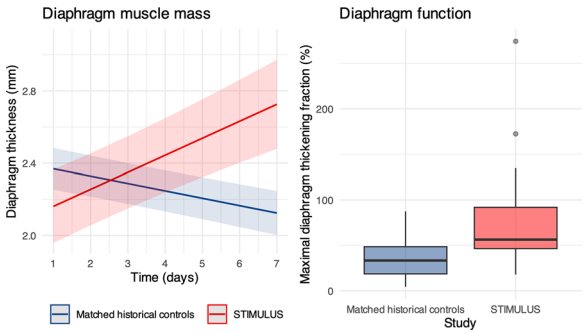


**Fig. 2 (abstract 000379)** Diaphragm structure and function in STIMULUS compared to historical controls matched for similar age, diagnosis, P/F ratio, and baseline diaphragm thickness. Left: Change in end-expiratory right hemi-diaphragm thickness over time compared to matched historical controls. The rate of change was significantly different between groups ($p < 0.0001$). Right: maximal diaphragm thickening fraction at the time of the first spontaneous breathing trial compared to matched historical controls ($p < 0.001$ for difference between groups)

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This trial was supported by an Early Career Investigator Award from the National Sanitarium Association. Dr. Goligher received salary support for this work as part of this award. The STIMULUS trial received in-kind support in the form of devices and supplies provided by Lungpacer Medical. Dr. Goligher reports receiving personal fees for consulting from multiple companies involved in phrenic nerve stimulation including Lungpacer Medical, Stimit, and Heecap, as well as consulting for Getinge, Vyaire, Drager, Zoll, and BioAge. Dr. Thiago Bassi, Nawzer Mehta, and Viral Thakkar received salary support as full time employees of Lungpacer Medical USA Inc. Dr Morris received a research grant from the Interdepartmental Division of Critical Care Medicine from the University of Toronto to support this work. Dr Bellissimo receives consulting fees from BioAge.

**Topic:** Acute respiratory failure and mechanical ventilation

## 000527

## The association between diastolic function, fluid balance, NT-proBNP and extubation failure in mechanically ventilated patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000527

**Introduction:** Accurately predicting readiness for extubation is of key importance in the care of critically ill patients. Diastolic dysfunction has been previously suggested as a risk factor for extubation failure and refers to impaired relaxation of the heart during the filling phase [1, 2]. Diastolic function can be qualified by echocardiographic parameters such as the ratio between mitral valve E-wave and A-wave (*E/A* ratio) and estimation of left ventricular filling pressures (E/e' ratio). These measures are highly influenced by preload status. Tissue Doppler e' velocity (the rate of myocardial relaxation during early diastolic filling) is considered as a more intrinsic measure of left ventricular compliance. Nevertheless, also in conditions of increased preload, the e' velocity may increase as a compensatory response to accommodate the additional volume.3 Preload status is related to fluid balance and NT-proBNP, which are also known predictors of extubation failure.
**Objectives:** To investigate the association between diastolic function parameters, fluid balance, NT-proBNP and extubation failure in patients weaning from mechanical ventilation.
**Methods:** In this prospective cohort study, adult patients who were mechanically ventilated for more than 48 h, in whom transthoracic echocardiographic measurement of diastolic function parameters could be performed, and passed a first spontaneous breathing trial (SBT) were included. Echocardiography was performed at the start and end of SBT. The primary endpoint was extubation failure (i.e., need for reintubation within 7 days). Baseline and delta values were compared between patients with and without the primary endpoint using the independent samples *T*-test or Mann–Whitney *U* test. Diastolic function parameters (*e'* and *E/e'*) were related to fluid balance in the 24 h before extubation and NT-proBNP using Pearson's correlation.
**Results:** A total of 45 patients were included (age 69 [IQR 58–75] years, 53% male, BMI 27 ± 5 kg/m$^2$, duration of mechanical ventilation 4.9 [IQR 3.0–8.7] days, SOFA score 9.0 ± 2.8). Patients with extubation success ($n = 33$) had a more negative mean fluid balance in the 24 h before extubation as compared to patients with extubation failure ($n = 12$) (Table 1). None of the investigated parameters of diastolic function and neither NT-proBNP measured at start of SBT were predictive of extubation failure in this cohort. Neither the delta of any of the diastolic function parameters during SBT was predictive of extubation failure (data not shown). We did observe a significant correlation between diastolic function parameters (e' and E/e'), fluid balance, and NT-proBNP (Fig. 1). In a multivariable logistic regression model including age, SOFA score, E/e' and fluid balance, fluid balance was the only significant predictor of extubation failure: OR 2.56 (95% CI 1.05–6.24), $p = 0.039$.

**Table 1 (abstract 000527)**

| | Extubation failure (n = 12) | Extubation succes (n = 33) | P-value |
|---|---|---|---|
| Fluid balance 24 h, L | 0.2 ± 0.6 | − 0.7 ± 1.4 | 0,007 |
| E, cm/s | 76 ± 21 | 74 ± 15 | 0,692 |
| A, cm/s | 7.5 ± 23 | 68 ± 17 | 0,348 |
| *E/A* | 1.0 [0.9–1.3] | 1.1 [0.8–1.3] | 0,596 |
| *e'* sept, cm/s | 8.1 ± 1.5 | 8.0 ± 2.8 | 0,833 |
| *e'* lat, cm/s | 10.2 ± 1.5 | 11.0 ± 3.1 | 0,229 |
| *e'* average, cm/s | 9.1 ± 1.2 | 9.4 ± 2.5 | 0,667 |
| *E/e'* average | 7,9 [6,1–10,5] | 7.5 [6.4–9.4] | 0,859 |
| NT-proBNP, pmol/L | 370 [84–1481] | 285 [73–685] | 0,755 |

**Conclusions:** In our study we could not reproduce the previously reported predictive value of diastolic dysfunction and NT-proBNP for extubation failure. Parameters of diastolic function (*e'* and *E/e'*) were significantly related to fluid balance and NT-proBNP. A negative fluid balance is likely to be the driving force of extubation success, and its pathophysiological substrate may be reflected by diastolic function parameters and NT-proBNP. Fluid-independent parameters of diastolic function are required to determine the role of intrinsic ventricular stiffness in the pathophysiology of extubation failure.

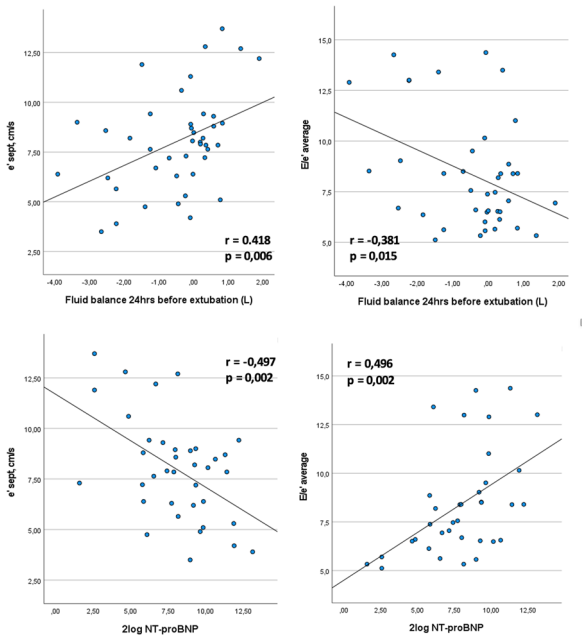


**Fig. (abstract 000527)** Pearson's correlation coefficients (*r*) of diastolic function parameters, fluid balance and NT-proBNP (*n* = 45)

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4. This investigator initiated study was supported by an unrestricted research grant from Roche Diagnostics Ltd.

**Topic:** Cardiovascular issues in ICU

## 000602

## Alternative RNA splicing mechanism is involved in the pathophysiology of sepsis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000602

**Introduction:** Sepsis, a life-threatening condition resulting from a dysregulated immune response to infection [1], is widely acknowledged for its significance in healthcare. Alternative splicing (AS) is a critical process that contributes to the diversity of gene expression and protein isoforms [2]. However, the impact of AS on sepsis development remains largely unexplored.
**Objectives:** This study aims to illuminate the role of AS in sepsis progression and investigate its therapeutic implications.
**Methods:** Phosphoproteomic analyses were conducted using various components of E. coli to replicate sepsis and systemic inflammatory response syndrome (SIRS) models. Mice were intraperitoneally injected with PBS, E. coli lysate, E. coli DNA, LPS, or DNA + LPS. After t = 2 h, mice were euthanized using carbon dioxide asphyxiation, and then spleens were dissected for mass spectrometry and protein expression analysis. Transcriptomic analysis was then performed to identify AS events in septic patients and a cecal ligation and puncture (CLP)-induced sepsis mouse model. The related datasets for this study include sepsis and healthy controls from the Gene Expression Omnibus (GEO) database, specifically the GSE185263 dataset comprising 348 sepsis patients and 44 healthy controls. RNA sequencing (RNA-seq) analysis of mouse blood was performed 6 h after CLP. We performed RNA-seq analysis to analyze the occurrence of AS events and transcript variants during sepsis. RNA-seq reads were aligned using STAR, and AS events were identified and quantified using rMATS due to its ability to handle replicated RNA samples, analyze various AS patterns, and utilize RNA-Seq reads mapped to exons and splice junctions. Differential AS genes were identified, and AS events related to prognosis were screened and analyzed. Survival time of septic mice was observed by targeting the RNA splicing pathway, and the number of immune cells and the proportion of immune cells in mice were detected by flow cytometry.
**Results:** Differentially phosphorylated proteins were found to be significantly enriched in RNA-splicing and spliceosome signaling pathways in multiple sepsis animal models compared to the control group. RNA sequencing analysis revealed AS events associated with immune response and RNA splicing in both healthy and septic patients. In the healthy vs. sepsis patient cohort, 1735 AS events in 873 genes were detected, including 48 A3SSs in 45 genes, 21 A5SSs in 21 genes, 1488 MXEs in 781 genes, 153 SEs in 129 genes, and 25 RIs in 24 genes. We next used the logistic regression model to analyze the correlation between the AS events included in the model construction and sepsis prognosis and to screen for independent risk factors. The effects of variables in the logistic regression model were described by ratio (OR) and 95% confidence interval. We further investigated the AS events in the CLP mouse model by analyzing the RNA-seq data. We detected 1362 altered AS events in CLP mouse model, and, these results also indicate that a gene may have several types of mRNA splicing events, and one gene may exhibit up to five or even six to seven AS types, while SE is the dominant type because more than 1/2 of the AS type

is an SE event. The significant DAS genes were mostly enriched in RNA splicing and spliceosome. Treatment with splicing modulator in CLP mice improved survival rates and triggered immune responses compared with CLP.
**Conclusions:** This study underscores the importance of AS signaling in sepsis pathogenesis. It provides a comprehensive analysis of sepsis multi-omics and reveals the potential of splicing modulation in sepsis from various perspectives. Intervention with splicing modulators in the CLP-induced sepsis model showed potential for attenuating sepsis severity and improving outcomes. The analysis of AS events in sepsis in this study enhances our understanding of the molecular mechanisms underlying sepsis occurrence and development, offering new directions for discovering molecular therapeutic targets for sepsis.

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**Topic:** Sepsis

## 001309

### Clinical predictors of VILI risk: a comparison between Driving Pressure and Mechanical Power Ratio

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 001309

**Introduction:** Mechanical ventilation may cause Ventilator-Induced-Lung-Injury (VILI) during ARDS. Therefore, it is important to identify possible indicators of VILI risk. In this experimental study, we compared the effectiveness of Driving Pressure (DP) and Mechanical Power Ratio (MPR) in predicting lung damage.
**Methods:** The study population consists of 125 pigs enrolled in previous experiments on VILI. Animals were ventilated with MPR (the ratio of mechanical power to the expected one), ranging from 0.86 to 26.7, and DP, from 3 to 22 $cmH_2O$. According to the literature, two different thresholds (DP = 14 cmH2O and MPR = 4.46) were used to identify 4 groups: Group 1, DP and MPR, below the threshold; Group 2, DP above and MPR below threshold; Group 3, DP below and MPR above threshold; Group 4, DP and MPR, above the threshold. End-experiment lungs' weight was used as a marker of VILI.
**Results:** In Panel A, we represent DP as a function of MPR with the identification of the two thresholds and the four groups. In Panel B, we show the lungs' weight measured in the four groups. As shown, the lungs' weight was significantly higher in the two groups having MPR above compared to the two groups with MPR below the threshold ($p < 0.001$), regardless of DP value. Of note, we did not find any significant difference in the lungs' weight when we compared the groups having the same MPR but different DP (i.e., Group 1 vs 2 and Group 3 vs 4).
**Conclusions:** The study suggests that MPR is a more effective indicator of VILI risk than DP. This is because MPR incorporates all the factors that contribute to VILI, such as tidal volume, DP, respiratory rate, flow, and PEEP. Relying solely on DP ignores the potential impact of the other VILI contributors.

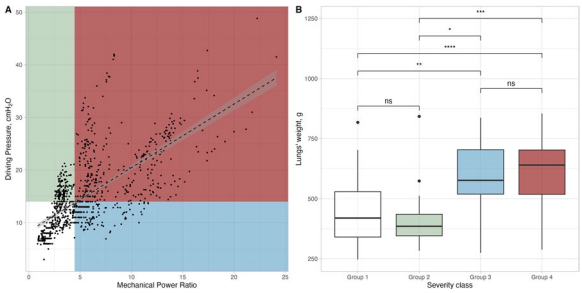


**Fig. (abstract 001309)** Comparison between Driving Pressure and Mechanical Power Ratio as a predictor of VILI. Panel A represents DP as a function of MPR with the identification of the two thresholds (see text for details; $p < 0.001$, $R2 = 0.40$). Panel B represents the comparison between the lungs' weight in the four groups as consequence of VILI (*$p = 0.015$, **$p = 0.004$, ***$p < 0.001$, ****$p < 0.001$)

**Topic:** Acute respiratory failure and mechanical ventilation

## 001327

### Ghrelin for neuroprotection in comatose cardiac arrest patients: a randomized phase 2 trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 001327

**Introduction:** Out-of-hospital cardiac arrest survival rates have markedly risen in the last decades, while neurological outcome only improved marginally. Despite research on more than twenty neuroprotective strategies involving comatose post-cardiac arrest patients [1], none have demonstrated unequivocal evidence of efficacy [2]. Treatment with acyl-ghrelin improved functional and histological brain recovery in experimental in vitro and in vivo models of cardiac arrest [3, 4] and was safe in a wide variety of human study populations [5].
**Objectives:** To determine safety and potential efficacy of intravenous acyl-ghrelin to improve neurological outcome in comatose patients after cardiac arrest.
**Methods:** A phase 2, multicenter, double-blind, placebo-controlled trial (GRECO trial) was conducted between January 18, 2019, and October 17, 2022 in three ICUs in the Netherlands.
Inclusion criteria were adult patients (aged ≥ 18 years) after cardiac arrest in a coma. Expected death within 48 h or unfeasibility of treatment initiation within 12 h were exclusion criteria. Patients were randomized to receive 600 µg intravenous acyl-ghrelin (intervention group) or placebo (control group) within 12 h after cardiac arrest, continued for seven days, twice daily, additional to standard care. Primary outcome was the score on the cerebral performance categories (CPC) at six months. Safety outcomes included any serious adverse events. Secondary outcomes: mortality and neuron-specific enolase (NSE) levels on days one and three.

**Results:** We enrolled 160 patients with a median age of 68 years, 75% male. 81 were assigned to the intervention and 79 to the control group. The common odds ratio for any CPC shift towards a better outcome in the intervention group was 1.78; 95% CI 0.98–3.22; $p = 0.06$ [Fig. 1]. This was consistent over all CPC categories. NSE levels on day one after cardiac arrest were significantly lower in the intervention group (34 vs 56 µg/L; $p = 0.04$), on day three 28 vs 52 µg/L ($p = 0.08$). Serious adverse events were comparable in incidence and type between the groups. Mortality was 38% in the intervention vs. 50% in the control group, absolute risk reduction 12.5%, $p = 0.11$.
**Conclusions:** In comatose patients after cardiac arrest, intravenous treatment with acyl-ghrelin was safe and potentially effective to improve neurological outcome. Phase 3 trials are needed for conclusive evidence.

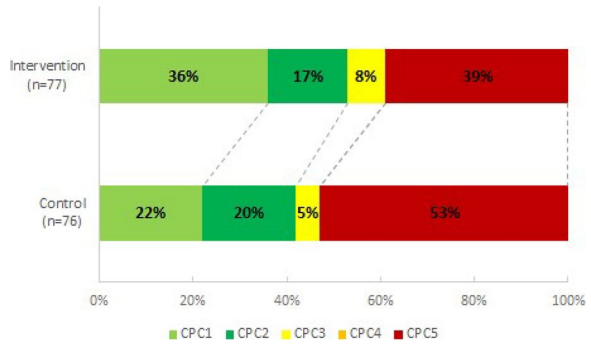


**Fig. 1 (abstract 001327)** Cerebral Performance Category scores at six months ("complete case analysis", intention-to-treat population)
The unadjusted common odds ratio for any shift towards a better outcome in the intervention group was 1.78 (95% CI 0.98–3.22; $p = 0.06$). Scores on the Cerebral Performance Category scale range from 1 to 5, with 1 indicating no or mild neurologic disability, 2 moderate disability, 3 severe disability, 4 coma, and 5 death.

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6. The trial was supported by a grant from the Dutch Research Council ZonMw (Grant number 95105001). ZonMw was not involved in trial design or conduct, data analysis, manuscript preparation or review.

**Topic:** Cardiac arrest

## 001494

## Early Moderate Hyperoxia Confers Mortality Benefit in Neurointensive Care Patients with Stroke: A Preliminary Bayesian Analysis of the ANZICS Adult Patient Database

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 001494

**Introduction:** The optimal range of arterial oxygen levels (PaO2) in mechanically ventilated neuro-intensive care unit (neuro-ICU) patients is yet to be determined. Bayesian analysis offers novel insights into the relationship between arterial oxygen level and outcome via (1) probabilistic evaluation of current thresholds (2) incorporation of prior distributions.
**Objectives:** The primary aim was to determine the association between first 24 h ICU $PaO_2$ (worst A-a gradient) and ICU mortality in day one mechanically ventilated patients with acute ischemic stroke (AIS), intracerebral haemorrhage (ICH), and non-traumatic subarachnoid haemorrhage (SAH). Secondary outcomes were ICU length of stay (LOS) and duration of mechanical ventilation (MV days).
**Methods:** Patients admitted to Australian and New Zealand ICUs from 2016 to 2023 with primary diagnosis of AIS, ICH and SAH were extracted ($N = 83,158$). Patients mechanically ventilated from day one of ICU admission were analysed ($N = 13,635$). The 'brms' package in R for Bayesian hierarchical regression modelling was used to determine the relationship between arterial oxygen tension ($PaO_2$) and outcome. Models were adjusted for ANZROD score [1], with posterior distributions estimated through Hamiltonian Monte Carlo (HMC). Bayesian inference analysis used minimally informative, sceptical and enthusiastic prior distributions. Odds ratios (ORs) were calculated with the ESICM range ($PaO_2 = 80–120$ mmHg) as the reference group.
**Results:** 13,635 patients (AIS = 2615, ICH = 6381, SAH = 4639) were analysed (mean GCS on admission, $8 \pm 4$; mean P:F Ratio, $303.6 \pm 139.8$). APACHE III scores (mean) were similar between stroke groups: $69.7 \pm 27$; ICH, $72.7 \pm 26$; and SAH, $63.2 \pm 27$. Mild hyperoxia was more prevalent than normoxia and $PaO_2$ levels > 299 mmHg occurred in < 10% of patients across stroke subtypes. Overall, average $FiO_2$ and $PaO_2$ decreased from 2016 to 2023. Bayesian regression revealed that the optimal $PaO_2$ (lowest probability of ICU mortality) was 167.5 mmHg (95% CI for mortality: 39.8%-44.7%), 163.9 mmHg (95% CI = 23.6–28.3%) and 173.2 mmHg (95% CI = 29.4–35.2%) for ICH, SAH and AIS, respectively. Adjustment for ANZROD score had minimal effect on optimal $PaO_2$. Bayesian inference showed that, compared to patients within the ESICM range (80–120 mmHg), those with severe hyperoxia ($PaO_2 > 299$ mmHg) had increased likelihood of ICU mortality (ICH: OR = 1.5, 95% CI = 1.3–1.8, likelihood OR > 1 = 100%; SAH: OR = 1.5 95% CI = 1.2–1.9, likelihood OR > 1 = 99%; AIS: OR = 1.2, 95% CI = 0.8–1.7, likelihood OR > 1 = 81%, Fig. 1). This remained true with a sceptical prior distribution (mean = 1, SD = 0.2; likelihood OR > 1 was > 80% across subtypes). No significant association was found between $PaO_2$ and the MV days or ICU LOS.
**Conclusions:** Our findings indicate that early exposure to severe hyperoxia, particularly in ICH or SAH patients, is associated with increased ICU mortality. Moderate hyperoxia however, may confer advantage. Further adjusted analyses are needed to assist decision making in lieu of randomised controlled trials.

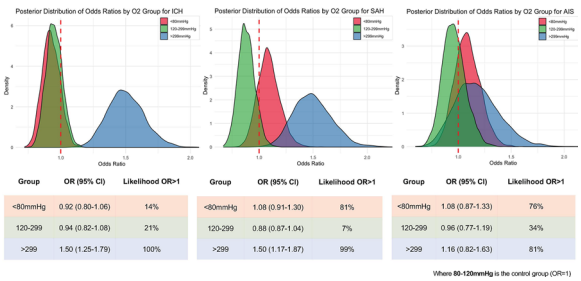


**Fig. (abstract 001494)** Posterior (predicted) distributions of Odds Ratios for ICU Mortality by caterogical oxygen exposed group (normoxia/reference group = 80–120 mmHg (ESICM recommended

range), hypoxia < 80 mmHg, severe hyperoxia > 299 mmHg). Plots show data for ICH, SAH and AIS patients from left-to-right

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**Topic:** Neurointensive care

## 001679

### Learning Curve for Intubation with a Hyper-angulated Video Laryngoscope: A Sub Analysis of a large alternating intervention trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 001679

**Introduction:** Traditional direct laryngoscopy (DL) has been the cornerstone of airway management for decades. The introduction of video laryngoscopy (VL) has offered advantages in visualization and intubation success. However, the optimal approach and the comparative effectiveness between these techniques remain a matter of debate. Recent trials have shown the superiority of VL compared to DL regarding the first-attempt success rate. However, while VL with hyper-angulated blades improves visualization of laryngeal anatomy, handling and insertion of the endotracheal tube might be challenging, especially for inexperienced users. Thus, our study evaluated the learning curve associated with first-attempt success rate using hyper-angulated VL.
**Methods:** This was an a-priori planned sub-analysis of the recently published clinical trial "Video Laryngoscopy vs Direct Laryngoscopy for Endotracheal Intubation in the Operating Room: A Cluster Randomized Clinical Trial" by Ruetzler et al. [1]. We utilized the cumulative sum method for plotting learning curves. The chart was created by plotting the cumulative sum values over time for each individual alongside the fixed horizontal decision limits. Crossing the upper decision limit indicates that the clinician's failure rate is significantly higher than the acceptable failure rate. Similarly, crossing the lower decision limit indicates that the clinician's failure rate is significantly lower than the acceptable failure rate. If the line remains between the two decision limits, no inference can be made. The acceptable and unacceptable failure rates for this study were set at 15% and 30%, respectively.
**Results:** We plotted learning curves for 4312 intubations across 223 unique providers (anesthesiologists, $n = 25$; CRNAs, $n = 35$; SRNAs, $n = 36$; fellows, $n = 46$; residents, $n = 81$). The median number of procedures per provider was 15. The overall first attempt failure rate was low (72 out of 4213 procedures), and the failure rates were comparable across provider groups. Sixty percent of the providers crossed the acceptance boundary, while the other 40% did not cross any of the boundaries. No provider crossed the unacceptable failure rate boundary. On average, it took 12 procedures to cross the acceptable failure rate boundary.
**Conclusions:** On average, it took health care providers 12 procedures to achieve acceptable failure rates for first-attempt intubation success rates using hyper-angulated VL.

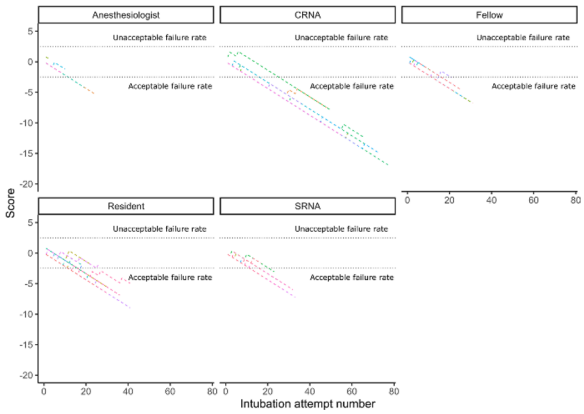


**Fig. 1 (abstract 001679)** Learning curves by health care provider group. Each differently colored line represents the learning curve of an individual provider. Individual trajectories may be obscured due to overplotting, but certain trends can be observed. No provider crossed the unacceptable failure rate boundary. Sixty percent of the providers crossed the acceptable failure rate boundary while for the rest no decision could be made. It took an average of 12 procedures to cross the acceptable failure rate boundary

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**Topic:** Perioperative care
Meeting Abstracts

**e-Posters**

## 000006

### The clinical efficacy and suitable implementation of two extracorporeal blood purification therapies: AN69-oXiris versus PMX-HP

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000006

**Introduction:** In septic shock patients, pathogens and excessive endotoxins continuously overstimulate the host's immune system with a cytokine storm that can lead to multi-organ failure and even mortality. Various types of extracorporeal blood purification treatments have recently been introduced to remove excessive endotoxins and cytokines. Herein, we compared the clinical efficacy of two blood purification methods, PMX-HP and AN69-oXiris, and discussed their detailed indications according to disease severity.

**Methods:** From December 2016 to April 2023, patients who underwent emergent surgery due to septic shock secondary to peritonitis and subsequently received blood purification treatment with AN69-oXiris or PMX-HP were enrolled. The protocol by which the patients were treated is summarized in the attached figure. Propensity score (PS)-matching was conducted to adjust for baseline characteristics between the two groups, and the changes in clinical parameters and outcomes were compared. Clinical outcomes were assessed in subgroups of patients who underwent PMX-HP treatment divided according to SOFA scores into low (0–7), intermediate (8–13), and high (> 13) disease severity groups.
**Results:** Forty patients received blood purification therapy with either PMX-HP or AN69-oXiris during the study period. After 1:2 PS matching, six patients in the AN69-oXiris group and 12 patients in the PMX-HP group were finally analyzed. Vasoactive-inotropic scores (VISs) decreased in both groups after 48 h of treatment compared to the baseline values, but the change in VISs was more pronounced in the PMX-HP group {− 57.6 [interquartile range (IQR) = − 166.4–(− 10)] vs. − 22.9 [IQR = − 64–0], respectively, $p = 0.041$}. Decreases in cardiovascular SOFA scores were significantly pronounced in the PMX-HP group [− 1.5 (IQR = − 4–0) vs. 0 (IQR = − 1–1), respectively, $p = 0.035$]. The 7-day mortality rate was significantly lower than the predicted mortality rate in a subgroup analysis of patients treated with PMX-HP in both the low disease severity group and the intermediate disease severity group.
**Conclusions:** PMX-HP and AN69-oXiris are potential therapeutic options for patients with refractory septic shock with intra-abdominal origins, especially after the surgical elimination of the infectious source. Further large-scale, prospective, randomized controlled trials that take into account patient characteristics, such as disease severity or cost burden, are needed to provide detailed guidance for blood purification treatment.

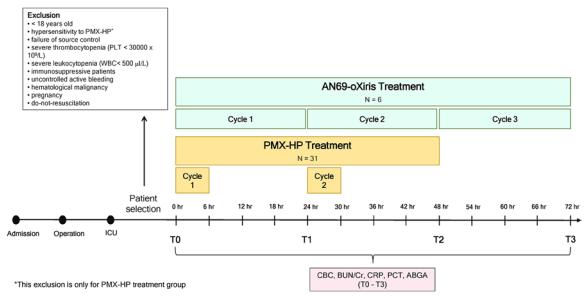


**Fig. (abstract 000006)** Treatment protocol

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**Topic:** Sepsis

## 000007

### Corticosteroids in Cardiogenic Shock: A Retrospective Analysis of the MIMIC-IV Database

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000007

**Introduction:** Despite advances in the management of cardiogenic shock (CS), 1-year mortality remains high at approximately 50% [1–2]. While corticosteroid administration in septic shock has been shown to result in faster shock reversal and lower short-term mortality [3–5], the role of corticosteroids in the management of CS remains uncertain.
**Objectives:** We aimed to estimate the impact of corticosteroids on 90-day (90d) mortality (primary outcome) among patients admitted to an intensive care unit (ICU) with CS. We also planned to explore the association of corticosteroid use with hospital length-of-stay, ventilator-free days (VFDs), vasopressor-free days, ventilator-associated pneumonia, central-line associated bloodstream infections, and hyperglycemia.
**Methods:** In this retrospective observational study, we used the Medical Information Mart for Intensive Care-IV (MIMIC-IV) database which includes ICU admissions at the Beth Israel Deaconess Medical Center from 2008 until 2019 [6]. We included all adult patients (≥ 18 years old) diagnosed with CS by International Classification of Diseases (ICD-9/10) codes, excluding repeated admissions, patients with documented adrenal insufficiency, those receiving baseline corticosteroids, or requiring extracorporeal life support. We considered exposure based on receiving any systemic corticosteroids from 6 h before to 24 h post-ICU admission. We calculated Cox proportional hazards using multivariate analysis adjusting for age, sex, baseline Sequential Organ Failure Assessment (SOFA) scores, Charlson comorbidity index (CCI), body mass index, maximum lactate within the first 24 h, vasopressor use within the first 48 h, and invasive mechanical ventilation within the first 48 h.
**Results:** We included 2000 patients admitted to ICU with cardiogenic shock, 143 (7.2%) of whom received systemic corticosteroids. The median age was 73.0 (interquartile range 19), the mean CCI was 6.42 (standard deviation [SD] = 2.72), and mean SOFA score on ICU admission was 7.93 (SD = 3.84). Corticosteroid-treated patients were younger (67.72 vs. 71.15 years, $p = 0.006$), had higher baseline SOFA scores (9.45 vs. 7.80, $p < 0.001$), and more often required vasopressors (78% vs. 63%, $p < 0.001$) and invasive mechanical ventilation (73% vs. 45%, $p < 0.001$) within 48 h of admission. Corticosteroid use was associated with increased mortality in the multivariate analysis (hazard ratio [HR] 1.39, 95% confidence interval [CI] 1.05–1.85, Fig. 1). Corticosteroid use was also associated with lower VFDs (2.8 days less, 95% CI 0.35–5.26) but was not associated with differences in other secondary outcomes.
**Conclusions:** Use of corticosteroids is associated with increased 90d mortality and a reduction in VFDs in patients admitted to ICU with CS. These findings suggesting potential harm of corticosteroids in CS require confirmation in well-designed randomized clinical trials.

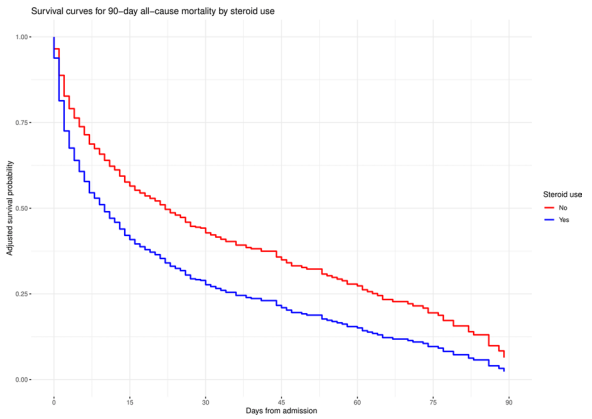


**Fig. 1 (abstract 000007)** Survival curve for cardiogenic shock patients by steroid use, derived from the multivariate Cox model ($p = 0.022$)

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**Topic:** Cardiovascular issues in ICU

## 000008

### Reducing In-Hospital and 60-Day Mortality in Critically Ill Pa-tients After Surgery with Strict Nutritional Supplementation: A Prospective, Single-Labeled, Randomized Controlled Trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000008

**Introduction:** Malnutrition in critically ill patients is a global concern, especially those who undergo abdominal surgery, as it is associated to higher infectious complications, prolonged hospital stays, and increased morbidity. Despite the importance of proper nutrition, guidelines remain broad, and practical implementation is often inadequate. We aimed to assess the effects of strict nutritional provision and investigate the appropriate target for nutrition support.

**Methods:** A prospective, randomized controlled trial was conducted in critically ill patients admitted to intensive care units following abdominal surgery. The schematic diagram of study enrollment is shown in the attached Figure. The intervention group received targeted protein and calorie, with consultation from a nutritional support team upon admission.

**Results:** In total, 181 patients in the intervention and 144 in the control group were analyzed. The intervention group demonstrated improved nutrition provision and subsequently better clinical outcomes, including reduced 60-day mortality (4.4 versus 15.3, $p = 0.001$), postoperative complication (24.9 versus 47.2, $p < 0.001$), and in-hospital mortality (5 versus 17.4, $p < 0.001$). High modified Nutrition Risk in Critically Ill scores [odds ratio (OR) = 2.658, 95% CI = 1.498–4.716] were associated with increased 60-day mortality, while active nutritional intervention (OR = 0.312, 95% CI = 0.111–0.873) was associated to lower mortality rates.

**Conclusions:** Our study highlights the importance of nutritional management for surgical patients, especially those at high nutritional risk. The intervention group, targeted with specific nutritional goals, showed better clinical outcomes of postoperative complications and mortality. High mNUTRIC scores were associated with higher mortality, whereas the active nutritional intervention was linked to lower mortality. These findings emphasize the need for early and individualized nutritional support to improve patient outcomes.

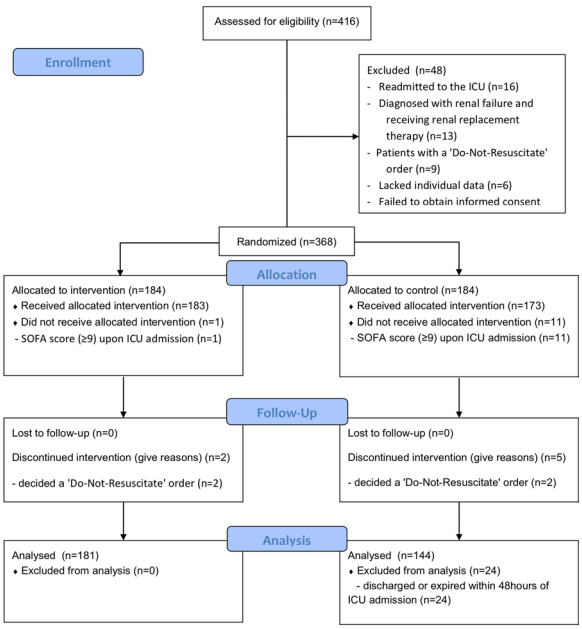


**Fig. (abstract 000008)** Flow chart of study participants

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**Topic:** Perioperative care

### 000010

### Correlation analysis of CLI and VLI with the fluid balance in critically ill patients with infectious diseases

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000010

**Introduction:** Although fluid administration is a prevalent therapeutic intervention in critical care, fluid overload is related to increased morbidity and mortality. Despite the availability of data referencing fluid administration timings, significant knowledge gaps exist regarding the optimal timing for fluid reduction or withdrawal. The capillary leak index (CLI), calculated as serum C-reactive protein divided by serum albumin, and the vascular leak index (VLI), calculated using a formula that considers the change in hematocrit levels at two different timepoints during fluid administration, and the net volume of the administered fluid has physiological implications. This suggests its usefulness as an indicator for the diuretic phase and fluid overload. Despite these physiological possibilities, the lacking evidence regarding its clinical efficacy presents a significant challenge.
**Objectives:** We aimed to investigate the potential correlations of the CLI at day 3 (day 3 CLI) and the VLI with the fluid balance, in mechanically ventilated patients with infectious diseases admitted to the intensive care unit (ICU).
**Methods:** We conducted a single-center retrospective study on consecutive adult patients admitted to the ICU of a tertiary hospital in Japan from October 2018 to December 2022. The inclusion criteria were patients with infectious diseases who were intubated within the first 24 h of admission and had an ICU stay > 5 days. The exclusion criteria were patients who underwent renal replacement therapy and those who received blood transfusions. The primary outcomes were the correlations of the day 3 CLI and the VLI with the fluid balance from day 2 to day 4 after admission, analyzed using Pearson's correlation coefficient. In-hospital mortality was assessed as the secondary outcome using binary logistic regression.
**Results:** This study included 250 patients (median age, 71.0 (61.0–78.0) years; 167 (66.8%) men). APACHE II scores, day 3 CLI, and VLI were 22.0 (19.0–28.0), 50.04 (14.39–96.98), and − 1.21 (− 4.37–0.81), respectively. A Moderate correlation was observed between day 3 CLI and fluid balance from day 2 to day 4 ($r = 0.41$, $p < 0.001$). And a very weak correlation, which is not statistically significant between VLI and fluid balance ($r = 0.03$, $p = 0.59$). Additionally, multivariate analysis revealed no statistically significant association of CLI and VLI with mortality (odds ratio = 1.00, 95% CI: 0.997 to 1.002; $p = 0.30$ and odds ratio = 1.00, 95% CI: 0.997 to 1.003; $p = 0.80$).
**Conclusions:** There was a moderate correlation between day 3 CLI and fluid balance from day 2 to day 4 in mechanically ventilated patients with infectious diseases admitted to the ICU. Considering the present findings, the CLI has the potential to be a useful indicator to estimate the risk of fluid retention and to determine the diuretic phase.

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**Topic:** Cardiovascular issues in ICU

### 000013

### Early enteral nutrition (within 48 h) for patients with sepsis or septic shock: a systematic review and meta-analysis

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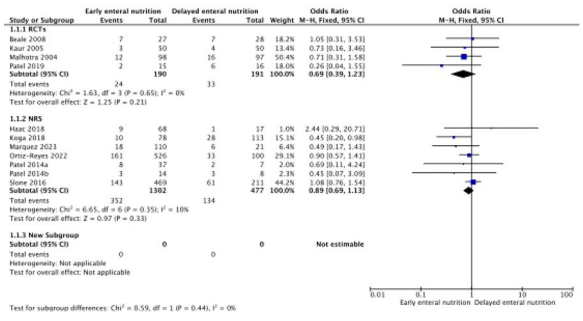
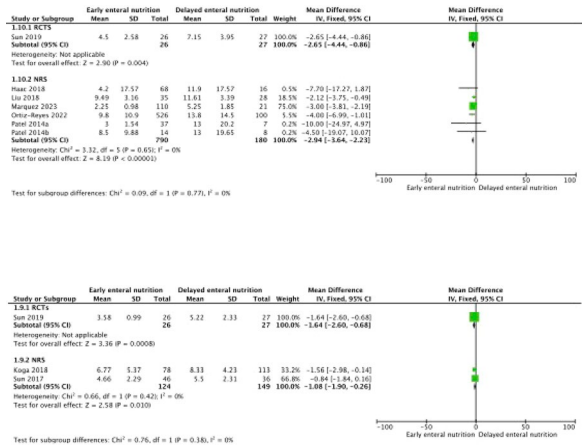
***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000013

**Introduction:** Medical nutrition therapy provides the opportunity to compensate for muscle wasting and immune response activation during stress and trauma.
**Objectives:** The objective of this systematic review is to assess the safety and effectiveness of early enteral nutrition (EEN) in adults with sepsis or septic shock.
**Methods:** MEDLINE, Embase, CENTRAL, CINAHL, ClinicalTrials.gov, and ICTRP were searched from inception until July 2023. Conference proceedings, reference lists of included studies, and expert content were queried to identify additional publications. Two review authors completed study selection, data extraction, and risk of bias assessment; disagreements were resolved through discussion. Inclusion criteria were randomized controlled trials (RCTs) and non-randomized studies (NRS) comparing the administration of EEN with no or delayed enteral nutrition (DEE) in adult populations with sepsis or septic shock.
**Results:** Five RCTs ($n = 442$ participants) and ten NRS ($n = 3724$ participants) were included. Low-certainty evidence from RCTs and NRS suggests that patients receiving EEN could require fewer days of mechanical ventilation (MD − 2.65; 95% CI, − 4.44–0.86; and MD − 2.94; 95% CI, − 3.64–− 2.23, respectively), and may show lower SOFA scores during follow-up (MD − 1.64 points; 95% CI, − 2.60–− 0.68; and MD -− 1.08 points; 95% CI, − 1.90–0.26, respectively), albeit with an increased frequency of diarrhea episodes (OR 2.23, 95% CI 1.115–4.34). Even though the patients with EEN show a lower in-hospital mortality rate both in RCTs (OR 0.69; 95% CI, 0.39–1.23) and NRS (OR 0.89; 95% CI, 0.69–1.13), this difference does not achieve statistical significance. There were no apparent differences for other outcomes.
**Conclusions:** Low-quality evidence suggests that EEN may be a safe and effective intervention for the management of critically ill patients with sepsis or septic shock.






**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000017

### The International, Prospective COSMOS (CytOSorb® TreatMent of Critically Ill PatientS) Registry: Interim results from the first 150 patients

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**Introduction:** The International COSMOS Registry tracks utilization patterns and clinical outcomes with real world use of the CytoSorb® (CS) hemoadsorption device in critical care settings.
**Methods:** Since July 2022, the International COSMOS Registry has been prospectively enrolling consecutive critically ill patients, including children, who undergo CS treatment as part of their standard care. Data was systematically gathered at multiple intervals, including 24 h before CS start, during CS treatment and 24 h post-CS treatment, upon intensive care unit (ICU) and hospital discharge, and final follow-up on day 90. Continuous variables were subjected to analysis via T-tests if the normal distribution assumption was met or Wilcoxon rank sum tests if not met, with findings presented as either mean ± standard deviation or median [interquartile range]. A $p$-value < 0.05 was used as the threshold for statistical significance.
**Results:** A total of 150 patients (33% female, age 59 ± 17 years) from 16 sites in Germany, Italy and Spain were included in this analysis. Indications for CS (multiple indications may apply for certain patients) included septic shock (57.6%), cardiogenic shock (12.9%), rhabdomyolysis (10.6%), acute/acute-on-chronic liver failure (10.6%), acute respiratory distress syndrome (6.8%), and others (9.1%). Median number of CS adsorbers used per patient was 2 [1, 3]. The platform used for integration of CS was renal replacement therapy (82.8%), standalone hemoperfusion (9.8%) and extracorporeal membrane oxygenation (7.4%).
Baseline median APACHE II score was 23 [17, 29] and median SOFA score was 12 [9, 15] with a median ICU-stay of 20 [11, 33] days. Compared to baseline, significantly lower plasma levels of lactate ($p$ < 0.0001) and creatinine ($p$ < 0.0001) were observed after CS, whereas albumin did not change ($p$ = 0.574). In the septic shock cohort, median lactate decreased from 3.3 [1.8, 6.7] to 1.6 [1.2, 2.9] mmol/L ($p$ < 0.0001). In patients with rhabdomyolysis (data from $n$ = 9), median myoglobin also significantly decreased after CS from 18,976 [1934, 34275] to 835 [623, 5925] µg/L ($p$ = 0.027). In the liver failure group, the decrease in bilirubin after CS from 7.28 [4.2, 15.5] to 6.11 [4.7, 8.6] mg/dL did not reach statistical significance (data from $n$ = 12, $p$ = 0.110). Median platelet count dropped significantly in the septic shock and liver failure cohorts whereas showed no significant change in the rhabdomyolysis cohort ($p$ = 0.722). Median fluid balance decreased from + 1386 [220, 3168] mL in the 24 h period before CS treatment to + 275 [− 768, 1846] mL in the 24 h post CS treatment ($p$ < 0.0001). Median norepinephrine dosage was reduced significantly from 0.31 [0.19, 0.55] to 0.20 [0.10, 0.36] µg/kg/min ($p$ < 0.0001) (see Fig. 1). Also, oxygenation significantly improved over course of treatment, with a median PaO2/FiO2 ratio increase from 132 [68, 208] to 189 [115, 260] mmHg ($p$ < 0.0001).
ICU-mortality rate was 35.0% in the overall cohort and 37.5% in the septic shock cohort and therefore lower than expected according to SOFA score.
**Conclusions:** The International COSMOS Registry provides real-world data showcasing a diverse range of indications and platforms for integrating the CS device. Compared to baseline, CytoSorb® treatment in addition to standard therapy was associated with significant reductions in lactate, creatinine, myoglobin, and the requirement for norepinephrine, leading also to significant improvements in fluid balance and arterial oxygenation. Observed mortality in the septic shock cohort compared favorably to risk score-based predicted values.
Trial registration: NCT05146336 on December 6, 2021.

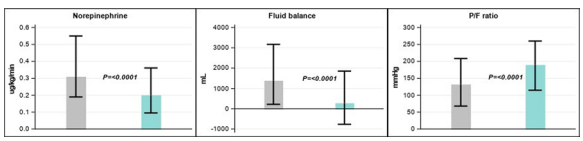


**Fig. 1 (abstract 000017)** Changes in norepinephrine, fluid balance and P/F ratio in 24 h periods before (grey) versus after CytoSorb® treatment (blue), data are presented as median and interquartile range

**Reference(s)**
1. COSMOS Registry is a company sponsored registry by CytoSorbents Corporation and CytoSorbents Medical Inc. TK and JS are full time employees of CytoSorbents Europe GmbH. WF and END are full time employees of CytoSorbents Inc.

**Topic:** Sepsis

## 000018

### Sedation practices in patients intubated in the emergency department compared to the intensive care unit

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000018

**Introduction:** Excessive sedation has been associated with adverse outcomes in critically ill patients. A previous study of mechanically ventilated patients in the emergency department (ED) revealed a high frequency of deep sedation in the ED which continued throughout the first 48 h of intensive care unit (ICU) admission.
**Objectives:** This study aimed to compare sedation management during and after intubation in the ED versus the ICU.
**Methods:** This was a single-center retrospective cohort study of adults intubated in the ED or in the ICU and received mechanical ventilation between Jan 2018 and Feb 2022. We collected data from the electronic medical record. The primary outcome was duration from intubation to first documentation of light sedation, defined as Sedation Agitation Scale score (SAS) of 3–4.
**Results:** The study included 264 patients (median age 63 yr, 58% male), with 95 (36%) intubated in the ED and 169 (64%) in the ICU (Table 1). Rapid sequence induction was significantly more frequent in the ED compared to the ICU (82.1% vs. 30.2%, $p<0.001$). Higher doses of sedatives and neuromuscular blocking agents were used for intubation in the ED, while no significant difference in opioid dosage was found. Regarding anesthetic agents used for intubation, ketamine was the most commonly used drug in the ED and was used more frequently than in the ICU (61% vs 40%, $p=0.001$). Propofol was the predominant sedative used in the ICU, with a higher prevalence compared to the ED (50% vs 33%, $p=0.01$). After intubation, opioids were less commonly used (25.3% vs. 68.6%, $p<0.001$), while ketamine and benzodiazepines were more frequently used (16.8% vs 4.7%, $p=0.001$; and 33.7% vs. 8.3%, $p<0.001$, respectively) in the ED compared to the ICU (Table 2). Within 24 h after intubation, 68% (65/95) ED patients and 82% (138/169) patients intubated in ICU achieved light sedation, with median durations of 13.5 h and 10.5 h. Patient location in the ED at intubation was associated with decreased probability of achieving light sedation at 24 h (adjusted odds ratio 0.64, $p=0.04$) (Fig. 1). Furthermore, deep sedation (SAS 1 or 2) was more frequently observed in the ED group at all time points, especially at 12 and 48 h (60.2% vs. 46.3%, $p=0.03$; and 26.5% vs. 13.0%, $p=0.02$, respectively) (Fig. 2).

**Table 1 (abstract 000018)** Baseline patient characteristics

| Variables | ED (*N* = 95) | ICU (*N* = 169) | *P* value |
|---|---|---|---|
| Age (year), mean (SD) | 56 (21) | 63 (15) | 0.004 |
| Male sex, *n* (%) | 55 (58) | 98 (58) | 0.99 |
| BMI (kg/m$^2$), median (IQR) | 26 (21–28) | 26 (23–31) | 0.30 |
| APACHE II, median (IQR) | 22 (17–27) | 22 (17–27) | 0.80 |
| baseline GCS <, = 8, *n* (%) | 61 (68) | 36 (25) | < 0.001 |
| Reason for intubation, *n* (%) | 8 (8) | 11 (7) | 0.56 |
| Airway obstruction | 25 (26) | 107 (63) | < 0.001 |
| Respiratory failure | 4 (4) | 4 (2) | 0.40 |
| Cardiogenic shock | 46 (48) | 22 (13) | < 0.001 |
| Neurological dysfunction | 3 (3) | 24 (14) | 0.004 |
| Sepsis | | | |

**Table 2 (abstract 000018)** Anesthetic agents used for peri-intubation in the ED versus ICU

| Drug types | ED (*N* = 95) | ICU (*N* = 169) | *P* value | ED (*N* = 95) | ICU (*N* = 169) | *P* value |
|---|---|---|---|---|---|---|
| Intubation period | During | | | After | | |
| Opioids | 9 (9.5) | 115(68) | < 0.001 | 24 (25.3) | 116 (68.6) | < 0.001 |
| Ketamine | 58 (61.1) | 68 (40.2) | 0.001 | 16 (16.8) | 8 (4.7) | 0.001 |
| Propofol | 31 (32.6) | 85 (50.3) | 0.01 | 48 (50.5) | 110 (65.1) | 0.02 |
| BZD | 6 (6.3) | 66 (39.1) | < 0.001 | 32 (33.7) | 14 (8.3) | < 0.001 |
| Rocuronium | 44 (46.3) | 64 (37.9) | 0.18 | – | – | – |

Data are shown as N (%) or median (IQR), BZD = benzodiazepine.

**Conclusions:** Critically ill patients intubated in the ED are at risk of deeper sedation and a longer time to achieve light sedation compared to patients intubated in the ICU.

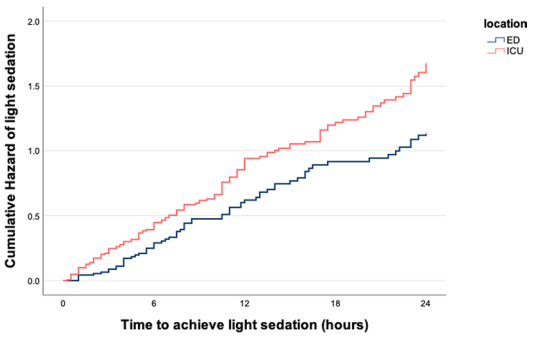


**Fig. 1 (abstract 000018)** Cumulative hazard of the time to achieve light sedation at 24 h, by patients' location of intubation

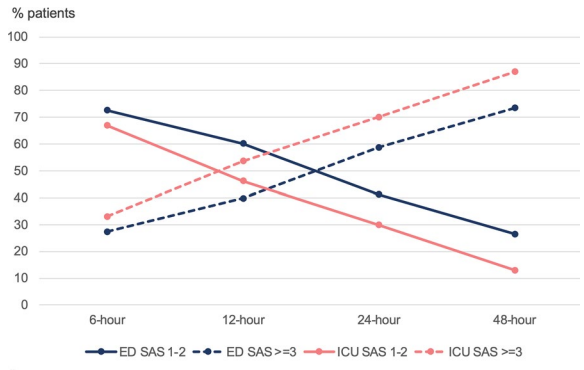


**Fig. 2 (abstract 000018)** Sedation Agitation Scale at each time point in ED and ICU patients

**Reference(s)**

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We thank Sumesh Shah, research coordinator and Stanley Oei, respiratory therapist for sharing their screening database.

**Topic:** Sedation, analgesia and delirium

## 000019

### Respiratory Physiotherapy Postextubation on Weaning Success

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000019

**Introduction:** The rate of failed extubation among patients undergoing mechanical ventilation (MV) weaning process ranges from 10 to 20%. In certain studies, this rate can reach up to 25% [1–3].
Among patients experiencing failed extubation, mortality rates range from 25 to 50%, excluding reintubations due to upper airway obstruction, as these cases do not significantly impact mortality [4, 5]. French Society of Anesthesia and Resuscitation guide for intubation and extubation in the ICU confirms the need for a chest physiotherapist in critically ill patients, with pre- and post-extubation action, to reduce the duration of weaning and extubation failure (Grade 2+), strong recommendation [6].
Despite these recommendations, many ICUs in Spain do not currently have critical care physiotherapists available to assist with patient weaning and extubation [7].
**Objectives:** The objective of this study is to evaluate the rate of reintubation at 24, 48, 72, and > 72 h post-extubation among patients who receive immediate post-extubation chest physiotherapy compared to those who do not.
**Methods:** This is a prospective observational multicenter study aimed at comparing the reintubation rates among different Spanish hospitals that perform post-extubation respiratory physiotherapy and those that do not. Approved by the ethics committee with number *PR(ATR)164/202*.
All patients aged 18 and above admitted to the intensive care unit who undergo extubation within one year will be included. Exclusion criteria include intubation for less than 48 h, contraindication for chest physiotherapy, pregnancy, life support limitation, need for intubation due to neurological or cardiothoracic surgery causes.
Post-extubation respiratory physiotherapy is defined as that which is applied within the first 2 h following the procedure.
**Results.** A total of 367 patients were included in this study (60% were male) with the main age of 59 ± 12 years old. Table 1 displays the characteristics of the included patients.
Of all patients that where extubated 72% ($N = 267$) did not required reintubation, 18.8% ($N = 69$) required reintubation during the first 24 h, 3.5% ($N = 13$) required reintubation at 24–48 h, 2.2% ($N = 8$) required reintubation at 72 h and 2.7% ($n = 10$) required reintubation after 72 h.
There were statistically significant differences related to de rate of reintubation when the physiotherapist followed up the patient during the next 2 h after extubation. A 35.5% ($N = 62$) of all patients required to be reintubated when there was no follow up, but only a 19.6% ($N = 38$) required reintubation when there was a follow up, being this difference statistically significant ($p < 0.05$) (Table 2).
**Conclusions:** Respiratory physiotherapy applied within the first 2 h following extubation could potentially benefit in reducing reintubation rates in an ICU.

Randomized, multicentre future studies could be optimal to replicate such data.

**Table 1 (abstract 000019)** DM: diabetes mellitus, DLP: dyslipidemia, HTA: arterial hypertension, COPD: Chronic obstructive pulmonary disease, OSA: Obstructive sleep apnea, ARDS: acute respiratory distress syndrome

| | N (%) |
|---|---|
| **Personal medical history** | |
| DM | 4,7% |
| DLP | 5,5% |
| Heart disease | 14,5% |
| Obesity | 6% |
| HTA + DM | 5,55% |
| HTA + DLP | 7,1% |
| DM + DLP | 2,5% |
| HTA + DM + DLP | 6,6% |
| HTA + DM + obesity | 1,9% |
| HTA + obesity | 4,9% |
| HTA + DLP + obesity | 3,6% |
| Others | 20,8% |
| **Respiratory history** | |
| COPD | 10,9% |
| OSA | 7% |
| Asthma | 5,6% |
| Lobectomy | 0,7% |
| **Diagnostic orientation** | |
| Pulmonary ARDS | 61,3% |
| Extrapulmonary ARDS | 33,5% |
| Neurologic | 5,2% |

DM: diabetes mellitus, DLP: dyslipidemia, HTA: arterial hypertension, COPD: Chronic obstructive pulmonary disease, OSA: Obstructive sleep apnea, ARDS: acute respiratory distress syndrome

**Table 2 (abstract 000019)** FTR1: Respiratory Physiotherapy during the next 2 h after extubation *$p < 0.05$

| | | REINTUBATION | | |
|---|---|---|---|---|
| | | NO | YES | Total |
| FTR1 | NO | 111 | 62 | 173 |
| | % within the FTR1 | 64,2% | 35,8% | 100,0% |
| | YES | 156 | 38 | 194 |
| | % within the FTR1 | 80,4% | 19,6%* | 100,0% |
| Total | | 267 | 100 | 367 |
| | % within the FTR1 | 72,8% | 27,2% | 100,0% |

FTR1: Respiratory Physiotherapy during the next 2 hours after extubation.
*p<0,05

**Topic:** Nursing care and physiotherapy

## 000022

## Comparison of continuous wound local anesthetics infusion and IV PCA for ratio of acute postoperative hypertension after hepatectomy

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000022

**Introduction:** Acute postoperative hypertension (APH) is a common complication during the anesthesia recovery period that can lead to adverse outcomes, including cardiovascular and cerebrovascular accidents especially the patients who underwent hypertension.
Pain relief by block of parietal nociceptive afferent nerves using continuous wound infiltration with local anaesthetics and intravascular(IV) PCA may be both beneficial in multimodal postoperative pain management and stable vital sign.
In the postoperative care unit (PACU), vital sign checked out both continuous wound infusion of ropivacaine and IV PCA after open hepatectomy was analysed in a prospective, randomized, double-blinded, placebo-controlled trial.
**Methods:** Eighty-two patients who have underlying hypertension were randomized to two groups to R and S. The group R used 0.5% ropivacaine (ON-Q group) using an elastomeric pump which delivered 4 ml $h^{-1}$ over 48 h through two multiholed Soaker® catheters placed between the transverse and the internal oblique muscles and the s.c. space. The group S used IV PCA (fentanyl 1000 mcg mix to N/S total 100 ml, delivered 1 ml $h^{-1}$ over 48h). Rescue medication was injected in the condition of hypertensive crisis (nicardipine 1 mg, brevibloc 10 mg, fentanyl 50 mcg). Vital signs (BP, heart rate), total dosage of rescue medication and visual analogue scale (VAS) were recorded. APH was defined as an increase in systolic BP by more than 20% or an increase in diastolic BP to above 110 mmHg. Hypertensive crisis was defined as a systolic BP $\geq$ 180 mmHg or a diastolic BP $\geq$ 110 mmHg, with or without acute target organ involvement.
**Results:** Under the conditions of the study, S was more vulnarable for APH than R ($R = 20$, $S = 31$ $p < 0.05$). In both group who have hypertensive crisis($R = 5$, $S = 7$), the total number of rescue medication required to achieve therapeutic BP response was significantly less in the group R (mean count was $R = 1$, $S = 4$). VAS score was similar in both group in the PACU (mean VAS 3–4).
**Conclusions:** Continuous surgical wound infusion with ropivacaine lower the risk of APH. This would be make more positive surgical outcome in the patients underwent hypertension or risk of hypertensive symptoms.

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**Topic:** Perioperative care

## 000025

### Intensive Care Unit Handover A standardized approach for improved documentation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000025

**Introduction:** Proper documentation of medical handovers in the Intensive Care Unit (ICU) is crucial for transmitting accurate patient information between healthcare providers. It prevents the omission of critical information, ensures accurate recording of new diagnoses in discharge summaries, and facilitates proper follow-up after discharge. Failure to document handovers and new diagnoses can lead to adverse events and medical errors. Accurate documentation also increases awareness among the medical team, reducing misunderstandings and errors [1].
It is essential for directing support and intervention strategies, improving patient outcomes. Additionally, accurate documentation is important for coding, defining case mix, and predicting the risk of death in the Intensive Care National Audit and Research Centre dataset (ICNaRC), which monitors and improves ICU performance in the UK [2].
**Objectives:** The objectives of this study were to assess the adequacy and precision of medical handover processes in the ICU, verify accurate documentation of new diagnoses made during ICU admission, ensure correct reflection of diagnoses in patients' discharge summaries, review existing documentation practices in the ICU, and identify deficiencies. Additionally, the study aimed to provide recommendations for enhancing patient care based on findings.
**Methods:** In this study, a retrospective analysis was undertaken across two cycles to assess modifications, involving a cohort of 20 intensive care unit (ICU) patients in each cycle. The age range of patients was 33–73 years in the first cycle and 28–80 years in the second cycle. The sample comprised 60% males and 40% females, encompassing diverse initial admission diagnoses. The presence of new ICU conditions was determined based on information extracted from radiology reports, laboratory results, specialty ward rounds, echo reports, and other ICU notes. Additionally, the documentation of these conditions in handover sheets and discharge summaries was also examined. The study identified specific examples of new diagnoses encountered during the analysis with the aim to provide reliable information for making recommendations to improve patient care.
**Results:** In the initial analysis, 65% of patients exhibited new ICU conditions, yet only 7.7% of these were documented in handover sheets, leaving a substantial 92.3% undocumented until discharge. In the second cycle, involving 55% of patients with new ICU diagnoses, a notable improvement occurred, with 90.9% meticulously documented in the handover sheets' diagnosis section. Regarding discharge summaries, only 38.5% of new diagnoses were initially recorded, with 61.5% left undocumented. Following recommended changes in the second cycle, a significant enhancement was observed, with 90.9% of new ICU diagnoses meticulously documented in discharge summaries' new diagnoses section—a substantial improvement from the 38.5% recorded before the introduction of new standardized forms. Fig. 1
**Conclusions:** The team conducting the analysis identified modifiable causes contributing to poor handover documentation in the first cycle and implemented targeted improvement interventions. The first improvement entailed the adoption of a standardized handover form, endorsed by the department's quality improvement team. The second enhancement involved the implementation of a standardized discharge summary for ICU patients, designed to comprehensively outline all admission and newly diagnosed conditions, including their respective stages.
This study underscores the critical importance of effective medical handover documentation in the Intensive Care Unit, emphasizing its role in ensuring the accurate transmission of patient information among healthcare providers. Proper documentation not only mitigates the risk of omitting vital information but also serves as a cornerstone in bolstering patient safety, minimizing errors, and ultimately improving overall outcomes.

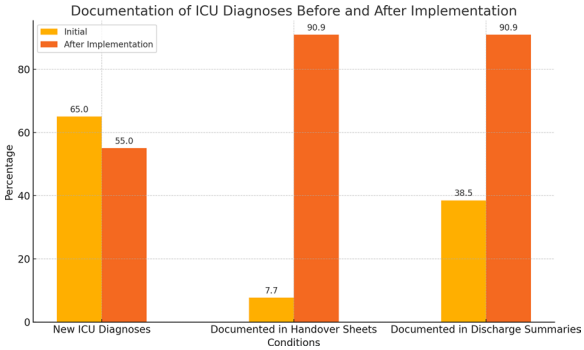


**Fig. (abstract 000025)**

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**Topic:** Health Services Research and Outcome

## 000026

### Short term of a Mannitol bolus on plasma acid base equilibrium and urinary electrolytes

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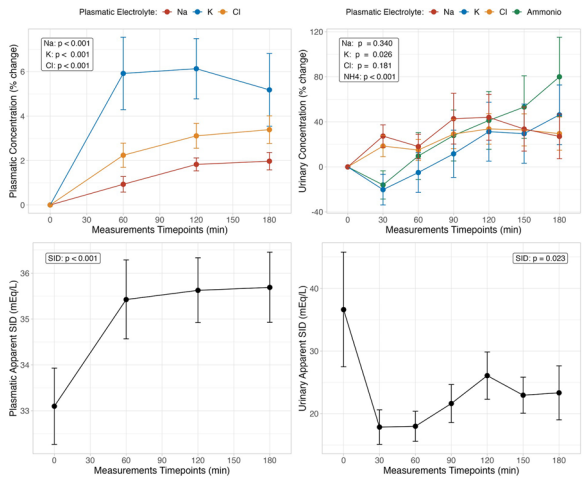
***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000026

**Introduction:** Mannitol, an osmotic diuretic, has been shown to induce alkalemia. The primary aim of this study was to evaluate the short-term effects of a bolus of Mannitol in mechanically ventilated critically ill patients on plasmatic and urinary electrolytes and acid–base equilibrium to the Stewart's approach.
**Methods:** Prospective study enrolling mechanically ventilated critically ill patients. While maintaining ventilatory setting constant (tidal volume on PBW = 8 mL/kg, PEEP 6), 1 g/kg PBW of Mannitol bolus was infused in 5 min. Before (baseline), immediately after the infusion and every 60 min till 180 min, we measured plasmatic electrolytes and acid–base balance-related variables, as well as respiratory mechanics and gas exchange variables, renal function indexes and fluid balance. Urinary electrolytes and acid–base balance-related variables were measured continuously using the Kidney Instant monitoriNG system (K.I.NG) and collected every 30 min. Apparent plasmatic and urinary strong ion difference (SID) were calculated.
**Results:** Preliminary data on 15 patients are reported. The average amount of Mannitol infused was 63 g. In Fig. 1, the effects of Mannitol on arterial and urinary pH, electrolytes and SID are reported. As shown, the infusion of Mannitol did not significantly change urinary composition in terms of pH and urinary [Na+] and [Cl–], while it significantly reduced both [K+] and [$NH_4^+$], resulting in a net reduction of urinary SID occurring in the first 30 min but lasting for 3 h. This behavior of urinary composition paralleled a shift of plasmatic acid–base balance

towards alkalosis, caused by a rapid increase in plasmatic SID, mainly driven by a concentration effect, related to a Mannitol-related increase in urinary output.
**Conclusions:** Urinary SID assessment by continuous urinary monitoring provided new insight on Mannitol mechanism of action with respect to Stewart's approach.




**Red**: Na; **Blue:** K; **Orange:** Cl; **Green:** Ammonio;

**Fig. (abstract 000026)** Red: Na; Blue: K; Orange: Cl; Green: Ammonio

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**Topic:** Acute Kidney Injury and haemofiltration

## 000028

## Development of a patient-oriented transfer tool for transition from ICU to the ward: a mixed methods study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000028

**Introduction:** Patients transferred from the intensive care unit (ICU) to a ward are often unprepared for the transition, as are their family members. They may lack sufficient knowledge about what will happen to them during and after transition. The use of patient/family centered written summaries supplemental to verbal information may be useful to improve knowledge and reduce transfer anxiety.

**Objectives:** We aimed to identify essential elements to include in an ICU-specific patient-oriented discharge summary tool (PODS-ICU).
**Methods:** We conducted a mixed methods study at Mount Sinai Hospital from May 2021 to December 2022. Participants were ICU patients who were transitioning to a hospital ward, and clinicians. We used a validated questionnaire to measure the relocation stress of patients; and standardized questions to qualitatively explore patients' needs during the transition, as well as perspectives of clinician stakeholders. Inductive thematic analysis was used for the qualitative analysis.
**Results:** 22 participants were recruited, including 10 patients and 12 clinician stakeholders (3 ICU physicians, 3 non-ICU physicians, 3 ICU nurses and 3 outreach team nurses). Data collected from the survey and interview were summarized into four overarching themes: experiences and transfer anxiety, information needs, support needs, and recommendations to improve the transition. 90%-100% of patients had positive experiences during the transition, whereas negative experiences were reported by 10–30% (Table 1). Patients expressed the need for more information for themselves and for their family members, including an explanation of the reason for ICU admission, a summary of the ICU course, and the reason for transfer. From all participants' perspectives, we identified the following essential elements for the PODS-ICU: the reason for transition, a summary of the ICU course, a clinical update, destination ward details, medication reconciliation, a future care plan, and the planned follow-up by the ICU outreach team (Fig. 1). The presence of family and earlier notification of an upcoming transfer were identified as support needs for patients to help them prepare mentally and reduce transfer anxiety. Moreover, using positive communication with patients and family members when providing transfer details and using the brief standardized transfer tools were recommended to improve transition care.

**Table 1 (abstract 000028)** Patient Relocation Stress Syndrome Scale (RSSS)—Short Form

| Item | Agree | Disagree | NA |
|---|---|---|---|
| I feel better able to cope and look after myself in a general ward | 50% | 20% | 30% |
| | 100% | 0 | 0 |
| I feel comfortable with the general ward environment | 90% | 0 | 10% |
| | 100% | 0 | 0 |
| I feel happy to be out of ICU and on the next stage of my recovery | 20% | 50% | 30% |
| | 30% | 70% | 0 |
| I think ward nurses know my physical condition/treatment plans well | 10% | 90% | 0 |
| | 30% | 10% | 60% |
| I feel abandoned and vulnerable following transfer to a general ward | 80% | 20% | 0 |
| | 80% | 10% | 10% |
| I don't feel ward nurses pay attention to me | 60% | 10% | 30% |
| I feel ward nurses ignore my concerns and needs | | | |
| I think my family is anxious about my condition following transfer to a general ward | | | |
| I felt well informed about my transfer from the ICU to the ward | | | |
| I think my family's role in my personal care and hygiene would be quite important in a ward | | | |
| My family and my opinions were taken into account in the decision to transfer from ICU to a ward | | | |

**Conclusions:** We identified informational gaps in patient and family knowledge at the time of ICU transfer, which informed essential elements for the PODS-ICU. The PODS-ICU may reduce transfer anxiety and improve care during the transition.

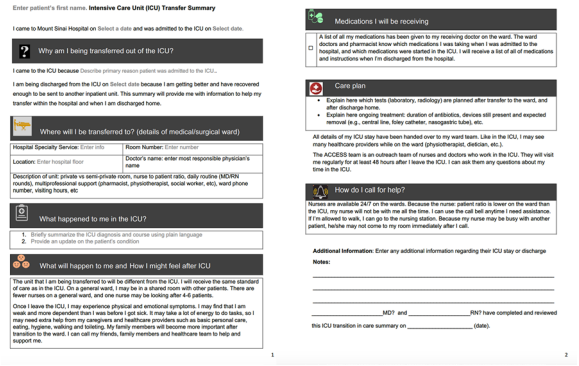


**Fig. 1 (abstract 000028)** ICU-specific patient-oriented discharge summary tool (PODS-ICU)

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**Topic:** Health Services Research and Outcome

## 000036

## Urinary Dickkopf-3 as a Predictor for Postoperative Acute Kidney Injury in the Intensive Care Unit

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000036

**Introduction:** As a life-threatening complication in patients undergoing surgery, acute kidney injury (AKI) is strongly associated with a worse prognosis. Urinary dickkopf-related protein 3 (DKK3) has been identified as a biomarker for predicting postoperative AKI in patients undergoing cardiac surgery. As a life-threatening complication in patients undergoing surgery, acute kidney injury (AKI) is strongly associated with a worse prognosis. Urinary dickkopf-related protein 3 (DKK3) has been identified as a biomarker for predicting postoperative AKI in patients undergoing cardiac surgery.
**Objectives:** To investigate the predictive value of urinary DKK3 on postoperative AKI and develop a clinical model based on the predictor for predicting the development of AKI within seven days for patients undergoing noncardiac surgery.
**Methods:** All patients who were admitted to the Intensive Care Unit (ICU) after noncardiac surgery from March 2023 to June 2023 were included in this study. The patients' baseline data on demographic characteristics, lifestyle risk factors, medical history, clinical features, and laboratory tests before surgery were collected at the time of admission. Besides, the blood samples for cystatin C and routine laboratory tests and the urine samples for DKK3 tests were simultaneously collected at the time of admission to the ICU. In addition, the independent predictors of postoperative AKI were identified by univariate, multivariate, and LASSO analyses. Moreover, a nomogram for predicting postoperative AKI was developed based on these independent predictors. Finally, the nomogram was evaluated through calibration and decision curve analyses.
**Results:** A total of 166 patients with a median age of 67 years old were included in this study, including 94 (56.63%) males. Among these patients, 47 patients (28.3%) developed postoperative AKI. Additionally, 7 independent risk factors, including preoperative serum creatinine, preoperative eGFR, preoperative serum albumin, preoperative serum potassium ion, cystatin C, uDKK3/uCr, and SOFA score, were selected by univariate and multivariate regression analyses. Eventually, 4 independent risk factors (including preoperative eGFR, cystatin C, uDKK3/uCr, and SOFA score) identified in this study by LASSO analyses were used to establish the nomogram. The area under the receiver operating characteristic (ROC) curve (AUC) for the prediction model was 0.868. The calibration curve and decision curve analysis results demonstrated that the nomogram had good prediction performance.
**Conclusions:** Urinary DKK3/creatinine was independently associated with postoperative AKI for patients in the ICU after noncardiac surgery. The nomogram constructed based on uDKK3/uCr, preoperative eGFR, cystatin C, and SOFA score showed a higher accuracy in predicting postoperative AKI.

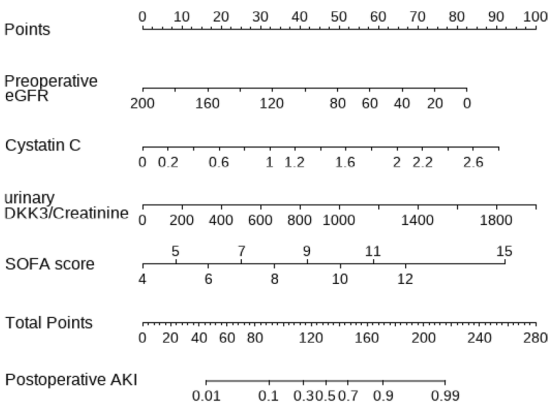
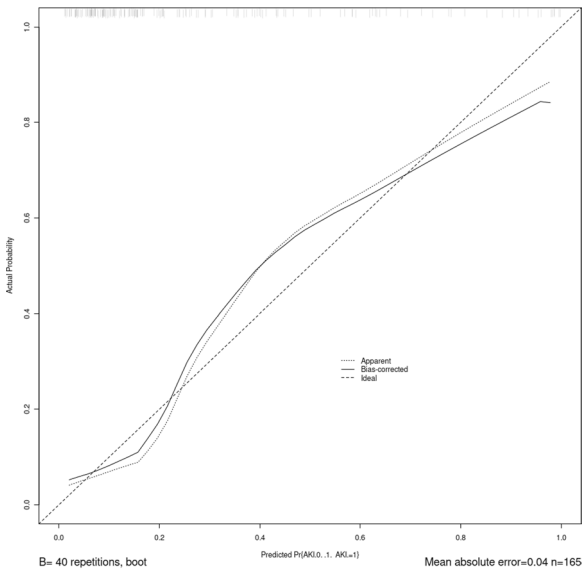
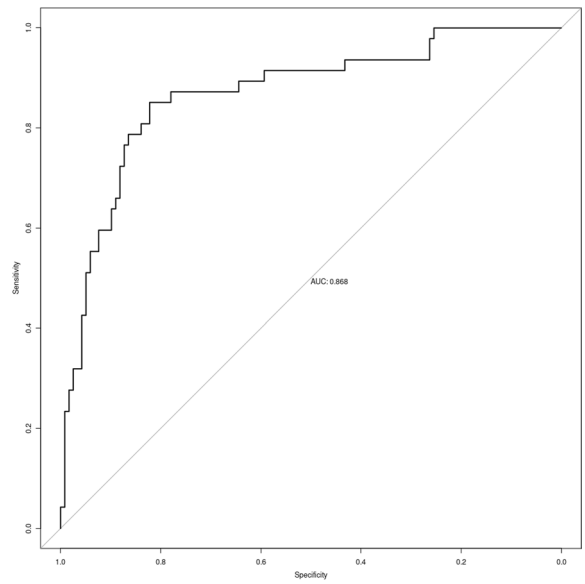



**Fig. (abstract 000036)** Nomogram for predicting postoperative AKI



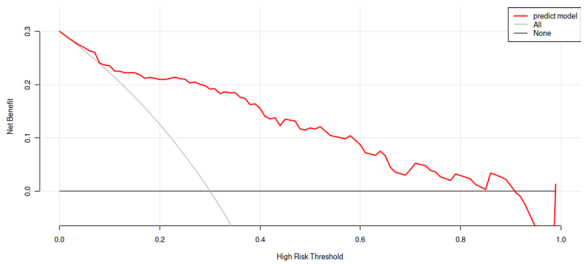

**The nomogram for predicting**

**Fig. (abstract 000036)** The nomogram for predicting




**The AUC of the prediction nomogram model**

**Fig. (abstract 000036)** The AUC of the prediction nomogram model




**The decision curve of the nomogram**

**Fig. (abstract 000036)** The decision curve of the nomogram

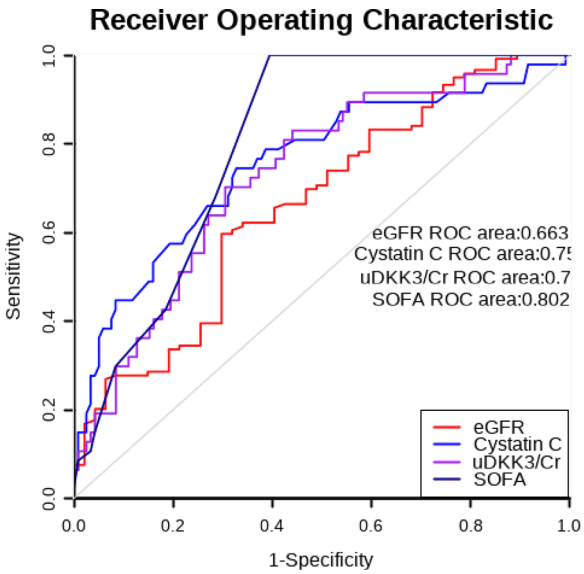



**Fig. (abstract 000036)** Predictive power of the different indicators

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**Topic:** Acute Kidney Injury and haemofiltration

### 000038

### Glucocorticoid receptor expression and signaling in critically ill patients with acute brain injury

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**Introduction:** Critically ill patients, including those with acute brain injuries (BI) are frequently hospitalised in an intensive care unit (ICU). As with other critical states, an adequate stress response is essential for survival. In this regard, corticosteroid treatment has been extensively investigated in these patients. The actions of glucocorticoids are mediated by a ubiquitous intracellular receptor protein, the glucocorticoid receptor (GCR). However, data on GCR-α expression and its signalling in acute BI injury are lacking.
**Objectives:** We designed a prospective observational study aiming at investigating the expression of *GCR-α* and *GILZ* in the polymorphonuclear leukocytes (PMNs) of ICU patients with BI and to compare their expression to normal controls. We also aimed at exploring possible correlations of *GCR-α* and *GILZ* expression with BI biomarkers and with cytokines implicated in the GC response during critical illness.
**Methods:** Forty-two critically ill patients with acute BI were included. These patients suffered from traumatic BI ($N=20$), aneurysmal subarachnoid hemorrhage ($N=12$), intracerebral hemorrhage ($N=7$), or acute ischemic stroke ($N=3$). All patients were steroid-free. Twenty-four age and sex-matched healthy controls were used for comparison. Expression of *GCR-α* and the glucocorticoid-inducible leucine zipper (*GILZ*), serum cortisol, interleukins (IL) 6, 8, and 10, and the BI biomarkers GFAP and total Tau were measured on ICU admission (within 48 h) and 5–7 days from admission.
**Results:** Compared to healthy controls, in the critically ill patients with BI, *GCR-α* mRNA expression was significantly downregulated on admission, and after 5–7 days in the ICU (2.3-fold, $p<0.05$ and 2.6-fold, $p<0.01$, respectively). Even though GCR-*α* was downregulated, its downstream gene, *GILZ*, was expressed at the same levels as in normal controls on admission and was significantly upregulated 5–7 days following admission (twofold, $p<0.001$). TNF-*α* levels were undetectable at both time-points. *GCR-α* expression levels inversely correlated with IL-6 and IL-10. The levels of cortisol and the BI biomarkers did not differ between the 2 time-points.
**Conclusions:** The low-grade inflammatory response seen in our BI critically ill patients does not seem to result in glucocorticoid resistance. Our critically ill patients with BI seem to possess a sensitive GCR, leading to increased *GILZ* expression. The induction of GILZ by aldosterone via the mineralocorticoid receptor cannot be excluded.

**Topic:** Neurointensive care

## 000039

### Association between systemic inflammation response index and poor neurologic outcomes in out-of hospital cardiac arrest patients

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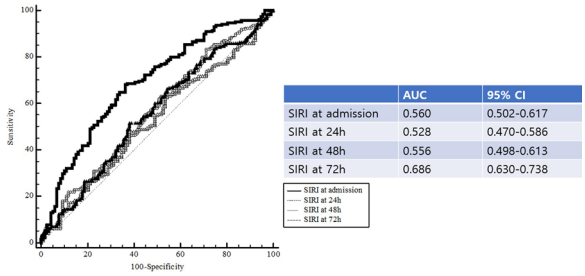
**Introduction:** Post-cardiac arrest syndrome (PCAS), a systemic inflammatory syndrome following CA, occurs during the reperfusion period after the ROSC. It shares several pathophysiological mechanisms with sepsis, and causes hypoxic brain injury. However, inflammatory markers to the outcome has not yet been fully investigated. An inflammation-related marker, the systemic inflammation response index (SIRI), which was developed in 2016 that can reflect the cancer-related inflammatory response, is calculated as neutrophils × monocytes/lymphocytes.
**Methods:** In this retrospective, observational singlecenter study, we tested the hypothesis that SIRI is associated with the neurological outcomes of OHCA patients treated with TTM. Venous blood sample were routinely collected at admission and at 24 h, 48 h and 72 h after the ROSC. The primary outcome was poor neurologic outcome (CPC3-5) at 6 months after CA.
**Results:** A total of 317 of 516 patients (61.4%) treated with TTM were included in the analysis. 127 of 317 patients (40.0%) had good neurologic outcome, and 190 of 317 patients (60.0%) had poor neurologic outcome. SIRI at 72 h were higher in poor neurologic outcome group, while SIRI at admission, 24 h and 48 h had no significant difference.
**Conclusions:** SIRI at 72 h after the ROSC were associated with poor neurological outcomes at 6 months after CA in patients treated with TTM.




| | AUC | 95% CI |
|---|---|---|
| SIRI at admission | 0.560 | 0.502-0.617 |
| SIRI at 24h | 0.528 | 0.470-0.586 |
| SIRI at 48h | 0.556 | 0.498-0.613 |
| SIRI at 72h | 0.686 | 0.630-0.738 |

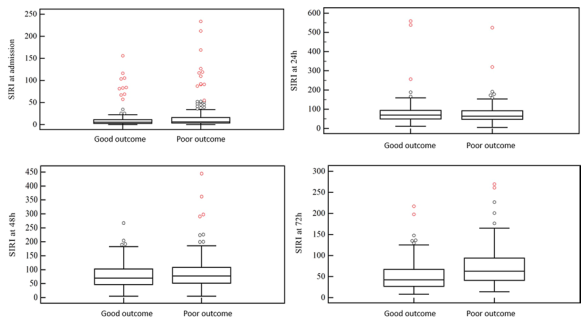



**Table (abstract 000039)** Odds ratio for poor neurologic outcomes at 6 months after ROSC

| | Poor neurologic outcomes at 6 months | | | |
|---|---|---|---|---|
| | SIRI at admission | SIRI at 24h | SIRI at 48h | SIRI at 72h |
| Multivariate | 1.006 | 0.999 | 1.004 | 1.010 |
| | (0.994-1.018) | (0.994-1.004) | (0.997-1.010) | (1.001-1.019) |
| SIRI≥50 | 1.898 | 1.110 | 1.453 | 2.635 |
| | (0.600-6.099) | (0.552-2.232) | (0.707-2.988) | (1.361-5.103) |

Adjusted by Age, Witnessed arrest, Bystander CPR, Initial shockable rhythm, Cardiac cause of arrest, Time from collapse to ROSC, Hypertension, Diabetic mellitus, hs-CRP at admission

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**Topic:** Cardiac arrest

## 000040

### Correlation of ICU-acquired weakness with diaphragmatic excursion measured by USG: a prospective observational study

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**Introduction:** Intensive care unit (ICU) acquired weakness (ICUAW) is a clinically detected condition characterized by diffuse, symmetric weakness involving the limbs and respiratory muscles. Not all patients who are weaned in ICU off ventilator have diaphragm weakness. They may have poor muscle power or MRC score. In this study, we plan to find a correlation between diaphragmatic excursion measured using ultrasound with MRC sum score, which has not been done in earlier studies. We hypothesize that diaphragm weakness is not there in many patients in ICU, leading to their weaning from the ventilator. However, they may have muscle weakness requiring long-term physiotherapy and rehabilitation. Identifying the patient with muscle weakness with diaphragm sparing is important to fastrack weaning in this group of patients.
**Objectives**: **Primary**: To assess the correlation between MRC sum score and diaphragmatic excursion measured using USG.
**Secondary:** To assess the sensitivity and specificity of Diaphragmatic excursion measured using USG in predicting the presence of ICUAW.
**Methods:** Patients admitted in the ICU and ventilated for more than 48 h were included in the study. Demographic data, including name, age, diagnosis, and APACHE II score at the time of admission,were collected.The patients were assessed after 48 h of mechanical ventilation-when they were at spontaneous breathing trial and off sedation for at least 30 min.

We calculated the MRC-sum score by summing all the obtained strength values of the upper limbs and lower limbs.
Thirty minutes after the MRC sum score was calculated patient was put in the supine position. The patient was disconnected from the ventilator for a brief period during which. Using Vivid™ iq from GE Healthcare USG machine low-frequency curvilinear transducer (1–5 MHz) using two-dimensional M-mode imaging ultrasonography 22 was done. The right side of the diaphragm was examined from the anterior subcostal view by positioning the probe below the right costal margin between the midclavicular and anterior axillary lines. The ultrasonic beam from the probe was aimed cranially at the posterior portion of the diaphragm to get maximum excursion. The diaphragmatic excursion was measured in three successive tidal volume breaths and vital capacity breaths. The mean of these readings was calculated and used for analysis. Other data, like the use of corticosteroids, NMB, and vasoactive drugs (noradrenaline, vasopressin, adrenaline) were noted.
**Results:** On comparing the relationship between the MRC sum score and DE normal breathing, we found a moderate correlation with a Spearman coefficient of 0.39 ($p = 0.006$) but a weak correlation between the MRC sum score and DE deep breathing with a Spearman correlation coefficient of 0.27 which is not statistically significant. Among patients who had ICUAW, the patients who were not extubated had a mean DE of 9mm during normal breathing and 17.6 mm during deep breathing was significantly less when compared to a mean of 11.1 mm during normal breathing and 19.7mm during deep breathing in patients who were extubated.
**Conclusions:** Our study concludes that diaphragmatic measurement OF USG can be used as a simple screening tool for predicting ICUAW in a busy ICU. Among patients who had ICUAW, those who were not extubated had a mean DE of 9mm during normal breathing and 17.6 mm during deep breathing compared to a mean of 11.1 mm during normal breathing and 19.7 mm during deep breathing.

**Topic:** Imaging in intensive care

## 000042

### Why women don't reach leadership in Critical Care Medicine

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**Introduction:** Evidence suggests potential gender disparities amongst critical care practitioners, including critical care clinical and administrative leaders. Despite guidelines published by the Association of American Medical Colleges (AAMC) in 2009 encouraging medical schools and academic institutions to focus on improve gender equality in academia and to increase the representation of women in senior academic and leadership positions, the literature supports significant and ongoing gender disparities in academic medicine, particularly in leadership positions.
**Objectives.** We completed a systematic review to summarize evidence surrounding clinical practice and leadership opportunities forwomen in critical care. Our PICOTS question was "Why women are not equally represented in Critical Care Medicine leadership roles and other similar fields worldwide, and what organizational policies and practices impede this progression?".
**Methods. Data Sources:** A systematic literature review was undertaken using four databases: Cochrane Library, Embase, PubMed, and the Web of Science.
**Study Selection:** The types of articles included were: consensus statements, opinions, and editorials.
**Data Extraction:** The database searches generated 724 records. 49 studies met inclusion criteria for data extraction. The included studies were published between 2011 and 2023 and represent seven countries, with 38 studies originating in the United States. Eight studies were commentaries, and the rest were qualitative, observational studies. The following 5 domains were found after grouping the studies according to the thematic content analysis of the results: pipeline issues, lack of opportunities, lack of self-efficacy, lack of mentorship, and sustaining women in leadership.
Data Synthesis: Covidence platform and CASP methodology.
**Results:** The papers were tabulated and the content was analyzed qualitatively using coding, iterative analysis and separation into themes. The CASP tool was used to assess the risk of bias in all studies. The following 5 domains were found after grouping the studies according to the thematic content analysis of the results:

1. Pipeline issues in having women who are ready for leadership (family issues, qualifications, motivation, confidence).
2. Lack of opportunities offered (disparities and bias).
3. Lack of self-efficacy (belief that one can be a leader).
4. Lack of mentorship (in having women leaders).
5. Sustaining women in leadership through fair support (fair treatment, harassment, unequal pay).

**Conclusions:** While the satisfaction rates of women in critical care medicine are high 55 challenges remain for women in leadership. By creating a culture of support, we can sustain them in those roles.

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**Topic:** Health Services Research and Outcome

## 000043

### Survey on the Knowledge of Fluid Management and Fluid Stewardship in Indonesia: A Cross-Sectional Study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000043

**Introduction:** Intravenous fluid administration is a common medical practice in hospitals. However, the knowledge of health practitioners vary and may impact patient outcomes. Despite global awareness of fluid management issues, Indonesia remains unexplored.
**Objectives:** The aim of this survey is to explore the correlation between doctors' professional status and their intravenous fluid therapy knowledge in Indonesian hospitals, hypothesizing that there is a significant difference.
**Methods:** Anesthesiologist and Resident in Training from Indonesia were asked to respond to an online survey about their opinions on fluid choices. Of the 65 multiple-choices in the survey, 25 addressed knowledge of fluid management and stewardship. For statistical analysis, data are represented as median with minimum and maximum values. The Mann Whitney U test and Chi-Square were used to study the difference in the different groups according to training status.
**Results:** 364 surveys were received, with respondents originating from 27 provinces throughout Indonesia, covering all of the country's major islands. The years of experience ranged from 0 to 57 with a mean of 10.57. The median cumulative score on the knowledge questions was 40 out of 100 with the lowest score 12 and highest score 72.
There are significant difference in the median cumulative score between resident in training 36 (12–64) and qualified anesthesiologist 44 (16–72) with P-Value 0.000. 263 (72.3%) respondents state that ringer's lactate is the most prescribed infusion in their workplace. The poor survey scores indicate that the respondents' knowledge about fluid management and stewardship still lacking, with fluid volume status assessment being the area most in need of improvement.
**Conclusions:** This survey assessed the knowledge of fluid stewardship and management across Indonesian anesthesiologist. Given that the median score was less than 50, it can be improved by proposing fluid stewardship education and training before establishing a comprehensive fluid stewardship program in Indonesia.

**Table 1 (abstract 000043)** Comparison of respndents' median scores with training status

| Variable | | Research Domain | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1: Basic knowledge of electrolytes (Min-Max) | 2: Administration of IV fluids (Min-Max) | 3: Knowledge of the composition of IV fluids (Min-Max) | 4: Fluid resuscitation (Min-Max) | 5: Assessment of fluid volume status (Min-Max) | Cumulative Score (Min-Max) |
| Respondents | n=364 | 25 (0-100) | 37.5 (0-87.5) | 60 (0-100) | 40 (0-100) | 0 (0-66) | 40 (12-72) |
| **Status** | | | | | | | |
| Resident in Training | 162 (44.5%) | 25 (0-100) | 37.5 (0-87.5) | 40 (0-100) | 40 (0-100) | 0 (0-66) | 36 (12-64) |
| Qualified Anesthesiologist | 202 (55.5%) | 37.5 (0-100) | 37.5 (12.5-87.5) | 60 (0-100) | 40 (20-100) | 33 (0-66) | 44 (16-72) |
| P-value | | 0.139 | 0.053 | 0.000 | 0.074 | 0.288 | 0.000 |

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3. Nil

**Topic:** Perioperative care

## 000044

### Framework for studying racial *bias* in end of life care

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**Introduction:** Despite improved end-of-life (EOL) care in the ICU there remain significant differences in the care dispensed to Black and Hispanic patients. There is a lack of trust in clinicians which may be due to a perception of implicit bias. Implicit, or unconscious racial bias may influence how physicians communicate with patients about their end-of-life care preferences, and thus result in less patient and family compliance with treatment recommendations on the quality of end-of-life care. This can be due to the implicit bias in how ICU clinicians deliver care or communication at EOL resulting in disparate care.
**Objectives:** There is a critical need to address this knowledge gap and incorporate the voices of Black and Hispanic patients and their families in end-of-life care decision making. The proposed research objective is to provide key insights about the presence of implicit bias among ICU clinicians, as well as views of Black and Hispanic patients regarding clinician trustworthiness and perception of bias, and how this may affect their EOL decisions and rejection of clinical advice.
**Methods:** Aim 1: To assess the presence of implicit bias among ICU clinicians. We hypothesize that there exist among ICU clinicians race implicit biases that may result in differential treatment of Black and Hispanic patients. We will conduct a self-administered survey of 376 ICU doctors and nurses using the Race Implicit Association Test better understand how clinical decisions may be aligned with consciously and unconsciously held beliefs on race and ethnicity of patients. We will evaluate these survey results to examine any association of bias with participant demographics and clinical practice features.
Aim 2: To assess Black and Hispanic patient and family EOL experiences and their perception of trustworthiness of clinicians. We hypothesize that Black and Hispanic patients do not consider their clinicians providing EOL care in the ICU trustworthy and reject clinical advice in EOL decision making. We will survey and interview 50 Black and Hispanic patients and their families. Using a validated, trust survey, modified for an ICU setting, we will (Aim 2.1) evaluate the level of trust present in the healthcare system and the organization, as well as the ICU team and clinicians who helped them reach the goals of care at the EOL. We will look for associations with participant demographics, education, and socio-economic status. We will also (Aim 2.2) conduct in-depth interviews with these participants to understand their experiences and perceptions of racial bias and assess whether these perceptions impact their goals of care decisions.
Aim 3: To develop recommendations. We hypothesize that getting feedback from culturally and experientially aligned individuals can help in reaching a balanced view on the factors causing perception of clinician untrustworthiness and resulting disparities in EOL care decisions. Using clinician and patient feedback from the above aims, we will form an Advisory Committee that will include past patients,

families, physicians, social workers, ethicists and spiritual care leaders, to develop (Aim 3.1) recommendations for gaining greater insight into the diverse views of Black and Hispanic patients who receive EOL care in the ICU, and (Aim 3.2) develop a future patient experience toolkit designed to help clinicians, to achieve racially unbiased, goal concordant care in the ICU.
**Results:** We will use an innovative combination of analytical and interpretive techniques from mixed methods strategies. This research will provide key insights about the views of Black and Hispanic patients and clinicians caring for them regarding EOL care. Better understanding personal characteristics, attitudes, experiences and structural influences will suggest potential future interventional targets. Knowledge generated will be used to educate clinicians on constructive ways to listen and respond to the needs of diverse patients.
**Conclusions:** This proposal spans sociocultural and health care system domains of influence and their intersection with key interpersonal and individual levels of influence.

**Topic:** Ethics and end of life care

## 000049

### Development of personalized non-invasive ventilation masks for critically ill children: a bench study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000049

**Introduction:** Obtaining a properly fitting non-invasive ventilation (NIV) mask to treat acute respiratory failure is a major challenge, especially in young children and patients with craniofacial abnormalities [1, 2] Personalization of NIV masks holds promise to improve pediatric NIV efficiency [3].
**Objectives:** This study aimed to test the air leak and skin pressure performance of personalized oronasal face masks using 3D-printed soft materials.
**Methods:** Personalized masks of three different biocompatible materials (silicone and photopolymer resin) were developed and tested on three head models of young children with abnormal facial features during bench simulation of pediatric NIV. The setup is shown in Fig. 1. Air leak percentages and facial skin pressures were measured and compared for each mask.
**Results:** Personalized NIV masks could be successfully produced in under 12 h in a semi-automated 3D production process. During NIV simulation, overall air leak performance and applied skin pressures were acceptable, with leak percentages under 30% and average skin pressure values mostly remaining under normal capillary pressure. There was a small advantage of the masks produced with soft photopolymer resin material.
**Conclusions:** This first, proof-of-concept bench study simulating NIV in children with abnormal facial features, showed that it is possible to obtain biocompatible, personalized oronasal masks with acceptable air leak and skin pressure performance using a relatively short, and semi-automated production process. Further research into the clinical value and possibilities for application of personalized NIV masks in critically ill children is needed.

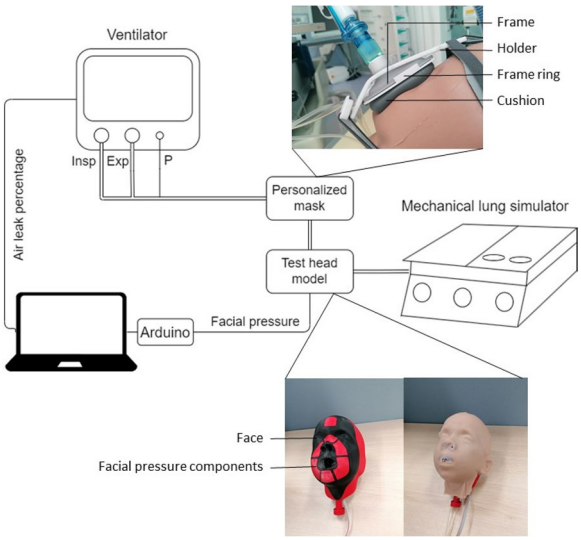


**Fig. 1 (abstract 000049)** A schematic overview of the bench test setup for pediatric non-invasive ventilation simulation with details on the test head model (A) and the personalized mask (B). The personalized mask consist of a frame, frame ring, holder and a personalized cushion. The mask is placed on the accompanying test head model, which contains facial pressure components that follow the outline of the ventilation mask. The pressure sensors underneath the components are connected to the laptop through a microcontroller (Arduino). The test head model has a 3 mm silicon layer to create an airtight connection to the mechanical lung simulator. The mask is connected to the ventilator, which directly provides information on the inspiration (insp) and expiration (exp) volumes, flows and pressures (P) to the laptop for data collection

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4. This research is funded by the Innovation Award Amsterdam UMC, the Emma Children's Hospital Foundation, the Cornelia Foundation, and Vermas Foundation.

**Topic:** Acute respiratory failure and mechanical ventilation

## 000051

### Cardiorespiratory response to rehabilitation on critical care with patients requiring prolonged mechanical ventilation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000051

**Introduction:** Early rehabilitation in critically ill patients increases physical function whilst reducing delirium and duration of mechanical ventilation (MV) [1, 2]. Variance in cardiorespiratory responses during rehabilitation on intensive care (ICU) exists, highlighting the challenge of targeting optimal intensity of rehabilitation [3]. Safety of rehabilitation interventions has been established [4], however, little evidence exists to support clinicians in determining target rehabilitation intensity to induce physiological adaptations, particularly in patients requiring prolonged MV. We aimed to investigate the safety and cardiorespiratory response to exercise for patients requiring > 7 days of MV.
**Methods:** Prospective, observational data was collected from patients in a large, UK, multi-specialty ICU. Eligible patients required > 7 days MV, clinical suitability to participate in rehabilitation and primary admission was not neurological or traumatic injury. Opportunistic sampling of a singular rehabilitation session for 20 patients was collected over 4-months. Rehabilitation outcomes were recorded using the Manchester Mobility Scale (MMS), with sessions aimed at achieving the highest level of mobility. Physiological data ($SpO_2$, HR, MAP, RR and MV) was collected with standard ICU monitoring pre(baseline), during (2-min intervals) and post rehabilitation (10 min after). Medians and percentage change for physiological variables at each time point were calculated to visualise responses.
**Results:** Exercise response was consistent across all variables, increasing with exercise and returning towards baseline 10 min post, except $SpO_2$ which showed little change (Graph 1–5). This trend was consistent in all forms of exercise, sitting on edge of bed, hoisting out (MMS 2 + 3, $n = 16$), standing practice and step transferring (MMS 4 + 5, $n = 4$). Average percentage change for all variables pre to post rehabilitation was < 10%. RR and MV showed greatest change during exercise (19.2% and 18.32%) (Table 1) compared with other variables, no adverse outcomes were reported during rehabilitation.

| | Spo2 | Heart rate (HR) | Mean arterial Pressure (MAP) | Respiratory Rate (RR) | Minute Ventilation (MV) |
|---|---|---|---|---|---|
| Median % change pre-during ($n = 20$) | 0 (− 1.46–0.13) | 6.39 (0.77–9.58) | 6.25 (0.00–19.62) | **19.20 (10.22–27.63)** | **18.32 (6.87–39.21)** |
| Median % change pre-during (MMS 2–3) ($n = 16$) | − 0.25 (− 1.46–0.13) | 4.81 (0.00–9.25) | 6.25 (− 0.56–19.62) | **17.48 (5.61–27.63)** | **18.32 (8.41–35.92)** |
| Median % change pre-during (MMS 4–5) ($n = 4$) | 0.00 (− 1.50–3.31) | 8.37 (6.88–13.39) | 5.95 (4.00–10.47) | **26.14 (21.63–28.27)** | **25.21 (15.32–35.11)** |
| Median % change Pre-Post ($n = 20$) | 0.00 (− 2.52–1.03) | 2.27 (− 3.34–6.37) | 2.07 (− 5.66–9.02) | 1.72 (− 10.76–24.35) | 9.16 (− 2.99–28.80) |

**Conclusions:** This small prospective audit supports that rehabilitation is safe in critically ill adults who require prolonged MV, with no adverse events reported and all physiological parameters within 10% of baseline 10 min post rehabilitation. Significant changes in MV and RR were observed during rehabilitation, indicating a greater sensitivity in exercise response. Further research investigating whether percentage change in MV and RR could be used to target rehabilitation dosage and intensity to improve outcomes is warranted.

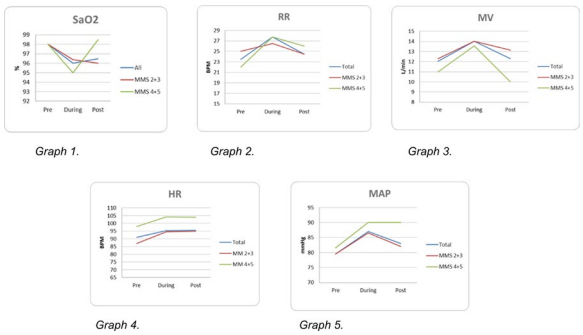


**Fig. (abstract 000051)** Cardiorespiratory response to rehabilitation

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**Topic:** Nursing care and physiotherapy

## 000053

### Ciprofol versus propofol for long-term sedation in mechanically ventilated patients with *sepsis*: a pilot randomized controlled trial

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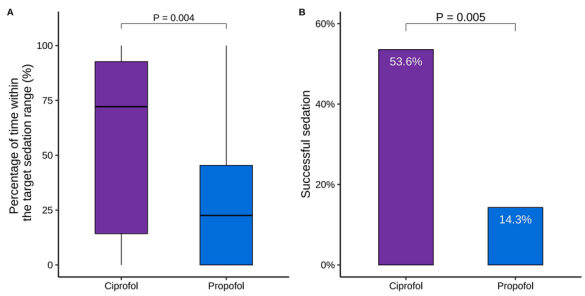
***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000053

**Introduction:** Sedatives are commonly used to facilitate mechanical ventilation in patients with sepsis. Ciprofol, a novel intravenous anesthetic structurally similar to propofol [1], exhibits superior binding activity to the gamma-aminobutyric acid-A receptor, positioning it as a promising sedative candidate [2]. It has been used for the induction and maintenance of general anesthesia and short-term sedation for critically ill patients [3–5], but the role of ciprofol in long-term sedation for mechanically ventilated patients with sepsis has not been well established. This pilot randomized clinical trial aimed to compare the efficacy and safety of ciprofol and propofol for long-term sedation in mechanically ventilated patients with sepsis.
**Methods:** The trial was prospectively registered at Chinese Clinical Trial Registry (number: ChiCTR2200066835). Mechanically ventilated adults with sepsis who anticipated to require long-term sedation (≥ 24 h) were randomly assigned to receive either intravenous ciprofol

or propofol in a 1:1 ratio. The primary outcomes were the percentage of time within the target sedation range and successful sedation (the percentage of time within the target sedation range ≥ 70% without rescue sedation). Secondary outcomes included weaning time, ICU and in-hospital mortality, length of ICU and hospital stay, hypotension, and bradycardia.

**Results:** Between February 14, 2023 and July 1, 2023, 60 patients were randomized, and 4 of them were excluded because of withdrawing treatment. 28 were assigned to the ciprofol group and 28 to the propofol group. The median age of enrolled patients was 69.0 years and 64.3% were male. The main infection source was pulmonary (73.2%), and most patients (78.6%) had septic shock with receiving at least one type of vasopressor (91.1%). The mean baseline APACHE II and SOFA scores were 29.5 (7.8) and 10.9 (3.7), respectively. Patient characteristics were similar between the two groups. As shown in Fig. 1, ciprofol group had significantly higher percentage of time within the target sedation range (median [IQR], 72.2% [14.3–92.7%] vs 22.6% [0.0–45.4%], $P = 0.004$) and successful sedation rate (53.6% [15/28] vs 14.3% [4/28], $P = 0.005$). No significant differences were observed in weaning time, ICU mortality, in-hospital mortality, length of ICU stay, and length of hospital stay between the two groups. Hypotension occurred in 4 (14.3%) patients of ciprofol group and 6 (21.4%) patients of propofol group. No patient occurred bradycardia.

**Conclusions:** Ciprofol is an effective and safe agent for long-term sedation in mechanically ventilated patients with sepsis.

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6. None.

**Topic:** Sedation, analgesia and delirium

## 000054

## From Potential Brain-Dead Organ Donor to Effective Donation: Challenges in a Tertiary Brazilian Public Hospital

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**Introduction:** The organ donation program in Brazil is one of the largest in the world and is based on donors diagnosed with brain death and obtaining family consent. Nonetheless, there is still a significant demand for donors. Understanding the main challenges affecting the successful organ donation process is important to guide strategies and improve population access to this resource.

**Objectives:** The objective was to analyze brain death notifications from a public tertiary hospital in Brazil to identify the proportion of effective donations and the main reasons why they did not occur.

**Methods:** A cross-sectional retrospective study was conducted to evaluate all notifications of brain death that occurred in a public tertiary hospital in São Paulo, Brazil, in the years 2021 and 2022, to identify outcomes such as effective donation, organs donated, reasons for non-donation, and reasons for family refusal.

Data were collected from the service's Organ Procurement Organization records and electronic medical record review.

**Results:** In both years, there were 194 notifications of brain death: 103 in 2021 and 91 in 2022. All patients were evaluated as potential organ donors in accordance with Brazil's legislation. The main reason for not proceeding with donation was clinical contraindication (30.4%). In 10 patients (5.1%), cardiac arrest occurred before completing the brain death protocol. Family refusal occurred in 44 cases (22.6%), with the primary reason for non-consent being the time required for the donation process (39%). Lack of knowledge about the patient's desire to be a donor or previous indications of not being a donor were other reasons mentioned by family members or legal representatives for rejecting the process.

Only 77 patients (39.6%) were effective donors. The most frequently transplanted solid organs were kidneys (53 donors), followed by liver (27 donors), pancreas (12 donors), and heart (8 donors). In 7 potential donors, organs were refused by transplant teams after evaluation (Fig. 1).

**Conclusions:** To increase the number of transplants in Brazil, there are several opportunities for action. Firstly, improving clinical care in intensive care units (which is heterogeneous in our country) can lead to a reduction in the number of medical contraindications to transplants, mostly due to infectious conditions. Furthermore, optimizing the brain death diagnosis process is imperative; greater availability of human and technical resources can shorten the time for completing the brain death diagnosis protocol, reducing the number of family refusals and increasing the quality of organs offered for donation.

Additionally, public and social education policies on the topic can also contribute to increasing the number of donations and reducing transplant waiting lists.

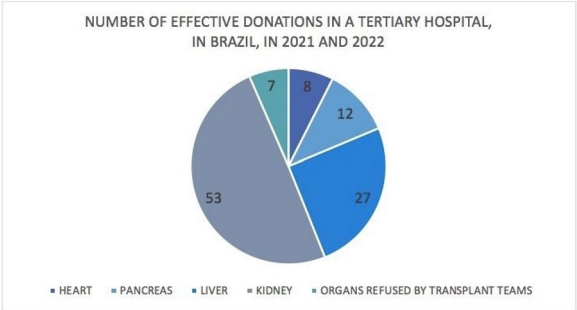


**Fig. (abstract 000054)** Number of effective donations in a tertiary hospital, in Brazil, in 2021 and 2022

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**Topic:** Brain death, organ donation and transplantation

## 000055

## Effect of Hyperbaric Oxygen Therapy on *Sepsis* Induced Neuroinflammation in a Rat Cecal Slurry Model

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000055

**Introduction:** Sepsis-associated encephalopathy (SAE), resulted from severe disturbance in the central nervous system caused by a systemic inflammatory response to sepsis, is a one of frequent and serious complications of sepsis. SAE is a major risk factor which deteriorating the prognosis of sepsis in aspect of mortality and length of hospital stay and survived SAE patients are likely to have prolonged or permanent neuro-psychological sequelae. Two vital mechanisms in the pathogenesis of SAE have been considered as follows: (1) neuro-inflammation mainly executed by microglia, (2) cerebral ischemia/hypo-perfusion caused by cerebral microcirculatory abnormalities. Although the effects of hyperbaric oxygen therapy (HBOT) in sepsis remain unclear, this study aimed to investigate effects of HBOT on neuroinflammation in a rat peritonitis model.
**Methods:** Cecal slurry peritonitis was induced in male rats, which were then randomly allocated into the HBOT and control groups. In HBOT group, two times of 90 min HBOT sessions (2.6 atmospheres absolute 100% oxygen) were performed with an interval of 24 h immediately after cecal slurry modeling. Brains of two group are harvested for mRNA isolation and RT-PCR analysis for gene expression of 4 cytokines, which are TNF-α, IL-1β, IL-6, IL-10, after two session of HBOT.
**Results:** We analysis of gene expression of three pro-inflammatory cytokines, which are TNF-α, IL-1β, IL-6, and one anti-inflammatory cytokine, which is IL-10, from the brain tissue. HBOT decreased the expression level of gene of pro-inflammatory cytokines (TNF-α, IL-1β, IL-6) significantly in peritonitis induced rats. However, the expression level of anti-inflammatory cytokine (IL-10) was not affected significantly after HBOT.
**Conclusions:** HBOT could be a promising therapeutic candidate for SAE considering the favorable effects of HBOT, which is the modulation in neuroinflammation. And treatment of SAE using HBOT may lead to increase of the survival rate and reduction of the cognitive and psychological sequelae in sepsis patients.

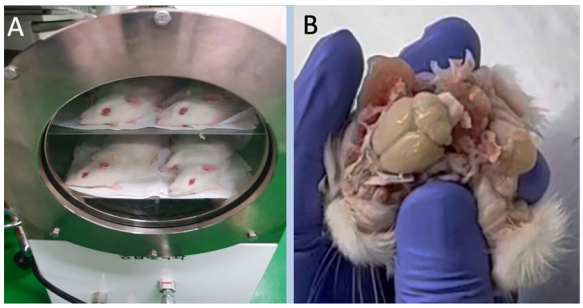


**Fig. 1 (abstract 000055)** (A) HBOT session and (b) brain tissue harvest

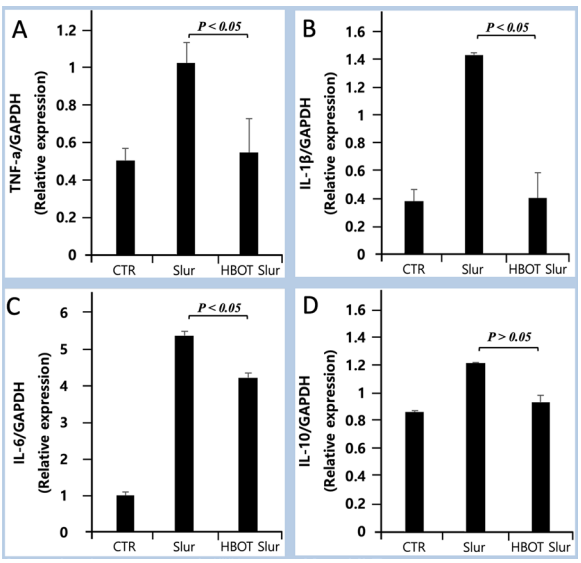


**Fig. 2 (abstract 000055)** Results of qRT PCR of 4 cytokines (A) TNF- α, (B) IL-1β, (C) IL-6, and (D) IL-10

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**Topic:** Sepsis

## 000058

### Two-center randomized controlled trial comparing high-flow oxygen therapy versus low level pressure support during spontaneous breathing trial

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**Introduction:** Spontaneous breathing trial (SBT) is the recommended method to determine the readiness to wean in patients who received mechanical ventilation for at least 24 h. Low pressure augmentation using pressure support (PS) ventilation is preferred as the initital SBT method rather than T-tube or continous positive airway pressure. High-flow oxygen therapy (HFT) via nasal cannual is recommended to use in several conditions. Current HFT system can be applied with tracheostomy or endotracheal tube via a specific connector and it may be an alternativeg method for SBT. However, the data regarding HFT during SBT is scant. We hypothesized that HFT will not be inferior to low PS during SBT.
**Objectives:** To compare the rate of SBT success, extubation within 48 h of SBT success, reintubation within 48 h after extubation, and hospital mortality between HFT and low PS.
**Methods:** Two centers, open-label, non-inferiority, randomized controlled trial was conducted by blocks of four randomization (Thai Clinical Trial Registration—TCTR20190703002). Adult mechanically ventilated patients > 24 h who were ready to wean were randomly assigned to HFT (Airvo-2, Fisher & Paykel) with a flow rate of 50 L/min, temperature of 37 °C, and inspired oxygen fraction ($FiO_2$) of 0.4 or low PS (PS 8 $cmH_2O$ without positive end-expiratory pressure and $FiO_2$ 0.4) for 30 min. Patients with unstable hemodynamics, significant abnormal acid–base, pregnant woman, or tracheostomized patients were excluded. The primary outcome was the rate of SBT success. The secondary outcomes included the rate of extubation within 48 h after SBT success, reintubation rate within 48 h after extubation, and hospital mortality between the two groups.
**Results:** 162 patients were enrolled (81 patients in HFT group and 81 patients in low PS group). Median age [interquartile range] was 70 [61–81] years and 56.2% of them were male. APACHE II and SOFA scores at enrollment were 12 [9–15] and 4 [2–6], respectively. No significant differences in baseline characteristics between the two groups were found except more patients with COPD in HFT group than low PS group (12.3% *vs.* 3.7%, respectively; $P = 0.04$). Pneumonia was the most common diagnosis on admission (45.7%) and acute hypoxemic respiratory failure was the most common indication of mechanical ventilation (65.4%). The rate of SBT success was 77 patients (95.1%) in HFT group and 77 patients (95.1%) in low PS group (OR = 1.00; 95% confidence interval [CI], 0.24–4.14; $P = 1.000$). Extubation within 48 h after SBT success was performed in 68 patients (84.0%) in HFT group and 62 patients (76.5%) in low PS group (OR = 1.60; 95% CI, 0.73–3.51; $P = 0.324$). Reintubation within 48 h after extubation was performed in 6 patients (9.0%) in HFT group and 11 (17.7%) in low PS group (OR = 0.46; 95% CI, 0.16–1.32); $P = 0.193$). Hospital mortality was significantly lower in HFT group compared to low PS group (11.1% *vs.* 24.7%; OR = 0.38; 95% CI, 0.16–0.90; $P = 0.039$). No significant differences in physiologic variables at end of SBT was observed between the two groups.
**Conclusions:** Among patients who were ready to wean, SBT performed with HFT was not inferior to low PS. No different in the rate of extubation within 48 h and reintubation within 48 h after extubation between the two Methods: However, mechanically ventilated patients who received SBT with HFT had significant lower hospital mortality compared to low PS.

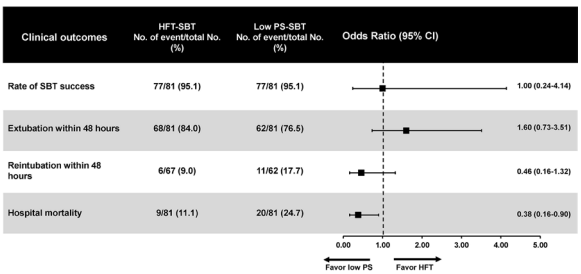


**Fig. (abstract 000058)** Primary and secondary outcomes between spontaneous breathing trial (SBT) with high-flow oxygen therapy (HFT) and low level pressure support (PS)

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000059

### Predictive score for urosepsis in patients with urinary tract calculi following surgical intervention

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000059

**Introduction:** Urosepsis is a life-threatening condition resulting from urogenital tract infections (1) and causes high mortality ranged from 20 to 40% (2). Patients undergoing surgical procedure for urinary tract calculi removal are at an increased risk for urosepsis (2). However, a reliable predictive scoring system to assess urosepsis risk in this population is lacking.
**Objectives:** This study aimed to assess the diagnostic accuracy of various clinical scoring systems including Systemic Inflammatory Response Syndrome (SIRS), Quick Sequential Organ Failure

Assessment (qSOFA), and Modified Early Warning Score (MEWS) as well as a newly developed scoring model for predicting urosepsis development in patients undergoing procedure for urinary tract calculi removal.
**Methods:** This retrospective study was conducted at a tertiary-care university hospital between January 2019 and December 2021. Individuals aged 18 years or older who underwent urinary tractstone removal procedure were enrolled. Development of post-procedural urosepsis within 7 consecutive days was followed. Urosepsis was defined as an urinary tract infection with a SIRS score of $\geq 2$. Multivariate logistic regression analysis was employed to identify variables associated with urosepsis development and was subsequently used to developed a new predicative model. SIRS, qSOFA, MEWS and the new predictive model were evaluated for diagnostic accuracy using area under the receiver-operating characteristic curve (AUROC).
**Results:** Preliminary analysis included 406 patients, 36 (8.9%) of them developed urosepsis.
Independent risk factors for post-procedure urosepsis included positive leukocyte urinalysis, bacterial growth from urine culture, the presence of struvite or infection stone, and moderate to severe hydronephrosis. The AUROC for diagnosis of urosepsis of SIRS $\geq 3$, qSOFA $\geq 1$, MEWS $\geq 3$ and the new predictive model $\geq 4$ were 0.79 (95% CI 0.69–0.90), 0.77 (95% CI 0.66–0.87), 0.96 (95% CI 0.90–1.00), and 0.84 (95% CI 0.77–0.90), respectively.
**Conclusions:** Although, the newly developed predictive model showed good diagnostic accuracy, it had lower discriminating power compared to MEWS. Giving that the two scoring models retrieve different clinical variables, combining these two may yield higher diagnostic accuracy. Subsequently, it should help identifying patients at risk for urosepsis and perioperative management can be promptly provided to improve outcomes in patients undergoing procedure for urinary tract calculi removal.

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**Topic:** Perioperative care

**000069**

## Peripheral Venous Oxygen Saturation as a Predictor of Early In-hospital Mortality in Emergency Department

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):** 000069

**Introduction:** Multiple physiological and biological parameters to evaluate the status of shock have been developed. Peripheral venous blood gas analysis is less invasive than gas analysis using arterial blood or central venous blood, but it is not commonly used as a reliable indicator of shock.
**Objectives:** We aim to investigate the correlation between initial peripheral venous blood $O_2$ saturation in emergency department and 24-h in-hospital mortality to evaluate its prognostic utility.
**Methods:** This was a retrospective observational study conducted in an academic teaching hospital with about 30,000 emergency department patients visits annually. Adult patients aged 18 years or older who visited the emergency department and underwent blood gas analysis from January 2015 to December 2019 was enrolled. Univariate and multivariate logistic regression analyses were performed to investigate the correlation with 24-h in-hospital mortality and the demographic, physiological, and biochemical variables performed for the demographic, physiological, and biochemical variables. Youden Index was used to select a cut-off $SpvO_2$ value.
**Results:** Out of a total of 69,827 patients, 20,967 were finally enrolled in this study, and 119 (0.58%) died in hospital within 24 h. Peripheral venous oxygen saturation, age, albumin, c-reactive protein, hemoglobin, bicarbonate, National Early Warning Score, and troponin I were significant independent variables in multivariate logistic regression analysis for 24-h in-hospital mortality (Table 1). For peripheral venous oxygen saturation, the odds ratio was 0.9735 ($p < 0.001$; 95% CI, 0.9622–0.9849). According to the Youden index, the peripheral venous oxygen saturation cutoff was 20.8%, which had a sensitivity of 31.9% and specificity of 91.9%. This negative correlation was unaffected by severity (low [$\leq 4$] or high [$> 4$] NEWS score) or early oxygen supplementation in emergency department.

**Table 1 (abstract 000069)** Results of multivariate logistic regression of 24 h mortality

| Variable | Odd ratio | 95% CI | *p*-value | VIF |
|---|---|---|---|---|
| Age | 1.0429 | 1.0253 to 1.0609 | < 0.0001 | 1.164 |
| Albumin | 0.3426 | 0.2387 to 0.4917 | < 0.0001 | 2.037 |
| Creatinine | 0.9896 | 0.8506 to 1.1514 | 0.8925 | 1.194 |
| CRP | 0.9969 | 0.9935 to 1.0003 | 0.0746 | 1.215 |
| Glucose | 1.0008 | 0.9991 to 1.0025 | 0.3645 | 1.067 |
| Hb | 1.2801 | 1.1584 to 1.4145 | < 0.0001 | 1.849 |
| Bicarbonate | 0.8374 | 0.8023 to 0.8740 | < 0.0001 | 1.412 |
| SpvO2 | 0.9735 | 0.9622 to 0.9849 | < 0.0001 | 1.177 |
| Potassium | 1.0467 | 0.8210 to 1.3343 | 0.7129 | 1.204 |
| NEWS | 1.3579 | 1.2671 to 1.4552 | < 0.0001 | 1.196 |
| INR | 1.1557 | 0.9344 to 1.4294 | 0.1822 | 1.143 |
| Total bilirubin | 1.0407 | 0.9825 to 1.1023 | 0.1739 | 1.111 |
| troponin I | 1.1525 | 1.0698 to 1.2416 | 0.0002 | 1.011 |

Abbreviations: VIF, Variance inflation factor, CRP, C-reactive protein, Hb, Hemoglobin, $SpvO_2$, Peripheral venous oxygen saturation, NEWS, National Early Warning Score

**Conclusions:** Initial peripheral venous oxygen saturation in emergency department was negatively correlated with 24-h in-hospital mortality and showed high specificity with cut-off value of 20.8%. In conjunction with other parameters with high sensitivity for initial mortality, such as lactate or NEWS, it can be implemented as a useful triage tool in the emergency department.

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11. This study was approved by Institutional Review Board of Gyeongsang National University Hospital

**Topic:** Sepsis

## 000070

### Ten-Year Single-Centre Experience in Managing Traumatic Subclavian and Axillary Artery Injuries

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**Introduction:** Trauma-induced injuries to the subclavian and axillary arteries are rare. Treatment options include open repair and endovascular interventions, and selecting the appropriate modality requires careful consideration. We aimed to evaluate the management of traumatic subclavian and axillary artery injuries in a single trauma center and thereby suggest protocols for appropriate therapeutic approaches.
**Methods:** This single-center retrospective study analyzed the medical records of 12 patients who sustained injuries to the subclavian and axillary arteries between January 2013 and January 2023. Injury grading was categorized as follows: grade A, minimal injury (intima only); grade B, vessel laceration < 25%; grade C, laceration 25–50%; grade D, laceration > 50%; grade E, pseudoaneurysm; grade F, vessel transection; and grade G, occlusion. Patient outcomes, including in-hospital mortality, limb salvage and length of stay (LOS) in the hospital and intensive care unit (ICU), were identified.
**Results:** The mean age of the patients was 52.5 ± 16.4 years, and 67% were males. The mean Injury Severity Score (ISS) was 22 ± 4. In-hospital mortality was 17% (n = 2). Among the patients who underwent open repair, one required additional surgery for revascularization, but none of the patients required amputation. The median LOS in the hospital was 48 days (interquartile range [IQR], 22–71 days), and the ICU LOS was 4 days (IQR, 2–22 days). When categorized into the open repair, endovascular repair, and observation groups, a significant difference was observed in injury grade but not in the ISS, LOS, or ICU LOS.
**Conclusions:** In our center, open repair was more prevalent for higher injury grades. In addition, pseudoaneurysm can be effectively treated through endovascular technique.
In the absence of evidence of limb ischemia, non-operative treatment can be applied in low-grade injuries with arterial laceration less than 50%. Even high-grade arterial injuries can achieve high limb salvage rates with appropriate use of various treatment modalities.

**Table (abstract 000070)** Clinical characteristics and management outcomes of traumatic subclavian and axillary artery injuries

| | Overall (n=12) | Open repair (n=7) | Endovascular repair (n=3) | Observation (n=2) | P-value |
|---|---|---|---|---|---|
| Mean age, y | 52.5±16.4 | 46.6±18.0 | 65.7±10.8 | 53.5±3.5 | 0.258 |
| Sex, n (%) | | | | | 0.852 |
| Male | 8 (67) | 5 (63) | 2 (25) | 1 (12) | |
| Mean systolic blood pressure | 83±40 | 70±41 | 100±10 | 105±64 | 0.417 |
| Mean Glasgow Coma Scale Score | 12±4 | 14±2 | 12±6 | 8±1 | 0.156 |
| Mean injury severity score | 22±4 | 23±4 | 18±2 | 27±4 | 0.077 |
| Mechanism of injury, n (%) | | | | | 0.240 |
| Blunt | 9 (75) | 4 (45) | 3 (33) | 2 (22) | |
| Penetrating | 3 (25) | 3 (100) | | | |
| Artery type, n (%) | | | | | 0.519 |
| Axillary | 5 (42) | 3 (60) | 2 (40) | | |
| Subclavian | 6 (50) | 3 (50) | 1 (17) | 2 (33) | |
| Both | 1 (8) | 1 (100) | | | |
| Injury grade, n (%) | | | | | <0.001 |
| A: Minimal injury (intima only) | 0 (0) | | | | |
| B: <25% laceration | 1 (8.3) | | | 1 (100) | |
| C: 25-50% laceration | 1 (8.3) | | | 1 (100) | |
| D: >50% laceration | 1 (8.3) | | 1 (100) | | |
| E: Pseudoaneurysm | 3 (25) | 1 (33) | 2 (67) | | |
| F: Vessel transection | 2 (17) | 2 (100) | | | |
| G: Occlusion | 4 (33) | 4 (100) | | | |
| Vein injuries, n (%) | 3 (25) | 3 (100) | | | 0.240 |
| Brachial plexus injury, n (%) | 9 (75) | 7 (78) | 1 (11) | 1 (11) | 0.114 |
| Reintervention, n (%) | 1 (8) | 1 (100) | | | |
| Amputation, n (%) | 0 (0) | | | | |
| Median length of hospital stay, d (IQR) | 48 (22-71) | 49 (43-60) | 22 (22-52) | 102 (51-152) | 0.100 |
| Median ICU length of stay, d (IQR) | 4 (2-22) | 3 (2-15) | 11 (7-16) | 24 (12-35) | 0.575 |
| In-hospital 30-day mortality, n (%) | 2 (17) | 0 (0) | 1 (50) | 1 (50) | 0.165 |

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**Topic:** Trauma

## 000071

### A Temporal Deep Learning Algorithm for Predicting Extubation Failures in Critical Care Patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000071

**Introduction:** Failure of extubation was related to poor outcomes in critical care patients. Building predictive models will facilitate risk evaluation before extubation. However, the majority of current models were derived from static clinical data [1, 2], which did not incorporate the temporal nature of patients' status. For limited studies that used temporal data, the data was sampled with a low density of time resolution [3, 4]. Therefore, a comprehensive and dynamic algorithm that combines both the static character and temporal status with an intensive time resolution of IMV-supported patients is necessary for developing a prediction model that is more reflective of clinical reality.
**Objectives:** To build and validate a deep learning-based prediction model of extubation failure in critical care patients supported by IMV.

**Methods:** Data from MIMIC-III (Medical Information Mart for Intensive Care-III) was used for training the TrAcE (**T**emporal Deep Lea**r**ning **A**lgorithm for Predi**c**ting **E**xtubation Failures) model. This study included patients between 18 to 89 years old, received IMV for more than 6 h and did not using tracheostomy or non-invasive ventilation within 1 h after extubation. We applied a novel deep learning algorithm that processed both static and temporal data to reflect the dynamic nature of IMV-supported patients (Fig. 1). The temporal features were collected with an intensive resolution of 1 h. The model was internally validated in a 20% hold-out dataset from the training data and externally validated in the PKUPH (Peking University People's Hospital) dataset. The performance of the model was evaluated with area under the receiver operating characteristic curve (AUROC) in comparison to other machine learning and time series deep learning models. We used the Captum [5] algorithm to interpret the TrAcE model and describe the dynamic feature contributions to the prediction result.
**Results:** A total of 30,438 valid extubation records were obtained from MIMIC-III database, of which 11,668 (38.33%) were extubation failures. The TrAcE model had better performance than other classic models (Fig. 2) in both the hold-out validation dataset (AUROC 0.823 [0.808–0.837]) and PKUPH dataset (with 5174 extubation failures in 14,232 valid IMV patients [36.35%], AUROC 0.859 [0.837–0.881]). Captum interpretation of the model revealed that the contribution to the results of extubations varied between different time points for AaDO2, Temperature, Ventilation time, Sodium and Glucose levels (Fig. 3).
**Conclusions:** We developed and validated a deep learning model (TrAcE) which combines both the static and temporal data of critical care patients to predict the risk of extubation failure. The model improved prediction performance with a time resolution of 1 h and provided a dynamic interpretation of features in the model, which made real time decision making in extubation viable.

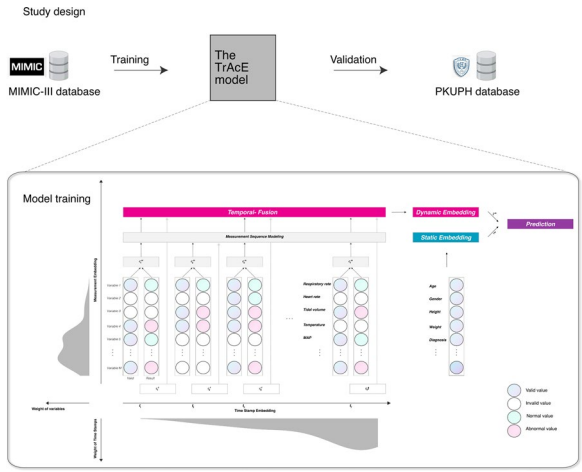


**Fig. 1 (abstract 000071)** The study design and model training process. As illustrated in the figure, the TrAcE model was trained with data from MIMIC-III dataset and externally validated with data from Peking University People's Hospital (PKUPH). The model collected both static and temporal data to better reflect the dynamic nature of IMV-supported patients. Abbreviation: MAP, Mean Arterial Pressure. MIMIC: Medical Information Mart for Intensive Care

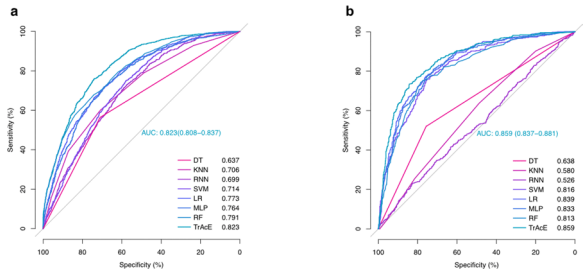


**Fig. 2 (abstract 000071)** Performance of TrAcE model in the internal (a) and external (b) validation dataset. Abbreviation: AUC, Area Under the Curve. DT, Decision Tree. KNN, K-Nearest Neighbors. LR, Logistic Regression. MLP, Multiplayer Perception. RNN, Recurrent Neural Network. SVM, Support Vector Machine

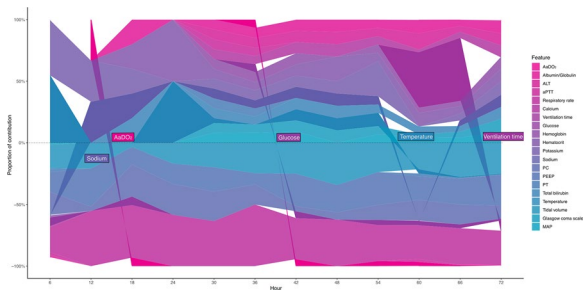


**Fig. 3 (abstract 000071)** Proportion of contributions of the top 20 features at different time point. Both positive and negative proportion of contributions were illustrated. Noted that AaDO2, Temperature, Ventilation time, Sodium and Glucose levels had both positive and negative contributions at different time. Abbreviation: AaDO2. Alveolar-arterial Oxygen Gradient. ALT, Alanine transaminase. aPTT, activated Partial Thromboplastin Time. PC, Pressure Control level. PEEP, Positive end-expiratory pressure. PT, Prothrombin Time. MAP, Mean Arterial Pressure

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**Topic:** Information systems and Data Science

## 000072

### Pulmonary outcomes according to the inspired oxygen concentration during general anesthesia in elderly patients: Multi-center, randomized controlled trials

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000072

**Introduction:** High concentrations of oxygen can cause pulmonary complications, including direct pulmonary toxicity and absorptive atelectasis. However, there are insufficient research on how it affects clinical outcomes in elderly patients, such as hypoxia due to atelectasis, decreased lung function, pneumonia, and intensive care unit admission. Therefore, this trial aims to compare whether different oxygen concentrations administered during general anesthesia in elderly patients affect the postoperative respiratory outcomes.
**Methods:** 79 patients age 65–90 yr scheduled for general anesthesia due to lower extremity surgery were randomly assigned to group H and group L. Group L was administered with 40% fraction of inspired oxygen. Whereas, group H sustained $FiO_2$ 100% during induction and extubation, and kept $FiO_2$ 50%. Chest sonogram was done before anesthesia and at PACU in both groups. Arterial blood gas exam was conducted at the beginning of surgery, PACU and the next day. Continuous variables were analyzed with student's t-test and Mann–Whitney *U*-test. Sonographic data was examined with repeated measures analysis of variance (ANOVA) and t-test.
**Results:** There is no statistical significantly difference between the two groups in demographic data, surgical management nor anesthetic medication. The ratio of arterial oxygen partial pressure to fractional inspired oxygen (P/F ratio) was higher in group L (*p*-value 0.036). Also, patients in group L received less oxygen supplementation at the following day of operation. 80.5% of group L and 57.9% of group H did not require oxygen supply. Pre-operative chest sonographic score were 4.5 ± 4.1 in group L and 3.7 ± 4.1 in group H and post-operative score were 4.7 ± 3.9 in group L and 6.8 ± 5.6 in group H. The difference of sonographic score was less in group L.
**Conclusions:** Maintaining high oxygen concentration during anesthesia cause more atelectasis and oxygen demand than low oxygen concentration.

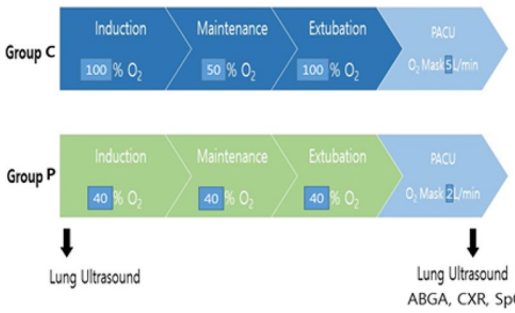


**Fig. 1 (abstract 000072)** Oxygen fraction alteration during anesthesia in Group C and Group H

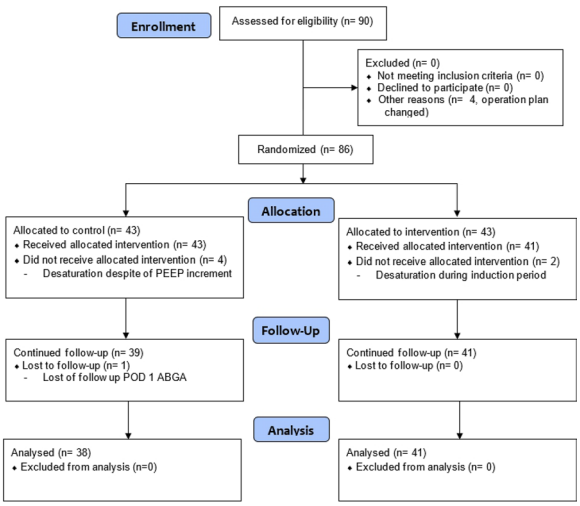


**Fig. 2 (abstract 000072)** Flow chart of patients enrollment in group L and group H

**Table 1 (abstract 000072)** Data of patient's demographic, and intraoperative variables

| | Group L (N=41) | Group H (N=38) | p-value |
|---|---|---|---|
| Male/Female | 16 /25(39.0 /61.0%)) | 10 /28(26.3/73.7%) | 0.336 |
| Age | 75.0 ± 6.2 | 76.5 ± 6.6 | 0.310 |
| BMI | 24.7 ± 3.7 | 24.3 ± 3.8 | 0.639 |
| Smoking | 5 (12.2%) | 4 (10.5%) | 1.000 |
| Position | | | |
| - supine | 28 (68.3%) | 26 (68.4%) | 0.982 |
| - RLD | 7 (17.1%) | 6 (15.8%) | |
| - LLD | 6 (14.6%) | 6 (15.8%) | |
| HTN | 21 (51.2%) | 27 (71.1%) | 0.116 |
| DM | 9 (22.0%) | 14 (36.8%) | 0.227 |
| Intra op fluid loading | 740.2 ± 550.7 | 651.3 ± 461.4 | 0.441 |
| Intra op pRBC | | | |
| - 0 | 33 (80.5%) | 31 (81.6%) | 0.813 |
| - 1 | 4 (9.8%) | 2 (5.3%) | |
| - 2 | 3 (7.3%) | 3 (7.9%) | |
| - 3 | 1 (2.4%) | 2 (5.3%) | |
| Anesthesia duration | 161.7 ± 77.8 | 146.8 ± 57.1 | 0.339 |
| Operation duration | 107.4 ± 70.8 | 88.2 ± 48.1 | 0.160 |

BMI, body mass index; RLD, right lateral decubitus; LLD, left lateral decubitus; HTN, hypertension; DM, diabetes mellitus; op, operation; pRBC, packed red blood cell. Group L was administered with 40 % fraction of inspired oxygen (FiO2). At post anesthetic care unit (PACU), group L kept oxygen with 2 L/min. Whereas, group H sustained FiO2 100 % during induction and extubation, and kept FiO2 50 %.

**Table 2 (abstract 000072)** Respiratory outrcomes between the two groups

| | Group L (N=41) | Group H (N=38) | p-value |
|---|---|---|---|
| PACU P/F ratio | 394.4 ± 97.5 | 345.0 ± 108.2 | 0.036 |
| PACU PaO2 | 110.4 ± 27.3 | 138.8 ± 44.7 | 0.001 |
| PACU ABGA SaO2 | 98.0 ± 2.0 | 98.6 ± 1.8 | 0.244 |
| PACU opioid use | 28 (68.3%) | 26 (68.4%) | 1.000 |
| POD1FiO2 | | | |
| - 0.21 | 33 (80.5%) | 22 (57.9%) | |
| - 0.28 | 5 (12.2%) | 6 (15.8%) | 0.054 |
| - 0.32 | 1 (2.4%) | 8 (21.1%) | |
| - 0.4 | 2 (4.9%) | 2 (5.3%) | |
| POD1 ABGA pO2 | 88.0 ± 28.4 | 91.9 ± 27.5 | 0.543 |
| POD1 P/F ratio | 387.1 ± 112.2 | 371.6 ± 107.4 | 0.535 |
| Post op pneumonia | 1 (2.4%) | 0 (0.0%) | 1.000 |
| Post op ICU care | 2 (4.9%) | 2 (5.3%) | 1.000 |
| Post op respiratory complication | 4 (9.8%) | 6 (15.8%) | 0.640 |
| Post op fever | 10 (24.4%) | 7 (18.4%) | 0.711 |
| Post op sono total | 4.7 ± 3.9 | 6.8 ± 5.6 | 0.064 |
| Preop sono total | 4.5 ± 4.1 | 3.7 ± 4.1 | 0.400 |

Abbreviation: PACU, post anesthetic care unit; PF, $PaO_2/FiO_2$; ABGA. arterial blood gas analysis; POD, post operative date; op, operation; ICU, intensive care unit; sono, sonogram

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**Topic:** Perioperative care

## 000081

## Performance of Monocyte Distribution Width in Suspected Infection Patients in the Emergency Department

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000081

**Introduction:** Suspicion of viable bacteria in the bloodstream in Emergency Department (ED) patients leads to important diagnostic and therapeutic clinical decisions. Blood culture collection is commonly accompanied by antibiotic administration and an admission decision pending the laboratory result, which may take up to 3 days. Monocyte Distribution Width (MDW) is a pathogen-agnostic marker of immune response and dysregulation, reported as part of a Complete Blood Count (CBC) with differential. MDW is derived from the distribution of peripheral blood monocyte volumes and aids in the identification of severe infections and sepsis in adult Emergency Department (ED) patients.

**Objectives:** To date, most MDW studies focus on the general ED population in a single region. The purpose of this analysis is to explore the relationship between MDW values and blood culture results in a multinational cohort of suspected infection patients.

**Methods:** Two data sources were included in the analysis: raw data from a multicenter, blinded, prospective cohort study conducted by Hausfater et al. [1] in two European EDs (Pitié-Salpêtrière APHP-Sorbonne Université hospital in Paris, France, and the Hospital Universitari Germans Trias i Pujol in Badalona, Spain) and interim data from a single-site observational study in the United States (Henry Ford Hospital, Detroit, Michigan, United States). All patients included in the analysis were aged 18 and older, presented to the ED, and received orders for both a CBC with differential and blood cultures. We evaluated MDW performance for the European and US studies independently and combined.

**Results:** There were 34 positive and 221 negative blood cultures across the European sites and 1408 positive and 6444 negative blood cultures in the US site. The incidence was 11.4 and 17.9, respectively. Performance for MDW relative to blood culture status in ED patients is shown in Table 1.

**Table 1 (abstract 000081)** Performance of MDW relative to blood culture status in ED patients

| | Hausfater et al. [1] | Henry Ford Hospital | Combined |
|---|---|---|---|
| MDW < 20 Blood Culture Negative | 33 | 2334 | 2367 |
| MDW < 20 Blood Culture Positive | 1 | 244 | 245 |
| MDW ≥ 20 Blood Culture Negative | 193 | 4110 | 4303 |
| MDW ≥ 20 Blood Culture Negative | 28 | 1164 | 1192 |
| Bacteremia Incidence | 0.114 | 0.179 | 0.177 |
| Sensitivity | 0.966 | 0.827 | 0.830 |
| Specificity | 0.146 | 0.362 | 0.355 |
| Positive Predictive Value | 0.127 | 0.221 | 0.217 |
| Negative Predictive Value | 0.971 | 0.905 | 0.906 |

**Conclusions:** This interim analysis suggests that MDW may be a useful adjunct to aid in bacteremia assessments in ED patients. The observed sensitivity related to MDW is consistent with the known relationship between positive blood culture and sepsis and is generalizable between different populations. Since MDW results are likely available well before blood culture results, this biomarker could support risk stratification among suspected infection patients. MDW values below 20 have a high predicative value for negative blood cultures. Further analysis incorporating additional clinical information will provide guidance for interpreting MDW values in combination blood culture results.

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2. Beckman Coulter Inc. 1000 Lake Hazeltine Drive, Chaska, MN 55318, United States of America.

**Topic:** Sepsis

## 000082

### Predictive validity of interleukin 6 (IL-6) for the mortality in critically ill COVID-19 patients with the B.1.617.2 (Delta) variant in Vietnam: a retrospective observational study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000082

**Introduction:** Evaluating the prognosis of patients with COVID-19 who may be at risk of mortality by analysing inflammatory mediators provides valuable insights for treatment decisions.
**Objectives:** This study aimed to investigate the serum IL-6 levels and their rate of change in predicting the mortality of critically ill patients with COVID-19 in Vietnam.
**Methods:** We performed a retrospective observational study of critically ill COVID-19 adult patients presenting at an intensive care centre in Vietnam from July 30 to October 15, 2021. We calculated the areas under the ROC curve (AUROCs) to determine how well the admission serum IL-6 levels and their rate of change on 3rd-day of admission could predict hospital mortality. The rate of change in serum IL-6 on the 3rd day after admission = 100% × ((serum IL-6 on the 3rd day) − (admission serum IL-6))/(admission serum IL-6). We also utilized ROC curve analysis to find the best cut-off value for each level or rate. Finally, we utilized logistic regression to identify factors associated with hospital mortality.
**Results:** Of 90 patients, 41.1% were men, the median age was 60.5 years (Q1-Q3: 52.0–71.0), and 76.7% of patients died in the hospital. Elevated serum IL-6 levels were observed upon admission (99.76 pg/mL; SD: 174.33) and on the 3rd day after admission (258.64 pg/mL; SD: 452.15), along with a significant rate of change in serum IL-6 during that period (839.5%; SD: 2753.2). While admission serum IL-6 level (AUROC: 0.610 [95% CI: 0.459–0.761]; cut-off value ≥ 15.8 pg/mL) and rate of change in serum IL-6 on the 3rd day of admission (AUROC: 0.586 [95% CI: 0.420–0.751]; cut-off value ≥ − 58.7%) demonstrated poor discriminatory ability in predicting hospital mortality, the 3rd day serum IL-6 rate of change from admission ≥ -58.7% (adjusted OR: 12.812; 95% CI: 2.104–78.005) emerged as an independent predictor of hospital mortality.
**Conclusions:** This study focused on a highly selected cohort of critically ill COVID-19 patients with a high serum IL-6 level and mortality rate. Despite the poor discriminatory value of admission serum IL-6 levels, the rate of change in serum IL-6 proved valuable in predicting mortality. To identify critically ill COVID-19 patients with the highest risk for mortality, monitoring the serial serum IL-6 measurements and observing the rate of change in serum IL-6 levels over time are needed.

**Reference(s)**
1. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

**Topic:** Sepsis

## 000084

### Plasma Calprotectin as a Marker of Infection in the Emergency Department—a prospective observational study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000084

**Introduction:** Reliably discriminating infection and sepsis from sterile inflammation is a recognised clinical challenge. Particularly in patients with cancer, after surgery or trauma, in whom a strong inflammatory reaction is often present, high levels of uncertainty promote prescription of unnecessary courses of antibiotics and increase the risk of antimicrobial resistance and adverse drug effects. Plasma levels of calprotectin, a novel infection biomarker with direct release from the cytoplasm of activated immune cells, could aid physicians in their decision making.
**Objectives:** To assess the diagnostic performance of calprotectin in an adjudicated diagnosis of infection and comparison to an established biomarker, C-reactive protein (CRP).
**Methods:** Prospective observational single-centre study recruiting patients with suspected infection in the emergency department. Diagnostic adjudication (no infection, low probability of infection, high probability of infection, confirmed infection) was performed by experienced physicians after reviewing patient files but blinded to calprotectin and other biomarker measurements. For regression modelling, non-linear associations between biomarkers and the outcome were modelled with restricted cubic splines.
**Results:** 245 patients, median age 55 years (IQR 32–70), 48% female, were recruited and eligible for analysis. Of these, 71 (29%) suffered from active cancer and 56 (23%) were receiving immunosuppressant therapies. 190 (78%) were started on antibiotics while only 15 (6%) blood cultures were eventually positive. The median calprotectin concentration in the overall cohort was 2.5 (IQR 1.6–4.7) mg/l. Ordinal regression analysis revealed a non-linear and mostly non-significant association of calprotectin with an adjudicated diagnosis of infection, while CRP showed a near-linear, significant association (Fig. 1). A sensitivity analysis excluding patients with cancer or immunosuppression showed similar Results: Comparing calprotectin levels across different sites of infection showed no significant differences (all $p > 0.05$). 181 (74%) patients had an adjudicated diagnosis of high probability of infection or confirmed infection. For a binary outcome (no infection and low probability of infection vs high probability of infection and confirmed infection), the area under the receiver operating characteristic curve was 0.57 (95%-CI 0.50–0.65) for calprotectin and 0.70 (95%-CI 0.63–0.76) for CRP.
**Conclusions:** In this study, calprotectin showed limited performance in identifying patients with an adjudicated diagnosis of infection. Calprotectin did not perform better than the established biomarker, CRP. Importantly, results were similar in the main cohort and excluding patients with cancer or immunosuppression.

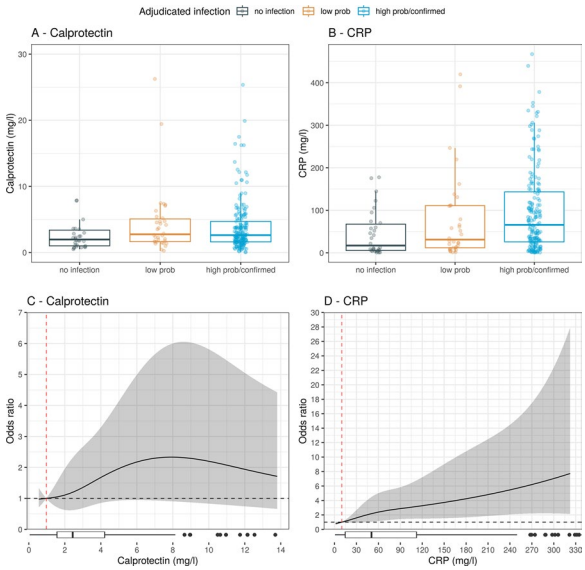


**Fig. (abstract 000084)** Boxplots showing levels of calprotectin (A) and CRP (B) across the different categories of the adjudicated diagnosis. Dose–response plots visualise flexible associations between calprotectin (C) and CRP (D) as predictors and an adjudicated diagnosis of infection as outcome in ordinal regression models. Red dashed line: reference value. Black dashed line: odds ratio = 1. Prob: probability

**Reference(s)**
1. Swiss National Science Foundation PostDoc Mobility (P500PM_214203)
2. Unrestricted research grant from Gentian.

**Topic:** Infections and prevention

## 000086

### Impact of thiamine supplementation on clinical outcomes of patients with septic shock: a retrospective before-after study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000086

**Introduction:** Sepsis and septic shock represent major challenges in terms of patient mortality. Despite numerous studies involving various drugs and interventions, effective results have not been demonstrated. Recently, the role of thiamine in critically ill patients has gained attention. In this study, we aimed to assess the impact of supplemental thiamine on clinical outcomes in patients with septic shock.
**Methods:** This retrospective before-after study included patients with: (1) an age ≥ 18 years with documented or suspected infection; (2) Sequential Organ Failure Assessment score ≥ 2; (3) serum lactate levels > 18 mg/dL and hypotension, 4) mean arterial pressure < 65 mmHg maintained after volume expansion of ≥ 30 ml/kg in the first two h of treatment followed by noradrenaline vasopressor dependence (with or without vasopressin) during the first six h of treatment; (5) intensive care unit (ICU) admission during two periods: May 1 to September 30, 2022 (control group) and November 1, 2022, to March 31, 2023 (intervention group). Only the intervention group received supplemental thiamine (200 mg in 50 ml 5% dextrose twice daily) for seven days or until ICU discharge. The primary outcome was lactate clearance. The secondary outcomes were 28-day mortality, ventilation-free and vasopressor-free days within 28 days, and incidence of renal replacement therapy (RRT) within 2 d of septic shock diagnosis.
**Results:** Sixty-two patients were included: 29 in the control group and 33 in the intervention group. There was no significant statistical difference in lactate clearance (control group 13 [44.8%] vs. 16 [48.4%] in the intervention group [$p = 0.80$]). There was no difference in secondary outcomes Nine patients (27.2%) in the intervention group were administered RRT compared to three (10.3%) in the control group ($p = 0.09$). However, after adjusting for independent covariates, multivariate analysis showed that age ($p = 0.017$), lactate clearance ($p = 0.044$), and vasopressor-free days ($p = 0.043$) were associated with a lower 28-day mortality.
**Conclusions:** In this retrospective before-after study involving patients with septic shock, intravenous thiamine did not improve lactate clearance and other important outcomes. However, in the multivariate analysis, after adjusting for independent covariates, younger age, a higher number of vasopressor-free days, and better lactate clearance was associated with a lower 28-day mortality rate.

**Reference(s)**
1. 2. Qian X, Zhang Z, Li F, Wu L. Intravenous thiamine for septic shock: A meta-analysis of randomized controlled trials. Am J Emerg Med. 2020;38:2718–22
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**Topic:** Sepsis

## 000087

### Discovery and validation of PCED1B as a novel biomarker for naive CD4 + T cell in *sepsis*

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000087

**Introduction:** Immune dysfunction significantly contributes to morbidity and mortality in sepsis, making the modulation of host immune responses a critical focus in clinical management. This study was undertaken to identify specific biomarkers on naive CD4 + T cells that could serve as indicators of sepsis pathogenesis and potentially inform targeted immunomodulatory interventions.
**Methods:** Publicly available single-cell RNA sequencing (scRNA-seq) and bulk RNA-seq datasets were analyzed for screening out naive CD4 + T cell-specific genes. Based on these hub genes, Mendelian randomization (MR) analysis followed by MR-Bayesian model averaging (MR-BMA) algorithm was implemented to explore the causal relationship between them and sepsis. Besides, single cell-type expression analysis, quantitative real-time PCR (qRT-PCR), cell–cell communication detection, and metabonomics evaluation were further conducted to unveil the underlying mechanism of potential therapeutic targets.
**Results:** scRNA-seq illustrated the significant exhaustion of naive CD4 + T cells in sepsis, and 33 hub genes were then identified. Both MR and MR-BMA analyses validated the elevated naive CD4 + T cell %CD4 + T cells were related to sepsis occurrence(odds ratio [OR] = 0.90, 95% confidence interval [CI], 0.83–0.97, $P = 0.0069$) and sepsis 28-day mortality(OR = 0.75, 95% CI, 0.64–0.88, $P = 0.0003$). Notably, among 33 hub genes, PCED1B was considered to have a strong causal association with 28-day mortality in sepsis patients (OR = 0.64, 95%CI, 0.51–0.81, $P = 0.0002$) which has been further validated by bulk RNA-seq analysis. Additionally, animal experiment showed a correlation between the level of PCED1B and the sepsis severity. Notably, PCED1B mediated the impact of naive CD4 + T cell %CD4 + T cell on sepsis-related death. Mechanistic

investigations revealed that PCED1B + CD4 + T cells may interact with monocytes/dendritic cells (DCs) via the MIF-(CD74 + CD44) axis, and concurrently engage with B cells/plasmablasts through the MIF-(CD74 + CXCR4) axis, thereby regulating multiple metabolic alterations in sepsis.
**Conclusions:** The interplay of PCED1B and naive CD4 + T cells revealed by this study will be helpful in sepsis therapy targeting immunity.

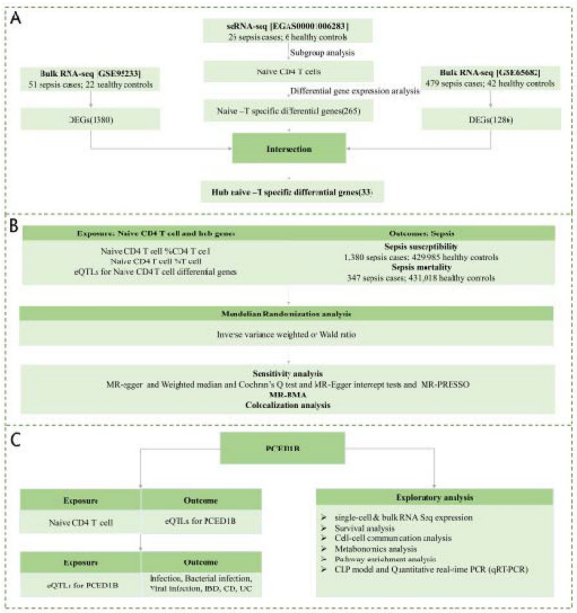


**Fig. 1 (abstract 000087)** The analysis process of our research. (A) Screening the naive CD4 + T cell in scRNA-seq samples and identification of hub genes associated with naive CD4 + T cell. (B) MR analysis processes of naive CD4 + T cell and naive CD4 + T cell hub genes with sepsis outcome. (C)Validation and functional analysis of PCED1B and naive CD4 + T cell MR results

**Reference(s)**
1. This work was supported by grants from the National Natural Science Foundation of China (Nos. 82241044, 82172152, and 82102244).
2. We thank all the participants and investigators of the eQTLGen Consortium, the UK Biobank, the FinnGen study, and the IEU open GWAS project developed by The MRC Integrative Epidemiology Unit (IEU) at the University of Bristol.

**Topic:** Sepsis

## 000088

### Intermittent versus Continuous Renal Replacement Therapy for Sepsis-Associated Acute Kidney Injury: An Analysis Using Japanese ICU Database

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**Introduction:** Sepsis-associated acute kidney injury (S-AKI), a common and severe complication in critically ill patients, is associated with increased mortality. Continuous renal replacement therapy (CRRT) and intermittent renal replacement therapy (IRRT) are two main modalities for the management of S-AKI. However, the optimal choice of RRT modality in S-AKI remains uncertain, with limited evidence to guide clinical decision-making.
**Methods:** We conducted a retrospective cohort study using data from the Japanese Intensive care PAtient Database (JIPAD), a multicenter, prospective registry of critically ill patients admitted to intensive care units (ICUs) in Japan. Adult patients (aged ≥ 18 years) with sepsis or septic shock who received RRT during their ICU stay were included. Patients on maintenance dialysis, post-cardiac arrest, or readmitted to the ICU were excluded. The primary outcome was in-hospital mortality. We compared patients who received CRRT only with those who received IRRT only. To account for potential confounding by indication, we performed 1:1 propensity score matching. We also conducted a pre-specified subgroup analysis based on the severity of sepsis (sepsis or septic shock).
**Results:** Among 250,672 patients registered from April 2015 to December 2021, 1,627 met the inclusion criteria and were analyzed. After propensity score matching ($n = 234$), in-hospital mortality did not significantly different between the CRRT and the IRRT groups (29.9% vs 41.9%; risk difference, − 11.97%; 95% CI, − 24.3 to 0.3; $P = 0.056$). In the subgroup analysis among patients with septic shock ($n = 180$), CRRT was associated with lower in-hospital mortality compared to IRRT (29.3% vs 50.6%; $P = 0.04$).
**Conclusions:** In this large retrospective cohort study using a JIPAD, CRRT was associated with lower in-hospital mortality compared to IRRT in patients with S-AKI due to septic shock. Our findings suggest that the choice of RRT modality may impact patient outcomes in S-AKI, and should be carefully considered in clinical practice.

**Reference(s)**
None.

**Topic:** Acute Kidney Injury and haemofiltration

## 000089

### Usefulness of Clinical Frailty Scale in predicting mortality in Intensive care unit, Alexandria university experience

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):** 000089

**Introduction:** Over the past decade, there has been widespread and increasing interest in assessing frailty in the intensive care unit (ICU). Frailty has many operational definitions, but broadly represents a state of decreased physiologic reserve that heightens vulnerability to acute stressors. We aimed to assess the usefulness of frailty scale as prognostic tool to predict outcomes of patients in ICU.
**Methods:** Observational study conducted in the intensive care units of critical care medicine department, Alexandria University. All patients above 65 years with no learning disability admitted to general ICU were included in the study in the period from January 2021 to September 2021. The CFS was assessed prior to the acute event and admission to the ICU by data received from patients if possible or from caregivers or the medical and nursing hospital notes. APACHE II score was calculated for every patient included in the study on admission to ICU as a routine. Comparison of CFS and APACHE II score in prediction

of ICU mortality and ICU length of stay were performed. Long ICU stay was defined as ICU stay more than 7 days.
**Results:** A total of 111 patients were included in the study with variable reason of ICU admission mostly septic shock and cerebrovascular stroke. CFS significantly predicted mortality in this patient's cohort with (AUC of 0.854, $p$ value of $<0.001$) but was lower compared to APACHE II score which showed higher accuracy with (AUC of 0.955 and $p$ value of $<0.001$) CFS predicted long ICU stay more than 7 days with significant accuracy (AUC of 0.818 and P value of 0.04) while APACHE score was non-significant in prediction of long ICU stay (AUC of 0.674 and P value of 0.261).
**Conclusions:** Clinical frailty scale assessment can be a useful tool to predict prolonged ICU stay and ICU mortality with high accuracy in elderly patients aged more than 65 years.

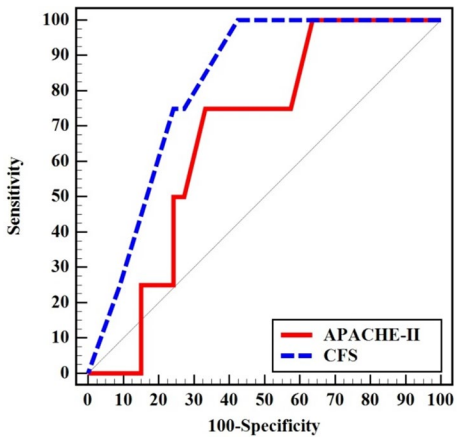


**Fig. 2 (000089)** ROC curve for APACHE-II and CFS to predict patient will stay more than 7 days in ICU stay (n = 12 vs. 99)

**Reference(s)**

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**Topic:** Health Services Research and Outcome

## 000091

### Prognostic value of ROX index in prediction of invasive mechanical ventilation in COVID 19 pneumonia

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000091

**Introduction.** High-flow nasal cannula (HFNC) use in patients with hypoxemic respiratory failure is increasing. HFNC use reduces the rate of endotracheal intubation in patients with acute respiratory failure compared with conventional oxygen therapy [1–3]. However, failure of HFNC may cause delayed intubation and increased mortality [4]. Therefore, predicting HFNC failure and determining the appropriate timing of endotracheal intubation are important strategies for HFNC treatment.
**Methods:** This study was conducted in critical care medicine department (isolation intensive care units), Alexandria Main University Hospital during the period from January to December 2021 after approval of local ethical committee and informed consents were taken from patients or next of kin. Patients were admitted only to this unit if they had confirmed severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in severe or critical situation as per local guidelines. Patients were included only if HFNC was applied early (<48 h) after admission. With exclusion of pregnant females or age less than 18. The following data were collected: age, sex, APACHE (acute physiology and chronic health evaluation) II score. The decision to initiate HFNC or mechanical ventilation was made by the treating clinical team. According to the Surviving Sepsis Campaign: guidelines on the management of critically ill adults with COVID-19 [9], HFNC is encouraged to use in acute hypoxemic respiratory failure despite conventional oxygen therapy.
**Results:** All 107 patients on HFNC within 48 h ended with 3 fates, 60 patients improved and weaned to less oxygen therapy to discharge (56.1%), 23 patients were invasively ventilated (21.5%) while 24 patients needed non-invasive ventilation (22.4%). Invasively ventilated patients group showed significant high APACHE II score (mean value 31.7 ± 4.2), high inflammatory markers of CRP (mean value 92.7 ± 40.7) and Interleukin 6 (mean value of 73.3 ± 30.0) which all were significantly higher than other 2 groups. ROX index measured at all intervals (1–2–6–12–24–36–48 h) were all significantly higher in patients group improved to discharge with $p$ value of 0.001 while no significant difference was found between ROX index values of invasive or non-invasive MV groups.
**Conclusions:** We concluded that ROX index can differentiate significantly between HFNC successful and failed groups at multiple intervals as early as 1 h from application and it can predict HFNC failure with remarkable accuracy.

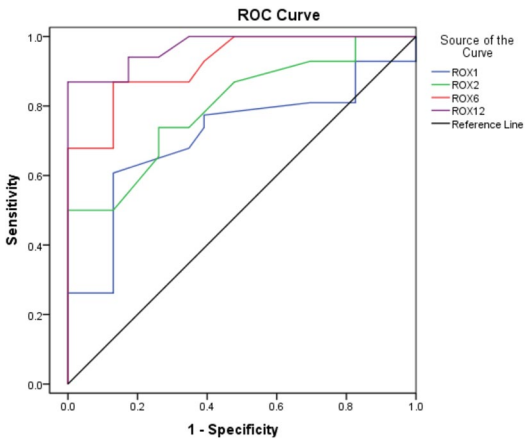


**Fig. 3 (abstract 000091)** Sensitivity, specificity and accuracy of ROX index at 1st, 2nd, 6th and 12th hours to predict mortality

**Reference(s)**

1. 1- Zhao H, Wang H, Sun F, Lyu S, An Y. High-flow nasal cannula oxygen therapy is superior to conventional oxygen therapy but not to noninvasive mechanical ventilation on intubation rate: a systematic review and meta-analysis. Critical care (London, England). 2017; 21(1):184. Epub 2017/07/14. https://doi.org/10.1186/s13054-017-1760-8 PMID: 28701227; PubMed Central PMCID: PMC5508784. 2- Ni YN, Luo J, Yu H, Liu D, Ni Z, Cheng J, et al. Can High-flow Nasal Cannula Reduce the Rate of Endotracheal Intubation in Adult Patients With Acute Respiratory Failure Compared With Conventional Oxygen Therapy and Noninvasive Positive Pressure Ventilation? A Systematic Review and Meta-analysis. Chest. 2017; 151(4):764–75. Epub 2017/01/17. https://doi.org/10.1016/j.chest.2017.01.004 PMID:28089816.

**Topic:** Acute respiratory failure and mechanical ventilation

### 000095

**Effects of balanced versus saline-based solutions on acute kidney injury in off-pump coronary artery bypass surgery: A randomised controlled trial**

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000095

**Introduction:** Although it has been suggested that hyperchloremic acidosis induced by 0.9% sodium chloride solution (saline) can adversely affect the kidney, whether chloride-restrictive fluid strategies can reduce the incidence of acute kidney injury after off-pump coronary artery bypass surgery remains unclear.
**Methods:** A total of 360 adults undergoing coronary artery bypass surgery were randomly assigned to receive balanced solution-based chloride-restrictive intravenous fluid (balanced group) or saline-based chloride-liberal intravenous fluid (saline group). The primary outcome was acute kidney injury within 7 postoperative days, as defined by the 2012 Kidney Disease: Improving Global Outcomes Clinical Practice Guideline.
**Results:** The incidence of acute kidney injury was 4.4% (8/180) in the balanced group and 7.3% (13/178) in the saline group. The difference was not statistically significant (risk difference, − 2.86%, 95% confidence interval [CI], − 7.72% to 2.01%; risk ratio, 0.61, 95% CI, 0.26 to 1.43, $P = 0.35$). Compared to the balanced group, the saline group had higher levels of intraoperative serum chloride and lower base excess, which resulted in lower pH.
**Conclusions:** In patients undergoing off-pump bypass surgery with normal estimated glomerular filtration rate, the intraoperative balanced solution-based chloride-restrictive intravenous fluid administration strategy did not reduce the rate of postoperative acute kidney injury compared to the saline-based chloride-liberal intravenous fluid administration strategy.

**Topic:** Acute Kidney Injury and haemofiltration

### 000096

**Nationwide Cohort Study on the Long-Term Risks of Radiation Therapy in Pediatric Patients with Brain Tumors**

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000096

**Introduction:** No existing study has comprehensively assessed radiation therapy (RT)-related side effects, encompassing long-term endocrinopathies, late-delayed complications, and late cerebrovascular complications in pediatric patients with brain tumors.
**Objectives:** The objective of our study is to investigate the correlation between radiation therapy and these specific side effects in pediatric patients with brain tumors on a nationwide scale.
**Methods:** We retrieved data on pediatric patients with brain tumors from the National Health Insurance Research Database (NHIRD) of Taiwan. The radiation therapy (RT) cohort comprised 815 patients, randomly matched for age, gender, and index year with non-RT patients. Utilizing multivariate Cox proportional hazards regression, we calculated adjusted hazard ratios (aHR) to assess the likelihood of developing late side effects in the RT cohort in comparison to non-RT controls.
**Results:** In patients receiving radiation therapy (RT), the incidence of late side effects was significantly higher when pioglitazone was administered compared to non-RT patients ($p < 0.05$). The multivariate Cox regression analysis unveiled a 1.173-fold increase in the incidence of late side effects in the RT group (adjusted hazard ratio [aHR] = 1.173, 95% CI 1.063–1.430, $p < 0.05$) compared to the non-RT group, with an observed interaction between age and RT-related late side effects.
Furthermore, patients undergoing RT exhibited a 1.172-fold (95% CI 1.020–1.398) and 1.796-fold (95% CI 1.250–2.578) higher risk of developing long-term endocrinopathies and late-delayed complications, respectively, than their non-RT counterparts (all $p < 0.05$). However, the risk of late cerebrovascular complications did not show a significant difference between the two groups ($p > 0.05$).
Specifically for long-term endocrinopathies, RT patients had a 1.602-fold (95% CI 1.010–3.718) and 1.120-fold (95% CI 1.005–1.548) higher risk for gonadotropin deficiency and hypothalamic-pituitary dysfunction, respectively, compared to non-RT patients (all $p < 0.05$). In terms of late-delayed complications, RT patients had a 3.208-fold (95% CI 1.953–5.297) higher risk of post-RT necrosis of the brain stem than non-RT patients ($p < 0.05$).
**Conclusions:** Pediatric patients diagnosed with brain tumors faced an elevated risk of late side effects, especially when diagnosed at a younger age. Key among the radiation therapy (RT)-related late side effects were gonadotropin deficiency, hypothalamic-pituitary dysfunction, and brainstem necrosis. Importantly, the incidence of these deficits demonstrated a time-dependent increase, underscoring the necessity for long-term surveillance in this patient population.

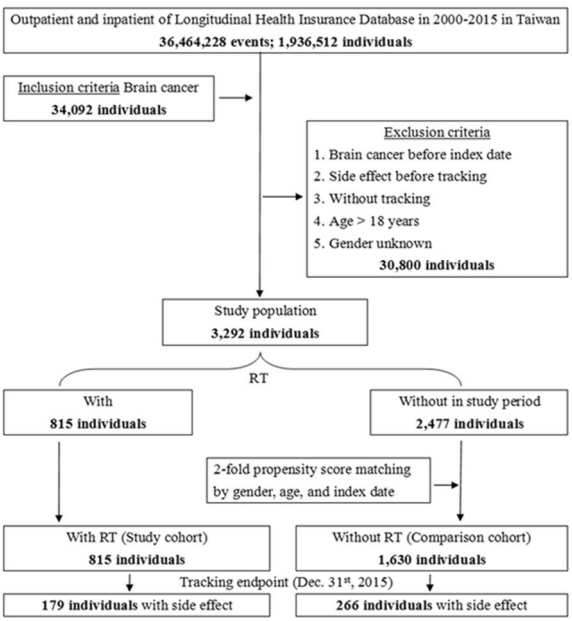


**Fig. 1 (abstract 000095)** The flowchart for selection of study population

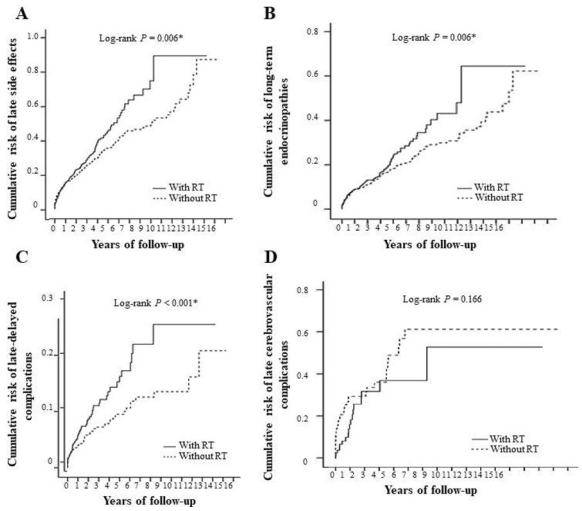


**Fig. (abstract 000095)** Kaplan–Meier plot for cumulative incidence of side effects in patients with (solid line) and without RT (dashed line). (A) Overall side effects. (B) Long-term endocrinopathies. (C) Late-delayed complications. (D) Late cerebrovascular complications. *$p < 0.05$

**Table (abstract 000095)** Multivariate Cox-regression analysis of RT associated with side effect subgroup

| | RT vs. Non-RT | |
|---|---|---|
| Subgroup | aHR (95%CI) | p-value |
| Long-term endocrinopathies | 1.172 (1.020, 1.398) | 0.018* |
| Hypothyroidism | 1.434 (0.635, 3.248) | 0.364 |
| Hypothalamic pituitary dysfunction | 1.120 (1.005, 1.548) | 0.045* |
| Growth hormone deficiency | | |
| Cortisol deficiency | 0.667 (0.261, 1.699) | 0.423 |
| Gonadotropin deficiency | 1.602 (1.010, 3.718) | 0.031* |
| Delay milestone | | |
| Short stature | 1.055 (0.348, 2.124) | 0.789 |
| Late-delayed complications | 1.796 (1.250, 2.578) | 0.002* |
| Late effect of radiation | — | — |
| Sensorineural hearing loss | — | — |
| Stroke | 2.785 (0.906, 8.589) | 0.077 |
| Post-RT necrosis of brain stem (tracheostomy) | 3.208 (1.953, 5.297) | <0.001* |
| Visual field defects | 0.903 (0.387, 2.104) | 0.853 |
| Myopia | 0.394 (0.139, 1.121) | 0.094 |
| Astigmatism | 1.446 (0.270, 7.726) | 0.655 |
| RT-induced nonsenile cataract | — | — |
| Nasogastic tube insertion | — | — |
| Gastrostomy | — | — |
| Late cerebrovascular complications | 0.817 (0.454, 1.471) | 0.553 |
| Cavernous/Arteriovenous malformation | 0.494 (0.104, 2.348) | 0.403 |
| Stroke | 1.018 (0.492, 2.114) | 0.928 |
| Cerebral atropy | 1.374 (0.240, 7.849) | 0.714 |
| Moyamoya disease | 0.982 (0.048, 20.089) | 0.998 |

RT, radiation therapy; aHR, adjusted hazard ratio; CI, confidence interval. Adjusted for the variables listed in Table 3. *p<0.05

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2. Sundgren PC, Cao Y. Brain irradiation: effects on normal brain parenchyma and radiation injury. Neuroimaging Clin N Am. 2009;19(4):657–68.

**Topic:** Neurointensive care

## 000099

### Brain injury biomarkers in humans undergoing general anaesthesia and non-cerebral surgery

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000099

**Introduction:** This study aims to investigate brain injury biomarkers neurofilament light (NFL), tau, neuron-specific enolase (NSE), calcium-binding protein S100B (S100B) and glial fibrillary acidic protein (GFAP) in blood during general anaesthesia and abdominal surgery in patients without suspected cerebral injury.
**Methods:** This prospective observational study was conducted at the Sahlgrenska University Hospital, Gothenburg, Sweden, between September and November 2021. Patients scheduled to undergo mixed abdominal surgery under general anaesthesia were eligible for inclusion. All patients had standard monitoring of vital parameters and near-infrared spectroscopy (NIRS) monitoring cerebral perfusion. Mean arterial blood pressures were kept within 20 mmHg compared to preoperative values but never under 60 mmHg.
Blood samples were obtained preoperatively as well as 2 and 24 h postoperatively. All samples were analysed at the Clinical Neurochemistry Laboratory of the Institute of Neuroscience and Physiology, Sahlgrenska Academy, University of Gothenburg, Mölndal Campus, Sweden.
**Results:** There were 23 patients (11 females [48%] and 12 males [52%]) included in the study. NFL, tau, NSE and S100B increased significantly when 2- and 24-h concentrations were compared with preoperative values, while GFAP did not. The continuous mean arterial blood pressure was 83.5 mmHg, with a 62.2–90.4 mmHg range. The mean NIRS was 77.5% (range 62.2–90.4). No patient had a drop in NIRS of 12% or more. Postoperative symptoms of confusion or neurological deficits were not observed in any patient within 24 h from the start of anaesthesia.
**Conclusions:** General anaesthesia and abdominal surgery in patients with well-maintained cerebral perfusion and no signs of postoperative cerebral injury caused increased brain injury biomarkers NFL, tau, NSE and S100B in blood. There was no increase in levels of GFAP in the blood. These data suggest that only GFAP is unaffected by general anaesthesia and surgery. More extensive studies on this subject are warranted.

**Topic:** Neurointensive care

## 000101

### Effect of targeted temperature management after successful endovascular reperfusion therapy in patients with acute basilar artery occlusion

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000101

**Introduction:** Even undergoing endovascular reperfusion therapy (ERT), patients with acute basilar artery occlusion (BAO) still have a high morbidity and mortality rate. Targeted temperature management (TTM) improved clinical outcomes in experimental animal ischemic stroke models. TTM appears to be a promising candidate treatment for acute BAO.
**Objectives:** We investigated the clinical effects of TTM after successful endovascular reperfusion therapy in patients with acute basilar artery occlusion.
**Methods:** A retrospective analysis was performed in a prospective registry at a single comprehensive stroke center. We enrolled patients with acute ischemic stroke in the acute BAO an initial National Institutes of Health Stroke Scale $\geq$ 10) who had successfully revascularization achieved. Patients with BAO underwent a mild TTM (35–6 °C) protocol, which included mechanical ventilation and 24–48-h hypothermia. Patients with BAO who did not perform TTM were treated according to the medical management protocol. Mental status, neurologic deterioration, cerebral edema, hemorrhagic transformation, good clinical outcome (GCO, 3-month modified Rankin Scale, $\leq$ 3), mortality, and safety were compared among the group.
**Results:** Of the 35 patients who met the study inclusion criteria, 9 patients were assigned to the TTM group and 22 to the non-TTM group. Intravenous thrombolysis was used in 1 (11.1%) of the patients in the TTM group and in 9 (36.0%) of those in the non-TTM group. Good functional status at 90 days occurred in 0 patients in the TTM group and in 12 (48.0%) in the non-TTM group. Symptomatic intracranial hemorrhage occurred in 2 patients (22.2%) in the TTM group and in 3 (12.0%) in the non-TTM group. Although mortality was not statistically different among the group, morbidity was significantly higher in the TTM group.
**Conclusions:** Although a small number of patients were evaluated, in patients with acute BAO who received successful revascularization by ERT, TTM may increase neurological deterioration and reperfusion injury and lead to worsened clinical outcomes.

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**Topic:** Neurointensive care

## 000102

### Factors enhanced seizure-free rate with AMPA receptor antagonist in traumatic brain injury and post-operative brain tumor surgery in neurosurgical intensive care unit

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**Introduction:** To achieve seizure control in traumatic brain injury and post-operative Brain tumor surgery reduces mortality in the neurosurgical intensive care unit. However, Primary treatment drug therapy does not result in effective seizure control in approximately 30 percent of patients. AMPA receptor (perampanel therapy, PER) was a known novel target for focal-onset seizures, with or without focal to bilateral tonic–clonic seizures, and generalized tonic–clonic seizures. This study collected efficacy and factors associated with the seizure-free rate of perampanel as an add-on or monotherapy.
**Objectives:** To collect efficacy and factors associated with the seizure-free rate of perampanel as an add-on or monotherapy in the neurosurgical intensive care unit.
**Methods:** This study is a single-center prospective interventional study. Data from all 76 patients who received PER as an add-on or monotherapy between January 2017 and December 2023. The observation period was 6 months. The observation endpoint is the drug response and retention rate at 6 months. Multivariate and linear regression analyses were performed by an array of clinical variables in relation to seizure-free rate at 6 months of follow-up and compare the differences in efficacy, retention rates, and factors associated with seizure-free, respectively.

**Results:** Clinical data were obtained for 76 patients with epilepsy and drug resistance epilepsy (DRE) (mean duration of treatment: 12.5 months). At 6 months, multivariate analysis showed significant differences in whether traumatic brain injury etiology (OR = 1.49, 95%CI: 0.072–0.734, $p = 0.030$), low-grade glioma etiology (OR = 0.55, 95%CI: 0.267–0.947, $p = 0.042$), the baseline seizure frequency less than 4 times per day (OR = 0.62, 95%CI: 0.096–0.625, $p = 0.045$), the number of previously failed anti-seizure medication less than 3 (OR = 0.43; 95%CI: 0.115–0.938, $p = 0.025$) and whether onset of PER therapy ≤ 48 h (OR = 1.31, 95%CI: 0.086–0.801, $p = 0.020$). This indicates that the factors enhancing a response to PER therapy are higher with a traumatic brain injury, low-grade glioma, baseline seizure frequency of less than 4 times per day, the number of previously failed anti-seizure medications less than 3 as well as onset of PER therapy ≤ 48 h. Therefore, a baseline frequency of less than 4 times per day and less than three previous anti-seizure treatments to control symptoms were independent factors affected PER add-on therapy for patients with DRE. Multivariate COX model showed that patients with DRE in combination with the central nervous system infection had a risk of a lower retention rate (OR = 11.832, 95% CI: 2.687–61.412, $P < 0.001$) than patients with DRE, according to other etiologies. Patients with Glioblastoma multiforme (OR = 0.062, 95% CI: 0.006–0.561, P = 0.006), and patients who have multiple types of seizures (OR = 35.251, 95% CI: 5.543–3.201, $P = 0.002$). After multivariate analysis, we found that age, Onset of PER therapy (hr), traumatic brain injury, low-grade glioma, seizure frequency at baseline, and number of previously failed medications were significantly associated with seizure-free. Age ≤ 55 year (AUC = 0.961, $p$-value < 0.001 accuracy 91.2%) was significantly cut off value that associated with seizure-free PER therapy.

**Conclusions:** Age, onset of PER therapy (hr), traumatic brain injury, low-grade glioma, seizure frequency at baseline and number of previously failed medications were significantly associated with seizure free in DRE patients with perampanel as an add-on or monotherapy in a neurosurgical intensive care unit. This provides a basis for assessing the expected patient selection and efficacy for patients with DRE.

**Table 4 (abstract 000102)** Cox regression analysis of time to withdrawl of PER

| Features | Exp (B) | 95% CI | *p*-value |
|---|---|---|---|
| Etiology known | | | |
| Infection | 11.832 | 2.687–61.412 | < 0.001 |
| Brain neoplasm | | | |
| Glioblastoma multiforme | 0.062 | 0.006–0.561 | 0.006 |
| Number of seizure type | 35.251 | 5.543–3.201 | 0.002 |
| Post-operative surgical site infection | 0.382 | 0.072–1.612 | 0.231 |
| Post-operative hydrocephalus | 0.425 | 0.057–1.847 | 0.387 |

Value presented as median, P-value analyzed using the Mann-Whitney test, Chi-square test and Cox regression model.

**Table 5 (abstract 000102)** Multivariate analysis factor affected seizure fress rate (responders group)

| | Beta coefficient | Std. Error | *p-value* |
|---|---|---|---|
| (Constant) | 3.17 | 0.52 | <0.001 |
| Onset to PER therapy (hr) | -0.58 | 0.02 | 0.018 |
| Traumatic brain injury | 1.49 | 0.23 | 0.025 |
| Low-grade glioma | 0.09 | 0.01 | 0.042 |
| Seizure frequency at baseline (times/day) | -0.95 | 0.22 | 0.038 |
| Number of previously failed ASMs | -0.55 | 0.19 | 0.007 |
| Age | -0.62 | 0.32 | 0.049 |

Value presented as mean ± SD. or n (%). p-value corresponds to Independent-t test and Fisher's exact test. Multivariate analyses were performed for an array of clinical variables in relationship to seizure free rate at 6 months follow-up. Linear regression were performed for an array of clinical variables in relationship to seizure free rate.

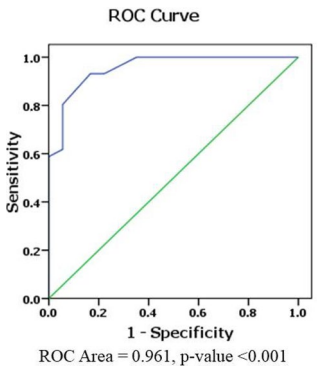


**Fig. 1 (abstract 000102)** Age cut off for good clinical outcome in seizure free rate

**Table 6 (abstract 000102)** Age cut off for good clinical outcome in seizure free rate

| Age cut off | a | b | c | d | Sensitivity | Specificity | PPV | NPV | Accuracy |
|---|---|---|---|---|---|---|---|---|---|
| -68.50 | 101 | 47 | 0 | 7 | 100.0% | 10.7% | 69.0% | 100.0% | 68.7% |
| -65.00 | 100 | 35 | 0 | 15 | 100.0% | 28.8% | 71.5% | 100.0% | 74.8% |
| -61.50 | 101 | 25 | 0 | 25 | 100.0% | 52.4% | 78.7% | 100.0% | 82.7% |
| -60.50 | 100 | 21 | 0 | 34 | 100.0% | 65.7% | 85.1% | 100.0% | 88.4% |
| -59.00 | 98 | 15 | 2 | 37 | 96.2% | 71.6% | 87.2% | 93.4% | 86.9% |
| -56.00 | 94 | 11 | 6 | 43 | 92.8% | 78.1% | 89.5% | 84.5% | 87.5% |
| -55.00 | 96 | 10 | 8 | 45 | 94.2% | 84.5% | 92.7% | 87.1% | 91.2% |
| -51.00 | 37 | 0 | 62 | 52 | 38.1% | 100.0% | 100.0% | 47.1% | 59.5% |
| -47.50 | 29 | 0 | 71 | 53 | 27.4% | 100.0% | 100.0% | 42.4% | 54.2% |
| -43.50 | 22 | 0 | 76 | 53 | 25.5% | 100.0% | 100.0% | 42.2% | 50.5% |

ROC Area = 0.961, p-value <0.001

**Table 1 (abstract 000102)** Demographic data of 76 patients with AMPA receptor antagonist in traumatic brain injury and post-operativebrain tumor surgery

| Variables | N = 76 |
|---|---|
| Male, n (%) | 31 (41.7%) |
| Age (year) | 54.82 ± 12.81 |
| Age at epilepsy onset (mean ± SD, years) | 44.04 ± 8.21 |
| Duration of epilepsy (mean ± SD, years) | 5.12 ± 2.14 |
| Body mass index, BMI (kg/m$^2$) | 22.14 ± 5.1 |
| Diabetes mellitus | 51 (66.5%) |
| Hypertension | 67 (88.1%) |
| Old cerebrovascular accident | 27 (35.8%) |
| History of ipsilateral TIA | 6 (9.1%) |
| Hypercholesteralemia | 52 (68.7%) |
| Seizure frequency per day, median (min, max) | 8 (6,10) |
| Coronary artery disease | 13 (17.7%) |
| Atrial fibrillation | 5 (7.5%) |
| Peripheral arterial occlusive disease | 4 (5.8%) |
| Etiology not known | 7 (9.4%) |
| Etiology known | 68 (90.6%) |
| Traumatic brain injury | 18 (23.7%) |
| Cerebrovascular accident | 10 (13.2%) |
| Malformations of cortical development | 2 (2.6%) |
| Mesial temporal sclerosis | 1 (1.3%) |
| AVM | 3 (3.9%) |
| Infection | 5 (6.6%) |
| Brain neoplasm | 29 (38.2%) |
| Meningioma | 9 (11.8%) |
| Low-grade glioma | 6 (7.9%) |
| Anaplastic astrocytoma | 3 (3.9%) |
| High-grade glioma | 4 (5.3%) |
| Glioblastoma multiforme | 7 (9.2%) |
| Result of Surgery | |
| Gross total resection | 22 (28.9%) |
| Partial resection | 7 (9.2%) |
| Seizure type | |
| Focal seizures, n (%) | 32 (43%) |
| Focal onset with awareness | 20 (27%) |
| Focal onset with impaired awareness | 12 (16%) |
| Evolving to bilateral tonic-clonic seizure | 43 (57%) |
| Number of seizure types (n, %) | |
| 1 | 50 (66%) |
| ≥ 2 | 25 (34%) |
| Onset to PER therapy (hour) | |
| ≤ 48 hr | 54 (72%) |
| More than 48 hr | 21 (28%) |
| Previously failed ASM (n, %) | 29 (38.2%) |
| Phenytoin | 18 (38.2%) |
| Valproic acid | 3 (3.9%) |
| Levetiracetam | 3 (3.9%) |
| Carbamazepine | 2 (2.6%) |
| Phenobarbital | 1 (1.3%) |
| Clonazepam | 1 (1.3%) |
| Other | 1 (1.3%) |
| Number of previously failed ASMs (n, %) | 31 (40.7%) |
| ≤ 3 | 25 (32.8%) |
| more than 3 | 6 (7.9%) |
| Concomitant ASM at baseline (n, %) | 33 (43.4%) |
| Phenytoin | 22 (28.9%) |
| Valproic acid | 3 (3.9%) |
| Levetiracetam | 2 (2.6%) |
| Carbamazepine | 1 (1.3%) |
| Phenobarbital | 1 (1.3%) |
| Clonazepam | 1 (1.3%) |
| Other | 3 (3.9%) |
| Number of concomitant ASM at baseline (n, %) | 22 (28.9%) |
| 1 | 18 (23.7%) |
| ≥ 2 | 4 (5.2%) |
| Seizure frequency at baseline (n, %) | |
| ≤ 4 times/day | 65 (85.6%) |
| more than 4 times/day | 10 (14.4%) |
| Final daily dose of PER (mean ± SD, mg) | 3.16 ± 1.02 |
| Final daily dose of PER (range) | 2–8 mg |
| Post-operative surgical site infection | 7 (10%) |
| Post-operative hydrocephalus | 10 (13.1%) |

Value presented as mean ± SD

**Table 2 (abstract 000102)** Univariate analysis for variables associated with non-responders/responders

| Features | Non-responders (n=32) | responders (n=44) | *p*-value |
|---|---|---|---|
| Gender (Male, %) | 6 (18.7%) | 8 (18.2%) | 0.249 |
| Age (mean ± SD, years) | 55.8 ± 14.62 | 59.5 ± 14.18 | 0.086 |
| Age at epilepsy onset (mean ± SD, years) | 52.04 ± 7.11 | 30.04 ± 6.42 | 0.021 |
| Duration of epilepsy (mean ± SD, years) | 6.12 ± 1.23 | 5.15 ± 1.14 | 0.36 |
| Body weight (kg) | 63.1 ± 8.47 | 59.3 ± 9.16 | 0.921 |
| BMI (kg/m$^2$) | 19.23 ± 2.84 | 18.18 ± 2.91 | 0.949 |
| Diabetes mellitus | 9 (28.1%) | 15 (34.1%) | 0.138 |
| Hypertension | 13 (40.6%) | 24 (54.5%) | 0.084 |
| Old cerebrovascular accident | 5 (15.6%) | 8 (18.2%) | 0.322 |
| History of ipsilateral TIA | 1 (3.1%) | 2 (4.5%) | 0.249 |
| Seizure frequency per day, median (min, max) | 6 (5,7) | 8 (6,10) | 0.83 |
| Etiology not known | 1 (3.1%) | 2 (4.5%) | 0.853 |
| Etiology known | 13 (40.6%) | 21 (47.7%) | 0.124 |
| Traumatic brain injury | 5 (15.6%) | 14 (31.8%) | 0.027 |
| Cerebrovascular accident | 6 (18.7%) | 2 (4.5%) | 0.041 |
| Malformations of cortical development | 0 (0%) | 1 (2.2%) | 0.38 |
| Mesial temporal sclerosis | 0 (0%) | 1 (2.2%) | 0.38 |
| AVM | 0 (0%) | 1 (2.2%) | 0.38 |
| Infection | 2 (6.3%) | 2 (4.5%) | 1 |
| Brain neoplasm | 5 (15.6%) | 9 (20.5%) | 0.45 |
| Meningioma | 4 (12.5%) | 5 (11.4%) | 0.51 |
| Low-grade glioma | 1 (3.1%) | 5 (11.4%) | 0.015 |
| Anaplastic astrocytoma | 1 (3.1%) | 2 (4.5%) | 0.249 |
| High-grade glioma | 2 (6.3%) | 2 (4.5%) | 1 |
| Glioblastoma multiforme | 3 (9.4%) | 4 (9.0%) | 0.86 |
| Result of Surgery | | | |
| Gross total resection | 10 (31.3%) | 12 (27.2%) | 0.47 |
| Partial resection | 3 (9.4%) | 4 (9.0%) | 0.86 |
| Seizure type | | | |
| Focal seizures, n (%) | 14 (43.75%) | 18 (40.9%) | 0.35 |
| Focal onset with awareness | 8 (25.0%) | 12 (27.3%) | 0.091 |
| Focal onset with impaired awareness | 5 (15.6%) | 7 (15.9%) | 0.46 |
| Evolving to bilateral tonic-clonic seizure | 19 (59.4%) | 24 (54.5%) | 0.19 |
| Number of seizure types (n, %) | | | |
| 1 | 24 (75.0%) | 26 (59.1%) | 0.078 |
| ≥ 2 | 9 (28.1%) | 16 (36.4%) | 0.24 |
| Onset to PER therapy (hour) | | | |
| ≤ 48 hr | 22 (68.8%) | 38 (86.4%) | 0.016 |
| more than 48 hr | 8 (25.0%) | 13 (29.5%) | 0.32 |
| Number of previously failed ASMs (n, %) | | | |
| ≤ 3 | 5 (15.6%) | 20 (45.4%) | 0.011 |
| more than 3 | 2 (6.3%) | 4 (9.0%) | 0.37 |
| Number of concomitant ASM at baseline (n, %) | | | |
| 1 | 7 (21.9%) | 11 (25%) | 0.46 |
| ≥ 2 | 1 (3.1%) | 3(6.8%) | 0.17 |
| Seizure frequency at baseline (n, %) | | | |
| ≤ 4 times/day | 25 (78.1%) | 40 (90.9%) | 0.043 |
| more than 4 times/day | 4 (12.5%) | 6 (13.6%) | 0.82 |
| Final daily dose of PER (mean ± SD, mg) | 4.15 ± 1.17 | 3.11 ± 0.82 | 0.532 |
| Post-operative surgical site infection | 2 (6.3%) | 5 (11.4%) | 0.097 |
| Post-operative hydrocephalus | 4 (12.5%) | 6 (13.6%) | 0.88 |

Value presented as mean ± SD. or n (%). p-value corresponds to Independent-t test and Fisher's exact test.

**Table 3 (abstract 000102)** Multivariate analysis for variables associated with responders group

| Features | Exp (B) | 95% CI | *p*-value |
|---|---|---|---|
| Old cerebrovascular accident | 1.2 | 0.528–1.972 | 0.654 |
| Etiology known | | | |
| Traumatic brain injury | 1.49 | 0.072–0.734 | 0.030 |
| AVM | 0.09 | 0.632–1.672 | 0.526 |
| Infection | 0.95 | 0.535–2.471 | 0.834 |
| Brain neoplasm | | | |
| Low-grade glioma | 0.55 | 0.267–0.947 | 0.042 |
| High-grade glioma | 0.11 | 0.434–1.814 | 0.726 |
| Glioblastoma multiforme | 0.35 | 0.536–2.472 | 0.614 |
| Seizure frequency at baseline (n, %) | | | |
| ≤ 4 times/day | 0.62 | 0.096–0.625 | 0.045 |
| more than 4 times/day | 0.31 | 0.428–3.145 | 0.871 |
| Number of previously failed ASMs ≤ 3 | 0.43 | 0.115–0.938 | 0.025 |
| Post-operative surgical site infection | 0.05 | 0.231–1.634 | 0.547 |
| Post-operative hydrocephalus | 0.06 | 0.336–1.872 | 0.359 |
| Onset to PER therapy (hour) | | | |
| ≤ 48 hr | 1.31 | 0.086–0.801 | 0.020 |
| more than 48 hr | 0.64 | 0.830–1.727 | 0.697 |

Value presented as mean ± SD, or n (%). p-value corresponds to Independent-t test and Fisher's exact test. Multivariate analyses were performed for an array of clinical variables in relationship to seizure free rate at 6 months follow-up. Linear regression were performed for an array of clinical variables in relationship to seizure free rate.

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**Topic:** Neurointensive care

## 000104

## Fluid balance control secured by advanced hemodynamic monitoring during continuous renal replacement therapy in ICU patients with acute circulatory failure. The GO NEUTRAL randomized controlled trial

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**Introduction:** Net ultrafiltration (UFNET) during continuous renal replacement therapy (CRRT) may help control fluid balance in ICU patients, but is usually set to 0 mL/h in patients with vasopressors. Although only 50% of hemodynamic instability events associated with CRRT (HIRRT) are related to preload dependence, UFNET is also usually discontinued when these events occur (1).
**Objectives:** To evaluate the effectiveness of a UFNET strategy guided by functional hemodynamic monitoring to control the fluid balance in patients undergoing CRRT, compared to the standard of care (i.e. UFNET 0 mL/h).
**Methods:** This was a multi-center, randomized, controlled, open-label trial in 4 ICUs in France. Eligible patients were adults receiving with acute circulatory failure and receiving vasopressors, severe acute kidney injury treated with CRRT since less than 24 h and equipped with a calibrated continuous cardiac output monitoring device. Patients were randomized (ratio 1:1) to receive during 72 h a UFNET $\geq$ 100 mL/h, adjusted using a functional hemodynamic protocol (intervention), or a UFNET $\leq$ 25 mL/h (control) without the application of the hemodynamic protocol. The hemodynamic protocol was applied in the intervention arm every 4 h to decrease or stop UFNET in case of a pejorative hemodynamic profile (orange or red profiles, Fig. 1), based on the evaluations of cardiac output, central venous pressure, arterial lactate and preload depdence status. The study primary outcome was the cumulative fluid balance at H72 (corresponding to the difference in fluid inputs and outputs [including diuresis] recorded over that period) and was analyzed in the modified intention-to-treat population (mITT, i.e. all enrolled patients alive at H72 and in whom hemodynamic monitoring and CRRT were continuously provided). Secondary outcomes were analyzed in the intention-to-treat population (ITT) and included: hourly net ultrafiltration rate, hourly fluid balance, number of HIRRT episodes (hypotension, tachycardia, decrease in cardiac output or mottles). Continuous variables were reported using median [interquartile range]. Registration: ClinicalTrials.gov NCT04801784.
**Results:** Between June 2021 and April 2023, 55 patients (age 69 [62–74], 35% female) were enrolled; 25 received the intervention and 30 the control strategy. At inclusion, 48 patients (87%) had sepsis, the norepinephrine dose was 0.45 [0.21–1.05] µg/kg/min, and the SOFA score 13 [11–15]. In the mITT population (21 intervention, 24 control), the fluid balance at H72 was − 2650 [− 4574–− 309] mL in the intervention arm, and 1841 [821–5327] mL in the control arm (difference: 4942 [95% confidence interval: 2736 to 6902]) mL, $P < 0.01$). In the ITT population, the hourly net ultrafiltration rate and the hourly fluid balance were respectively and significantly higher and lower in the intervention arm, compared to controls (100 [50–140] ml/h vs. 20 [0–20] ml/h, $P < 0.01$ and − 27 [− 59–29] mL/h vs. 26 [8–69] mL/h, $P = 0.01$). The cumulative number of HIRRT episodes per patient at H72 was not statistically different between the control and intervention arms (1 [0–3] vs. 2 [1–4], $P = 0.23$). Hemodynamics, oxygenation and SOFA scores did not statistically differ between study arms at H72. Day-90 mortality

was 18/30 (60%) in controls and 17/25 (68%) in the intervention arm ($P = 0.99$).

**Conclusions:** In patients receiving vasopressors and CRRT, a fluid balance control strategy by UFNET guided by a functional hemodynamic protocol allowed a significant decrease in fluid balance, compared to the standard of care, with no increase in HIRRT incidence.

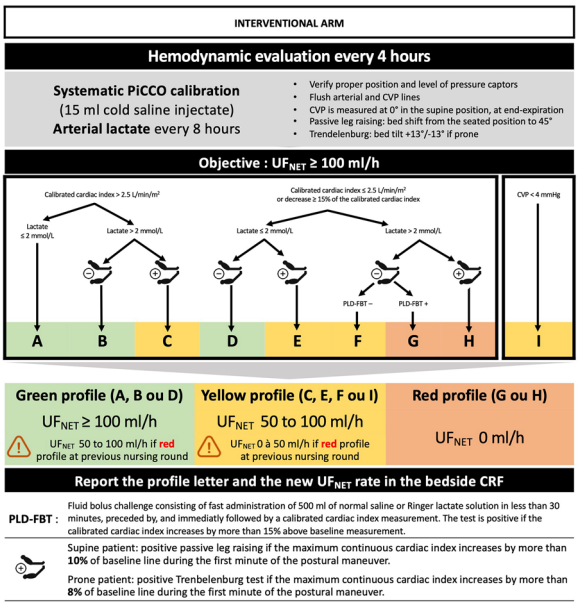


**Figure (000104)** CVP: central venous pressure; PLD-FBT: preload dependence evaluated by a fluid bolus challenge; UFNET: net ultrafiltration

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**Topic:** Acute Kidney Injury and haemofiltration

## 000109

### Effects of closed-loop ventilation versus conventional ventilation on alarms and interventions at the ventilator

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000109

**Introduction:** Mechanical ventilation is an essential intervention in the intensive care unit (ICU). Closed-loop ventilation modes, like INTELLiVENT®-Adaptive Support Ventilation (ASV), offer important advantages by automatically adapting ventilator settings based on real-time monitoring. Previous studies demonstrated its safety and improved lung protectiveness in various patient groups [1], however knowledge gaps remain regarding clinicians' workload and acceptance.

**Objectives:** To compare workload related to alarms and interventions at the ventilator with INTELLiVENT-ASV versus conventional ventilation in patients receiving postoperative ventilation after cardiac surgery. We also determined the acceptance of the closed-loop mode by ICU caregivers.

**Methods:** We conducted preplanned analysis of POSITiVE [2], a randomized clinical trial comparing INTELLiVENT-ASV with conventional ventilation in patients after cardiac surgery. The primary outcome was a combination of the number of alarms, and the number of manual interventions at the ventilator. Manual interventions included those related to changing ventilation and alarm settings. The primary outcome was calculated over the first three hours of ventilation or until extubation. Caregivers' acceptance was determined using a questionnaire based on the Technology Acceptance Model 2 [3], and a user acceptance score ranging from 1 to 10.

**Results:** POSITiVE included 210 patients (104 automated and 106 conventional). The automated mode generated a comparable number of alarms at a similar frequency as the conventional group (2.00 [1.33–3.57] vs 2.24 [1.33–4.01] alarms per hour; $P = 0.65$), less ventilation control interventions per hour (0.33 [0.33–1.00] vs 1.00 [0.33–2.00]; $P < 0.001$), but significantly more alarm management interventions per hour (12.50 [9.13–24.00] vs 2.11 [1.33–3.65]; $P < 0.001$), compared to the conventional group. Respectively, 99 ($\geq 1$ for 95% of patients) and 103 ($\geq 1$ for 97% of patients) surveys were completed for the automated and conventional group. Perceived ease of use did not differ between the two modes. The automated mode scored higher in perceived usefulness (2.61 [2.25–2.84] vs 2.11 [1.82–2.35]; $P < 0.001$) and had higher user acceptance (7.98 [7.75–8.20] vs 7.01 [6.67–7.35]; $P < 0.001$) compared to the conventional group.

**Conclusions:** Automated ventilation for post-cardiac surgical patients reduces the number of interventions related to ventilation management and shows higher clinicians' acceptance, indicating its potential to optimize patient care and reduce bedside nurses' workload. However, while alarm frequencies were similar, interventions related to alarm management increased.

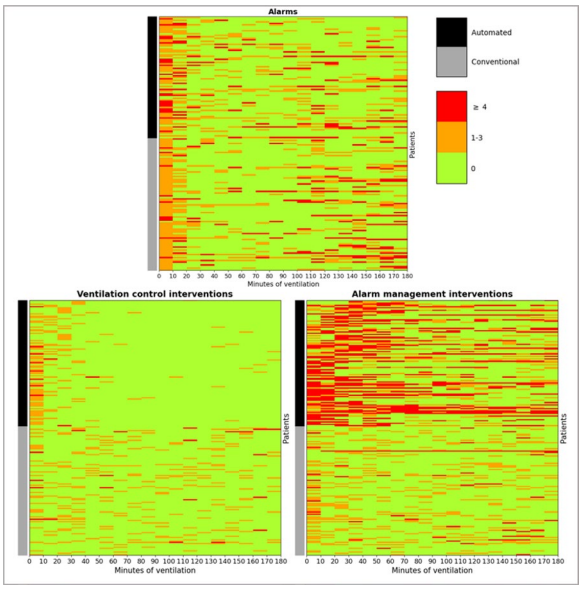


**Fig. 1 (abstract 000109)** Heatmap of the number of alarms (upper), ventilation control interventions (lower left) and alarm management interventions (lower right) occurring in the first 3 h or until extubation in intervals of 10 min. On the y-axis each patient is visualized and on

the x-axis the ventilation time. Patients following a black box represent the automated group and patients following a gray box represent the conventional group. Green represents zero alarms/interventions during that period, orange 1–3 alarms/interventions and red 4 or more alarms/interventions

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000110

## Potentially modifiable risk factors of acute kidney injury after emergency abdominal surgery

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000110

**Introduction:** Emergency abdominal surgery has high rates of mortality and morbidity. Patients undergoing emergency abdominal surgery show a septic condition in about 40% at the time of surgery, and elderly patients have particularly poorly controlled comorbidities. Therefore, this patient group has a high potential to improve postoperative morbidity, mortality, and postoperative clinical outcomes through perioperative management, aggressive resuscitation, and anesthesia management. However, the incidence and risk factors of postoperative acute kidney injury (AKI) have rarely been reported. We aimed to investigate the incidence and prognosis of AKI and find potentially modifiable risk factors of AKI in these high-risk patients.
**Methods:** We retrospectively reviewed consecutive patients who underwent emergency open abdominal surgery at a single tertiary care university hospital during between 2010 to 2022 ($n=474$). Baseline characteristics, surgery and anesthesia-related parameters were included in our binary logistic regression analysis. Smooth transformation of linear associations of our covariates with AKI was evaluated using restricted cubic splines.
**Results:** The overall incidence of AKI was 20.3% ($n=96$). Postoperative AKI was significantly associated with clinical outcomes including admission to ICU, length of hospital and ICU stay, and in-hospital mortality.
Multivariable logistic regression analysis for postoperative AKI revealed that age, body-mass index and ASA classification class 3 or 4 were significant predictors. Furthermore, intraoperative vasopressin continuous infusion (odds ratio 4.06, 95% confidence interval [CI] 1.19–13.9), preoperative platelet count (odds ratio 0.72, 95% CI 0.57–0.90, $p=0.003$) and maximal serum lactate level during surgery (and odds ratio 1.14, 95% CI 1.04–1.26, $p=0.006$) were identified as potentially modifiable risk factors.
Cubic spline function curves of multivariable-adjusted relationships showed that the risk of AKI increases as the maximal serum lactate level or the level at the end of surgery increases. Also, the risk of AKI decreased as the preoperative platelet count are higher.
**Conclusions:** Our study showed that AKI after emergency abdominal surgery is significantly associated with postoperative clinical outcomes including the admission to ICU, length of hospital or ICU stay, and in-hospital mortality. We also demonstrated that preoperative platelet count, intraoperative maximal lactate level, and vasopressin infusion are potentially modifiable risk factors of postoperative AKI in patients undergoing emergency open abdominal surgery.

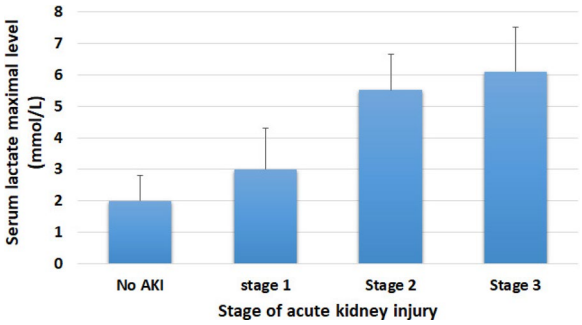


**Fig. 1 (abstract 000110)** Comparison of intraoperative maximal serum lactate levels between the patients with and without acute kidney injury

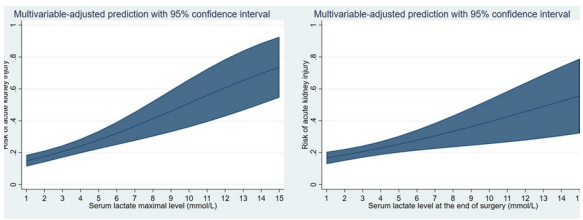


**Fig. 2 (abstract 000110)** Cubic spline function curves of the multivariable-adjusted relationship between intraoperative maximal serum lactate level and the risk of acute kidney injury (left) and the association between serum lactate level at the end of surgery and the risk of acute kidney injury (right)

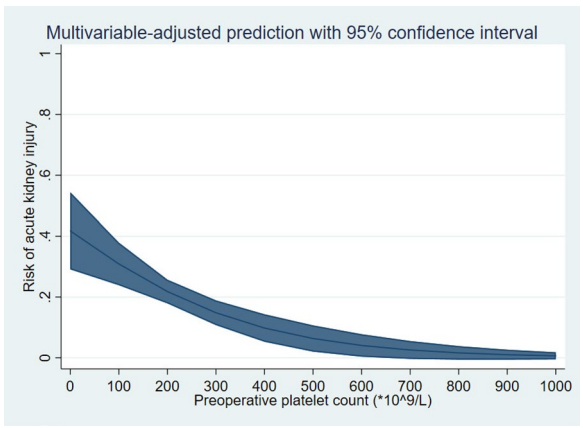


**Fig. 3 (abstract 000110)** Cubic spline function curves of the multivariable-adjusted relationship between the preoperative blood platelet count (*109/L) and the risk of acute kidney injury

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**Topic:** Perioperative care

## 000111

### Association of Heart Failure Categorized by Ejection Fraction with In-Hospital and Cardiovascular Mortality among Patients with Acute Decompensated Heart Failure

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000111

**Introduction:** Echocardiography derived ejection fraction (EF) is a powerful prognosticator for heart failure (HF). Acute heart failure (AHF) may either be new onset or acute decompensated heart failure (ADHF). Studies were limited on the association of heart failure categorized by EF with mortality among AHF patients particularly ADHF. Majority of studies would either do combined binary classification or use different EF range values. Further, most studies would either enrolled both de novo and acute decompensated heart failure or combined chronic and acute heart failure in the analysis. Hence, there are scarcity in knowledge and inconsistencies with data results regarding the association of heart failure categorized by ejection fraction in acute heart failure particularly in acute decompensated state.
**Objectives:***Primary Objectives:*
1. To describe the demographic, clinical characteristics, and outcome of patients with acute decompensated heart failure.
2. To determine association of heart failure (HF) categorized by ejection fraction with in hospital and cardiovascular mortality among patients with acute decompensated heart failure

**Methods:** This was a retrospective cohort study of patients enrolled in the national Philippine Heart Association HF registry admitted due to AHF from January 2015-December 2018. Patients with de novo HF were excluded. Binary logistic regression analysis was done.
**Results:** From a total of 1123 patients with AHF, 460 patients (41%) were diagnosed with ADHF. The mean EF of 412 patients was 42.44% (SD 15.44%). Heart failure reduced EF (HFrEF) was the most common classification (50%), followed by heart failure preserved EF (HFpEF 31%), and heart failure mildly reduced EF (HFmrEF 18%). The mean age was 56 years. More than 50% were males. The most common chief complain was dyspnea followed by chest pain. Majority of patients (53%) were in New York Heart Association classification III. The most common etiology of heart failure was coronary artery disease followed closely by hypertensive heart disease. Majority has no identifiable precipitating factors for decompensation. In-hospital mortality occurred in 11 patients (2.72%) with cardiovascular mortality as the major cause of death.

On adjusted analysis (Table 1), the odds of dying for HFrEF and HFmrEF was 7x (OR adj = 6.7; 95% CI 0.65–64.35) and 3x (OR adj = 3.29 95% CI 0.15–70.60) respectively compared to the odds of dying in HFpEF. However, this result was not statistically significant. The clinical variable that showed statistically significant association with mortality was COPD (adjusted OR 10.82, 95% CI 1.43–81.89). Heart rate also conferred a higher odds to mortality, for every beat/min increase of heart rate, the odds increase by 5% at 95% CI of 1.01–1.09.
**Conclusions:** This study showed that acute decompensated heart failure occurred in 41% among acute heart failure patients.HFrEF was the most common classification of HF occurring at 50%, followed by HFpEF (31%), and lastly by HFmrEF at 18%**.** The mean age was 56 years and more than 50% were males. The mean EF was 42.44%. The most common presenting symptom was dyspnea followed by chest pain. Coronary artery disease (CAD) and hypertensive heart disease (HHD) were the common etiologies for heart failure. Hypertension was the most common risk factor followed closely by diabetes. Infection and acute coronary syndrome were only second and third respectively in the precipitating factors for acute decompensation. The precipitating factor for acute decompensated heart failure could not be identified in majority of patients. In-hospital mortality occurred in 2.72% with cardiovascular mortality as the major cause of death. Although there was a trend for higher odds of dying for HFrEF and HFmrEF as compared to HFpEF, the study did not show statistical significance. This might be due to small number of events but this may suggest that EF alone should not be used as sole criterion for evaluation of AHF but should importantly consider other significant risk factors.

**Table 1 (abstract 000111)** Adjusted Analysis of the Association of Heart Failure Categorized by EF with In-Hospital Mortality among Patients with Acute Decompensated Heart Failure

**Adjusted Analysis of the Association of Heart Failure Categorized by EF with In-Hospital Mortality among Patients with Acute Decompensated Heart Failure.|**

| Clinical Variables | Multivariate Analysis | | |
|---|---|---|---|
| | Adjusted odds ratio | 95% CI | P-value |
| **HF by Ejection Fraction,** n= 405 | | | |
| HFrEF | 6.70 | 0.65-64.35 | 0.111 |
| HFmrEF | 3.29 | 0.15- 70.60 | 0.446 |
| HFpEF | (reference) | (reference) | |
| Age in years, n 404 | 0.99 | 0.93-1.05 | 0.696 |
| Male Sex, n=405 | 1.91 | 0.30-12.00 | 0.488 |
| CAD, n=405 | 0.25 | 0.04-1.61 | 0.145 |
| VHD non RHD, n= 405 | 8.45 | 0.73-97.53 | 0.087 |
| Hypertension, n=404 | 0.24 | 0.04-1.40 | 0.112 |
| DM, n=405 | 0.90 | 0.14-5.97 | 0.917 |
| CKD, n=405 | 2.85 | 0.15-55.51 | 0.489 |
| COPD, n=405 | **10.82** | **1.43-81.89** | **0.021** |
| ACS, n=405 | 5.46 | 0.93-32.03 | 0.060 |
| HR (bpm), n=403 | **1.05** | **1.01-1.09** | **0.008** |
| Creatinine (mg/dl), n= 384 | 1.00 | 0.99-1.01 | 0.792 |

*HFrEF Heart Failure Reduced Ejection Fraction, † HFmrEF Heart Failure mildly reduced Ejection Fraction; ‡ HFpEF Heart Failure Preserved Ejection Fraction; § CAD Coronary Artery Disease; ǁ VHD non RHD Valvular Non Rheumatic Heart Disease; ¶ DM Diabetes Mellitus; **CKD Chronic Kidney Disease; †† COPD Chronic Obstructive Pulmonary Disease; ‡‡ ACS Acute Coronary Syndrome; §§ HR Heart Rate

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6. Sincere acknowledgment is extended to my sisters and brothers Sholie, Grace, Jing, Joy, Ramil, Jeanette, Wally, and Remy; my son Luis, nieces and nephews namely Roni, Julian, Julian, Loren, and Christine. Heartfelt acknowledgment is also sincerely offered to my dear mentors Dr. Eduardo Punzalan, Prof Cynthia Cordero, Dr Eugene Reyes, Dr Alisa Bernan, Dr. Marissa Alejandria, and Prof Nymia Simbulan. Also to the following who have been supportive namely Dr. Sandra Yao, Mr. Raul Cruz, Ms. Girlie Monis, Dr. Jinggoy Atibagos, and Ralph Villanueva
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**Topic:** Cardiovascular issues in ICU

## 000113

### Lower versus higher oxygenation target in intensive care unit patients with chronic obstructive pulmonary disease and acute hypoxaemic respiratory failure

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000113

**Introduction:** Oxygen supplementation is essential in treating patients with chronic obstructive pulmonary disease (COPD) and acute hypoxaemia. While higher oxygenation targets have been discouraged in patients with COPD due to the risk of $CO_2$ retention, the optimal oxygenation target for these patients has yet to be determined in the intensive care unit (ICU).
**Objectives:** To investigate the benefits and harms of a lower partial pressure of arterial oxygen ($PaO_2$) oxygenation target of 8 kPa versus a higher $PaO_2$ oxygenation target of 12 kPa in ICU patients with COPD and acute hypoxaemic respiratory failure.
**Methods:** This is an analysis of a pre-planned subgroup in the HOT-ICU trial [1], being patients with COPD. In the HOT-ICU trial, ICU patients with acute severe hypoxaemic respiratory failure were randomised 1:1 to a lower ($PaO_2$ of 8 kPa) versus a higher ($PaO_2$ of 12 kPa) oxygenation target during ICU admission, for a duration of up to 90 days including readmissions. The randomisation was stratified for the presence or absence of COPD. The primary outcome was 90-day all-cause mortality; secondary outcomes at 90 days were the number of patients with one or more serious adverse events in the ICU (new episodes of shock, intestinal ischaemia, cerebral ischaemia, or myocardial infarction), days alive and free of life support (mechanical ventilation, vasopressors/inotropes, or renal replacement therapy), and days alive out of hospital.
**Results:** The HOT-ICU trial enrolled 2928 patients, of whom 563 had COPD: 277 patients were allocated to the lower-oxygenation group, and 286 patients to the higher-oxygenation group. The median $PaO_2$ was 9.1 kPa (interquartile range [IQR] 8.7 to 9.9) in the lower-oxygenation group compared with 12.1 kPa (IQR 11.2 to 12.9) in the higher-oxygenation group. Data for partial pressure of arterial carbon dioxide ($PaCO_2$) and pH were available for 497 patients (88%), and showed no between-group differences in time-weighted averages during ICU stay; median $PaCO_2$ 6.0 kPa (IQR 5.2 to 7.2) and pH 7.40 (IQR 7.36 to 7.43) in the lower-oxygenation group, compared with $PaCO_2$ 6.2 kPa (IQR 5.4 to 7.3) and pH 7.39 (IQR 7.34 to 7.42) in the higher-oxygenation group. Arterial blood gas data for the first 30 days are presented in Fig. 1. At 90 days 122 of 277 patients (44%) in the lower-oxygenation group versus 132 of 285 patients (46%) in the higher-oxygenation group had died (adjusted relative risk 0.98; 95% CI 0.82 to 1.17; $P = 0.67$). We found no statistically significant differences in any secondary outcomes.
**Conclusions:** In ICU patients with COPD and acute severe hypoxaemic respiratory, targeting a $PaO_2$ of 8 kPa did not reduce 90-day all-cause mortality compared with targeting a $PaO_2$ of 12 kPa. There were no between-group differences in $PaCO_2$, pH levels, or any secondary outcomes. These findings may not be transferred to COPD patients with hypercapnic respiratory.

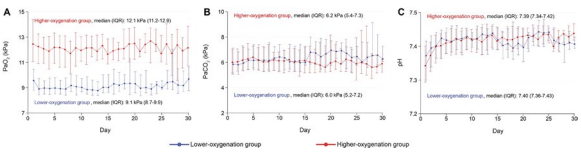


**Fig. 1 (abstract 000113)** Oxygenation and arterial blood gas data until 30 days post-randomisation. $PaO_2$ = partial pressure of arterial oxygen. $PaCO_2$ = partial pressure of arterial carbon dioxide. COPD = chronic obstructive pulmonary disease. Group medians with interquartile ranges (IQR) are calculated for the 90-day intervention period. Panel A: Oxygenation data for the 563 COPD patients in the HOT-ICU trial. Values are medians of daily patient-means with IQRs. Daily patient-means were calculated from the lowest and highest PaO2 in pre-specified 12-h intervals. Panels B-C: Arterial blood gas data for the 497 Danish COPD in the HOT-ICU trial. Values are daily medians of patients' time-weighted averages with IQRs

**Reference(s)**
1. The HOT-ICU trial was funded by a grant from Innovation Fund Denmark (4108-00011A) and supported by Aalborg University Hospital, the Regions of Denmark (EMN-2017-00901 and EMN-2019-01055), the Obel Family Foundation (25457), the Danish Society of Anaesthesiology and Intensive Care Medicine, and the Intensive Care Symposium Hindsgavl. No additional funding was provided for this sub-study. Funders of this study had no role in the design, collection, analysis, interpretation of data, or writing of this report.
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**Topic:** Acute respiratory failure and mechanical ventilation

**000114**

## Anaemia's Impact and Management Post-Aneurysmal Subarachnoid Haemorrhage

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**Introduction:** Cerebral vasospasm (CVS) and delayed cerebral ischemia (DCI) remain major morbidity and mortality factors following aneurysmal subarachnoid haemorrhage (aSAH) [1]. Anaemia is prevalent in aSAH patients and linked to worse outcomes. Nevertheless, optimal haemoglobin (Hb) and packed red blood cell transfusion (pRBCT) strategy remain unknown [2].
**Objectives:** Examine the association between anaemia and pRBCT with CVS, DCI and functional outcome after aSAH.
**Methods:** Single-centre retrospective study including all adult patients with aSAH admitted to a tertiary´s hospital Neurocritical Care Unit (NCCU) from 2018 to 2022. Primary Outcome was CVS and functional outcome assessed with the Glasgow Outcome Scale (GOS). Secondary Outcomes were NCCU and hospital length of stay. Anaemia was considered if Hb dropped below 10 g/dL, from admission and throughout the DCI risk period. CVS was diagnosed with TCD or cerebral angiography.
**Results:** A total of 221 patients were included, none of which had anaemia on admission. Baseline characteristics, treatment strategy and outcomes are shown in Table 1. Considering those who developed anaemia (n = 114, 52%), 74% were female with a mean age of 60 years, 59% had hypertension and 28% smoking history. In this subgroup, 42% had a severe aSAH (Hunt-Hess of IV/V), with the most frequent location being the anterior communicating and middle cerebral arteries; 55% were managed surgically and 45% with endovascular treatment. Patients with anaemia were more likely to present with worse neurological grade and to have their aneurysm secured by clipping ($p < 0.001$). Only 33% of patients were transfused, more likely to happen with an Hb of less than 8 g/dL (53% vs 14%) and no pRBCT were used for an Hb threshold above 10 g/dL. On univariate analysis, anaemia was associated with CVS (OR 3.17, 95% CI, 1.826–5.52, $p < 0.001$), DCI (OR 2.95, 95% CI 1.61–5.42, $p < 0.001$) and worse functional outcome, both at 6 months (OR 2.3, 95% CI 1.15–3.90, $p\ 0.014$) and one year after discharge (Or 2.34 95% CI 1.07–5.12, $p = 0.031$). Transfusion failed to alter the link between anaemia and CVS or DCI (OR 3.05, 95% CI 1.45–6.42, $p = 0.002$) and failed to improve patient outcome (OR 4.05, 95% CI 1.89–8.53, $p < 0.01$). Time to event analysis (Fig. 1), showed a statistically significant association between anaemia and CVS (Log Rank < 0.001). There was no statistically significant difference between patients with severe (Hb ≤ 8 g/dL) and moderate (8 < Hb ≤ 10 g/dL) anaemia. Anaemia was associated with prolonged NCCU and hospital stay ($p < 0.001$), longer for patients with severe anaemia versus those with moderate anaemia ($p = 0.017$ and $< 0.001$, respectively).
**Conclusions:** Anaemia is prevalent among aSAH patients and an Hb decline below 10 g/dL was strongly associated with CVS, DCI, poor functional outcome, and extended hospital and NCCU stay. Transfusion strategy for a medium Hb of 7.7–7.8 g/dL did not improve study endpoints. Our findings encourage further evaluations on the value of a higher threshold transfusion strategy in aSAH patients.

**Table 1 (abstract 000114)** Baseline characteristics, complications, treatment strategy and outcomes

| | Anaemia | | No anemia |
|---|---|---|---|
| | Hb ≤ 8 g/dL n = 57 (40%) | 8 > Hb ≤ 10 g/dL n = 57 (40%) | Hb > 10 g/dL n = 107 (60%) |
| **Female**, n (%) | 43 (75%) | 41 (72%) | 52 (49%) |
| **Age (years)**, mean (SD) | 60 (± 14) | 60 (± 13) | 56 (± 13) |
| **Smoking history**, n (%) | 13 (23%) | 19 (33%) | 41 (38%) |
| **Hypertension**, n (%) | 32 (56%) | 35 (61%) | 49 (46%) |
| **Hunt-Hess score** | | | |
| **I-III**, n (%) | 31 (54%) | 35 (61%) | 84 (79%) |
| **IV-V**, n (%) | 26 (46%) | 22 (39%) | 23 (21) |
| **Aneurysm Management** | | | |
| **Surgical clip**, n (%) | 36 (63%) | 27 (47%) | 30 (28%) |
| **Endovascular**, n (%) | 16 (28%) | 26 (55%) | 43 (40%) |
| **Ventilation days**, median (p25-75) | 23 (7-36) | 14 (2-28) | 5 (0-3) |
| **Analgosedation days**, median (p25-75) | 19 (7-24) | 11 (2-21) | 4 (0-2) |
| **Transfusion**, n (%) | 30 (53%) | 8 (14%) | - |
| **Haemoglobin threshold**, median (p25-75) | 7.7 (7.5-8.0) | 7.8 (7.5-8.0) | - |
| **Packed Red Blood Cell**, mean (SD) | 2 (± 0.85) | 1 (± 0.35) | - |
| **Vasospasm**, n (%) | 38 (67%) | 30 (53%) | 34 (31%) |
| **Interhemispheric index**, median (p25-75) | 3.8 (3.4-4.7) | 3.2 (3-4.2) | 3.7 (3.2-4.3) |
| **DCI**, n (%) | 25 (44%) | 23 (40%) | 21 (20%) |
| **NCCU length of stay**, median (p25-75) | 31 (18-47) | 23 (15-34) | 11 (8-19) |
| **Hospital length of stay**, median (p25-75) | 57 (32-82) | 36 (26-52) | 22 (16-30) |
| **GOS 28 days** | | | |
| **4-5**, n (%) | 15 (26%) | 32 (56%) | 69 (64%) |
| **1-3**, n (%) | 39 (68%) | 20 (36%) | 33 (31%) |
| **Not available** | 3 (5%) | 5 (9%) | 5 (5%) |
| **GOS 6 months** | | | |
| **4-5**, n (%) | 26 (46%) | 21 (37%) | 70 (65%) |
| **1-3**, n (%) | 24 (42%) | 35 (61%) | 24 (23%) |
| **Not available** | 7 (12%) | 1 (2%) | 13 (12%) |
| **GOS 1 year** | | | |
| **4-5**, n (%) | 34 (74%) | 35 (73%) | 71 (87%) |
| **1-3**, n (%) | 12 (26%) | 13 (27%) | 11 (13%) |

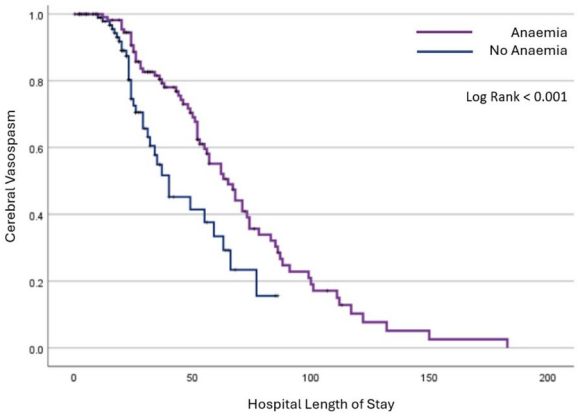


**Fig. 1 (abstract 000114)** Time to event analysis showing a statistically significant association between anaemia and CVS

**Reference(s)**

1. 1. Findlay JM, Nisar J, Darsaut T. Cerebral Vasospasm: A Review. Can J Neurol Sci. 2016 Jan;43(1):15–32.
2. 2. Hoh BL et al. 2023 Guideline for the Management of Patients With Aneurysmal Subarachnoid Hemorrhage: A Guideline From the American Heart Association/American Stroke Association. Stroke. 2023 Jul; 54(7):e314-e370.

**Topic:** Neurointensive care

## 000115

### Predictive value of Presepsin for vasopressor and ventilator treatment after hospitalization in patients with pneumonia

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**Introduction:** Presepsin is a specific and valuable biomarker of the predictive value in sepsis and community-acquired pneumonia.
**Objectives:** This study analyzed which the high plasma presepsin level (HPL) was associated with vasopressors, mechanical ventilation or death in patient with pneumonia or not.
**Methods:** This retrospective single-center study analyzed patients admitted through the emergency room at Konyang University Hospital from April to December. A total of 252 patients were enrolled, of which 78 (30.9%) were pneumonia. Excepting 1 patient without presepsin level, total 77 patients were analyzed. We used HPL as the cuf-off in this study based on a previous study in which the presepsin level was 720 pg/mL when the PSI score was above 130.
**Results:** Among all patients, 21 (27.3%) patients received vasopressors and 19 (24.6%) patients received mechanical ventilation, and death were 23 (29.9%) during hospital stay. There was no difference in the median value of presepsin levels between patients who received vasopressors and patients who did not (570.5 pg/mL (IQR 346.6–749.5 pg/mL) vs 707.0 pg/mL (IQR 414.5–1373.0 pg/mL), p = 0.352). Patients with HPL tended to receive more vasopressors within 72 h of hospitalization compared to patients with low levels, but there was no statistical difference (38.5% vs 21.5%, $p = 0.097$). There was no difference in the application of mechanical ventilation (26.9% vs 23.5%, $p = 0.475$) and death between two groups (34.6% vs 27.5%, $p = 0.346$).
**Conclusions:** Plasma level of presepsin did not predict mechanical ventilation treatment or death. There was a tendency for a high number of patients to receive vasopressor during HPL.

**Topic:** Infections and prevention

## 000116

### Magnesium vs. calcium loss in steady state citrate continuous renal replacement therapy (ciCRRT)

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**Introduction:** When initiating ciCRRT both calcium (Ca) and magnesium (Mg) balance undergo dynamic changes before reaching steady state. In a CVVHDF model, Zakharchenko et al. demonstrated that, sampling twice within 1 h in steady state, postfilter $Mg^{2+}$ is significantly related to the postfilter $Ca^{2+}$ and that loss of Mg was not covered by magnesium concentration in ordinary dialysis/substitution fluid.
**Objectives:** To compare Ca and Mg loss in steady state over a longer period in a broader range of citrate doses but with similar clearances.
**Methods:** In this study targeting high vs. low postfilter ionized calcium by titrating citrate concentrations, calcium and magnesium loss in effluent were compared once steady state had been reached in CVVH (12, 18 and 24 h after initiation). Clearance was targeted at 30 ml/kg/h in all patients. Appropriate statistical analyses were performed, accounting for repeated measurements and normality of values.
**Results:** A total of 35 patients were included: mean age 65.4 (SD 14.8), 69% were male, APACHE II 30.0 (5.4) on admission. Mean clearance dose was 26.3 ml/kg/h (SD 1.0). Mean circuit citrate concentration was 4.2 (0.9) mmol/L of blood (minimum 3.0, maximum 5.5). In 103 measurements (34 at 12 h, 35 at 18 h, 34 at 24 h) a lower Mg loss (1.7 (0.4) mmol/h) than Ca loss (5.1 (0.9) mmol/h) from circuits ($p < 0.001$) was demonstrated. Mg and Ca loss via effluent correlated significantly ($r = 0.622$, $p < 0.001$). Calcium loss was weakly correlated to circuit citrate concentrations ($r = 0.187$, $p = 0.045$). This correlation was not present for magnesium loss.
**Conclusions:** We found a strong correlation between total magnesium and total calcium loss in effluent in ciCVVH (Fig. 1), similar to Zakharchenko's findings for postfilter $Mg^{2+}$ and $Ca^{2+}$ values. However, correlation between circuit citrate concentrations was either weak (in case of calcium effluent loss) or absent (in case of magnesium effluent loss). Calcium and magnesium balance are the product of effluent loss and replacement fluids containing them. Generally, protocols for correction of calcium loss in citrate circuits CRRT are well developed and usually incorporated in commercialized apparatus. However, protocols for magnesium correction seem to be lacking, possibly because in clinical practice total Mg is measured and $Mg^{2+}$ values are generally not available bedside.
In an elegant study, de Jonge et al. used daily measurement of total calcium measured in an effluent sample, together with other beside parameters, to develop a simple mathematical equation to calculate calcium-excretion in the ultrafiltrate during ciCVVH with citrate anticoagulation. The equation included total blood calcium concentrations, total effluent (l/24 h) and blood flow (ml/h). Addition of citrate concentrations did not improve the fit of the model. Our findings suggest that a similar study for magnesium loss in effluent would likely demonstrate similar findings.

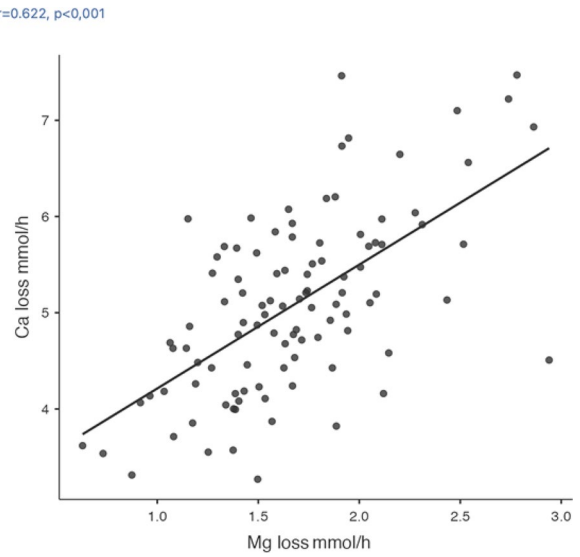


**Fig. 1 (abstract 000116)** Correlation between total magnesium and total calcium loss (mmol/h) in effluent in ciCVVH

**Reference(s)**

1. de Jonge E, van der Vooren M, Gillis JMEP, Del Prado MR, Wigbers J, Bakhshi-Raiez F, Elzo Kraemer CV. Negative calcium balance despite normal plasma ionized calcium concentrations during citrate anticoagulated continuous venovenous hemofiltration (CVVH) in ICU patients. J Nephrol. 2023 May;36(4):1019–1026. PMID: 36342643

2. Zakharchenko M, Leden P, Rulíšek J, Los F, Brodska H, Balik M. Ionized Magnesium and Regional Citrate Anticoagulation for Continuous Renal Replacement Therapy. Blood Purif. 2016;41(1–3):41–7. PMID: 26960213.

**Topic:** Acute Kidney Injury and haemofiltration

## 000117

### Observational Study of the clinical utility of the Nucleosome levels in septic acute kidney injury: a new target to estimate renal damage?

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**Introduction:** Uncontrolled inflammatory and immune responses frequently contribute to both acute and chronic renal injuries [1]. NETosis occurs when neutrophils decondense their nuclear chromatin and DNA, ultimately ejecting it in a web-like form into the extracellular space. Histones H3 and H4 are major components of nucleosomes which are the major building blocks of neutrophil extracellular traps. NETosis serves as a swift and efficient immunological reaction to mitigate and contain infections. Both basic and clinical research underscore the significance of innate immune cells like neutrophils in the onset and advancement of renal ailments [2].
**Objectives:** We evaluated levels of circulating H3.1 nucleosomes, a surrogate of NETosis, to examine if there was an association between the development of acute kidney injury (AKI) and its severity in patients with confirmed sepsis and septic shock.
**Methods:** This study was a secondary analysis of patients recruited for the SISPCT-trial (which investigated the effect of Sodium Selenite administration and procalcitonin-guided therapy on the mortality of patients with sepsis or septic shock) [3]. A cohort of 881 sepsis patients, including those with either new-onset acute kidney injury (AKI) or no AKI, was examined. AKI severity was categorized based on the maximum elevation of serum creatinine (Scr) levels observed within 7 days of enrolment. Patients with preexisting impaired renal function who did not progress to AKI were evaluated to provide a comparator. H3.1 nucleosome levels were analysed at admission and serially in frozen citrate plasma samples.
**Results:** 881 patients were eligible for inclusion in the study. 67(7.6%) patients developed stage 1 AKI, 28 developed stage 2 AKI (3.2%) and 219 (24.8%) patients progressed to stage 3 AKI. 189 (86%) with stage 3 AKI required RRT. Nu.Q® H3.1 levels were significantly higher in those who developed severe AKI when compared to patients who did not develop AKI. (1151 ng/ml [509–3797] vs 484 ng/ml [216–1127]); ($p < 0.001$). In patients who remained in RRT demonstrated a significant reduction in Nu.Q® H3.1 levels over 7 days compared to patients with AKI 3 who did not require RRT, (1335 pg/ml [604–4165] to 898 pg/ml [447–1778]; ($p < 0.001$) compared to patients with AKI 3 and without RRT (741 pg/ml [242–1362] to 625 pg/ml [399–1166]; $p = 0.924$).
Baseline values of H3.1 levels also differ in patients without evolving AKI but preexisting renal impairment. The more pronounced the reduction in GFR at baseline, the higher the levels of H3.1 at baseline ($p < 0.001$). H3.1 levels at baseline could predict severe AKI ($p < 0.001$). However, in terms of prediction of AKI they are not superior (AUC 0.695) to serum creatinine (AUC 0.755) or the glomerular filtration rate (AUC 0.754).
**Conclusions:** NETosis represent a significant element in the pathogenesis of septic AKI and may serve as an indicator for the immune status in individuals with pre-existing renal conditions. Subsequent investigations are imperative to elucidate the involvement of NETosis in both AKI and chronic kidney disease, facilitating the assessment of potential therapeutic strategies aimed at modulating these mechanisms.

**Reference(s)**

1. 1.Salazar-Gonzalez, H., et al., Neutrophil Extracellular Traps in the Establishment and Progression of Renal Diseases. Medicina (Kaunas), 2019. 55(8). 2. Lee, S.A., et al., Role of Immune Cells in Acute Kidney Injury and Repair. Nephron, 2017. 137(4): p. 282–286.3. 3. Bloos, F., et al., Effect of Sodium Selenite Administration and Procalcitonin-Guided Therapy on Mortality in Patients With Severe Sepsis or Septic Shock: A Randomized Clinical Trial. JAMA Intern Med, 2016. 176(9): p. 1266–76.

**Topic:** Acute Kidney Injury and haemofiltration

## 000118

### Study of Bayesian Based Posaconazole PKPD in Chinese Patients

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**Introduction:** Posaconazole has a broad antibacterial spectrum and is mainly used for the prevention of systemic fungal infections in children or adults at high risk of invasive fungal disease (IFD), There are three dosage forms of posaconazole, namely oral suspension, enteric coated tablets, and injection. Due to various factors such as gender, weight, race, concomitant use, and drug interactions, the in vivo pharmacokinetic pharmacodynamics (PKPD) of posaconazole, especially its suspension, results in significant variability in blood drug concentrations between individuals. Studies have shown that about 30% of patients receiving posaconazole fail to reach the target of trough concentration > 0.7 mg $L^{-1}$ during the prevention of IFD, and inadequate blood concentration of posaconazole is an independent predictor of breakthrough invasive fungal infections. The prevention of Candida and Aspergillus by Posaconazole is time-dependent, and AUC/MIC can be the optimal PKPD target for Posaconazole antifungal therapy. This article presents a PK/PD study on the prevention of invasive fungal infections in children and adults using two dosage forms of posaconazole, in order to establish a new personalized anti-infection treatment model for critically ill patients with posaconazole.
**Objectives:** To evaluate the predictive ability of the Posaconazole population pharmacokinetic software (Bayesian forecasting process) in Chinese adult and children patients,and to valadate its clinical application effect.
**Methods:** A total of 382 hospitalized adults who were treated with posaconazole in our hospital were selected, including 294 patients who took enteric coated tablets (initial dose of 300 mg q12h, maintenance dose of 300 mg qd) and 88 patients who took suspension (200 mg tid). The concentrations of posaconazole from those patients was collected to develop pharmacokinetic parameters using the posaconazole population pharmacokinetics (PPK) model of NextDose-Posaconazole, and the individualized dose protocols and the predicted concentration–time curves were calculated using the patient information such as age, body weight, et al., according to Bayesian evaluation. The clinical efficacy of the protocols were verified through clinical cases.
**Results:** The average trough concentrations from the adult patients were ($1.61 \pm 0.87$) and ($0.31 \pm 0.20$) μg $mL^{-1}$ for enteric coated tablets and suspension, respectively, from the children patients were ($1.58 \pm 0.86$) and ($0.36 \pm 0.26$) μg $mL^{-1}$ for enteric coated tablets and suspension. The apparent volume of distribution (Vd) predicted by Bayesian forecasting process was ($94.59 \pm 3.24$) and ($94.73 \pm 3.62$) L, respectively; and the clearance rate (CL) was ($3.85 \pm 1.27$) and ($12.90 \pm 2.32$) L $h^{-1}$, respectively using Cavg, ss (1.25 μg·$mL^{-1}$) as the PKPD target in the adult patients; respectively, the apparent volume of distribution (Vd) predicted by Bayesian forecasting process was ($45.22 \pm 15.80$) and ($25.78 \pm 11.47$) L, respectively; and the clearance rate (CL) was ($2.76 \pm 1.10$) and ($6.70 \pm 1.50$) L $h^{-1}$ from the children patients.The trough concentration compliance rate required to reach the standard with Cavg, ss (1.25 μg·$mL^{-1}$) was 99.25% and 16.67%,

respectively. After the dosing regimens were adjusted for patients whose trough concentration does not meet the standard target, the compliance rate increased from 16.67% to 71.43%. The dose regimens predicted by Bayes were applied to patients, and the clinical case validation showed that the efficacy was satisfactory, with no adverse reactions observed.

**Conclusions:** The clinical application of NextDose-Posaconazole based on Bayesian forecasting had positive predictive ability for the individualized dosing regimen of posaconazole in Chinese patients and could help assist clinical individualized application of posaconazole.

**Table 1 (abstract 000118)** PKPD parameters of adult patients taking posaconazole enteric coated tablets/suspensions

| DF | G (M/F) | Age (y) | $C_{tr}$ (μg·mL$^{-1}$) | CL (L·h$^{-1}$) | Vd (L) | $C_{avg,\ ss}$ (μg·mL$^{-1}$) | $C_{avg,\ ss}$ Achieving Rate (%) | AUC (μg·mL$^{-1}$) | MIC(mg·L$^{-1}$) | AUC/MIC |
|---|---|---|---|---|---|---|---|---|---|---|
| ECT | 76/58 | 50.18±14.32 | 1.61±0.87 | 3.85±1.27 | 94.59±3.24 | 1.63±0.57 | 133 (99.25%) | 39.21±13.71 | Candida-MIC:0.06 | 653.43±228.54 |
| | | | | | | | | | A. fumigatus-MIC:0.25 | 156.82±54.85 |
| | | | | | | | | | Other Aspergillus-MIC:0.5 | 78.41±27.43 |
| SUS | 28/14 | 42.93±12.82* | 0.31±0.20** | 12.91±2.32** | 94.73±3.62 | 0.45±0.11** | 7（16.67%） | 10.90±2.74** | Candida-MIC:0.06 | 181.61±45.58** |
| | | | | | | | | | A. fumigatus-MIC:0.25 | 43.59±10.94** |
| | | | | | | | | | Other Aspergillus-MIC:0.5 | 21.79±5.47** |

DF: Dosage form; G:gender; M:Male; F:Female; ECT: enteric-coated tablets ; SUS: suspension; $C_{tr}$: Trough concentration; CL: Clearance；Vd：Volume of distribution；$C_{avg,\ ss}$：Steady state average blood drug concentration；AUC：Area under the blood drug concentration time curve；MIC: Minimum inhibitory concentration.

*：Compared to enteric coated tablets，p<0.01；**：Compared to enteric coated tablets，p<0.001。

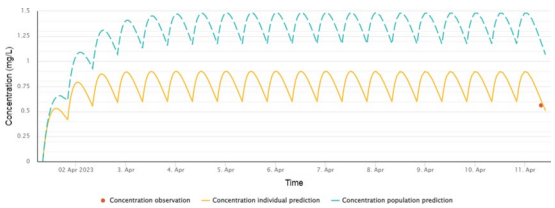


**Fig. 1 (abstract 000118)** Population and individual concentration–time curve prediction chart of posaconazole suspension in patient No.1*

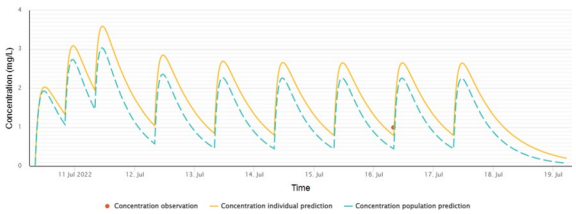


**Fig. 2 (abstract 000118)** Population and individual concentration–time curve prediction chart of posaconazole enteric-coated tablets in children patient No. 2*

**Table 2 (abstract 000118)** PKPD parameters of pediatric patients taking posaconazole enteric coated tablets/suspensions

| DF | G (M/F) | Age (y) | $C_{tr}$ (μg·mL$^{-1}$) | CL (L·h$^{-1}$) | Vd (L) | $C_{avg,\ ss}$ (μg·mL$^{-1}$) | Dose predictioned (mg·d$^{-1}$) | AUC (μg·mL$^{-1}$) | MIC (mg·L$^{-1}$) | AUC/MIC |
|---|---|---|---|---|---|---|---|---|---|---|
| Crush | 23/61 | 2.76±1.03 | 1.57±0.99 | 1.70±0.42 | 18.56±3.00 | 4.10±1.16 | 205.88±29.32 | 98.36±27.78 | Candida-MIC:0.06 | 1639.30±463.03 |
| | | | | | | | | | A. fumigatus-MIC:0.25 | 393.43±111.13 |
| | | | | | | | | | Other Aspergillus-MIC:0.5 | 196.72±55.56 |
| Swa | 22/54 | 9.93±3.50* | 1.58±0.86 | 2.76±1.10* | 45.22±15.80* | 2.52±0.86* | 204.89±27.95 | 60.50±20.56* | Candida-MIC:0.06 | 1008.34±342.65* |
| | | | | | | | | | A. fumigatus-MIC:0.25 | 242.00±82.24* |
| | | | | | | | | | Other Aspergillus-MIC:0.5 | 121.00±41.12* |
| SUS | 20/26 | 5.08±3.00#& | 0.36±0.26#& | 6.70±1.50#& | 25.78±11.47#& | 1.22±0.34#& | 908.54±189.22 | 29.17±8.23#& | Candida-MIC:0.06 | 486.14±137.25#& |
| | | | | | | | | | A. fumigatus-MIC:0.25 | 116.67±32.94#& |
| | | | | | | | | | Other Aspergillus-MIC:0.5 | 58.34±16.47#& |

DF: Dosage form; Crush：Crush and take enteric coated tablets; Swa：Swallow whole enteric coated tablets；SUS: suspension; G:gender; M:Male; F:Female; $C_{tr}$: Trough concentration; CL：Clearance；Vd：Volume of distribution；$C_{avg,\ ss}$ Steady state average blood drug concentration；AUC：Area under the blood drug concentration time curve；MIC: Minimum inhibitory concentration.

*：Enteric coated tablets（Swallow whole enteric coated tablets）vs enteric coated tablets（Crush and take enteric coated tablets），p<0.001；#：suspension vs enteric coated tablets（Crush and take enteric coated tablets），p<0.001；&：suspension vs enteric coated tablets（Swallow whole enteric coated tablets），p<0.001.

**Table 3 (abstract 000118)** Treatment plan for adult patients who do not meet the initial blood drug concentration standard after taking posaconazole suspension

| Treatment plan | | Number of cases（n） | $C_{avg,\ ss}$-Achieving Rate（%） |
|---|---|---|---|
| Increasing the dose of posaconazole | Increasing the dose to 400mg tid po | 2 | 1（50.00%） |
| | Increasing the dose to 600mg tid po | 13 | 9（69.23%） |
| Change Posaconazole to Voriconazole | Voriconazole tablets | 4 | - |
| | Voriconazole for injection | 14 | - |
| Change posaconazole to echinocoecins | Micafenil or Cabozantine | 2 | - |
| total | | 35 | - |

**Reference(s)**
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**Topic:** Poisoning/Toxicology/Pharmacology

## 000119

### Do multiple PCR testing always require a bronchoalveolar lavage sample?

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000119

**Introduction:** The use of panels based on multiple polymerase chain reaction (PCR) in respiratory samples is widely spreading in intensive care units (ICU). More often, these tests are performed on high-quality samples collected through an invasive high-risk procedure, such as bronchoalveolar lavage (BAL) fluid sampling during fibrobronchoscopy, a technique that critical patients sometimes cannot tolerate.
**Objectives:** Primary objective: To compare sensitivity (S) and negative predictive value (NPV) of BAL, endotracheal aspirate (ETA) and sputum samples.
**Methods:** Retrospective study of a prospective database of 498 lower respiratory samples from critically ill patients with suspected respiratory infection. The BIOFIRE®FILMARRAY® Pneumonia Panel Plus (FA-PP) and conventional culture techniques (CT) (gold standard), were performed on respiratory samples. Six paired analyses (3 sensitivity and 3 NPV), with Bonferroni's correction for multiple comparisons were performed.
**Results:** No statistically significant differences were detected for S ($p = 0.2$) and NPV ($p = 0.73$) between BAL and ETA samples (Table). ETA samples showed significantly higher S ($p < 0.001$) and NPV ($p = 0.002$) than sputum (Table). The S of BAL samples was significantly higher in BAL fluid than in sputum samples, ($p < 0.001$), but showed comparable NPV ($p = 0.01$) after applying Bonferroni's correction.

| | Total (nº) | S (%) | NPV (%) |
|---|---|---|---|
| BAL | 66 | 100 | 100 |
| ETA | 369 | 96,1 | 98,6 |
| Sputum | 14 | 66,7 | 83,3 |

*Concordance table between FA-PP and CT, according to type of sample

**Conclusions:** These results suggest that ETA, being less invasive, provides comparable results to BAL, making it a reasonable choice for molecular testing, particularly in situations where the invasive nature of bronchoalveolar lavage may pose challenges for critically ill patients.

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**Topic:** Infections and prevention

## 000120

### Enteral nutrition can be advanced by feeding a small quantity of water as a precursor in the initial phase after severe burns

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**Introduction:** The International Burn Society (ISBI) recommends early initiation of enteral nutrition in severely burned patients (1). However, it is worth noting that aggressive nutritional support carries potential risks. For example, critically burn patients may suffer from acute colonic pseudo-obstruction (ACPO) due to intestinal peristalsis. In addition, gastrointestinal mucosal edema caused by severe burns may lead to malabsorption of nutrients. The consensus of clinical experts is that gastrointestinal and metabolic problems can result from excessive or inappropriate nutritional support.
**Objectives:** To explore the main factors influencing physicians' decision to initiate adaptive feeding in the early phase of burn management, to promote the early implementation of enteral nutrition that is beneficial for critically ill patients.
**Methods:** A retrospective study analyzed medical data of adult extensive burn patients between January 2009 and December 2020. Patients enrolled in the present study were admitted to the burn department within 24 h after the accident and with a burned area of more than 30% TBSA. Data were divided into two groups: the adaptive feeding group and the fasting group. The total burned area, a full-thickness burned area, burn type, inhalation injury, the start time of adaptive feeding, and the start time of enteral nutrition are the main observation. Outcome measures were 28-day mortality and hospital mortality.

**Results:** In the univariate analysis, there were significant differences in the burn type, TBSA, full-thickness burned area, and inhalation injury for the start time of adaptive feeding (all $P < 0.05$). For linear regression, the results of this analysis revealed that full-thickness burned area and inhalation injury were the main influencing factors for the start time of adaptive feeding in severely burned patients ($P < 0.05$). There was no significant difference in overall mortality, 28-day mortality, length of hospital stay, and the occurrence of gastrointestinal nutrition intolerance between the two groups; however, the start time of enteral nutrition was significantly earlier in the adaptive feeding group ($P < 0.01$). The results of propensity score matching (PSM) showed that although the survival rate was not significantly improved by adaptive feeding, the start time of enteral nutrition in the group of patients receiving adaptive feeding within 24 h of burn injury was significantly earlier than that of the fasting group.
**Conclusions:** This study found that the main influencing factors for physicians to decide between complete fasting or adaptive feeding are the burn area, the size of the full-thickness burned area, and inhalation injury. This study found that early initiation of adaptive feeding as an intervention measure is beneficial for early initiation of enteral nutrition. Because infection and wound coverage are the two major unresolved problems affecting the prognosis of patients with severe burns, the mortality rate of severe patients has not decreased significantly for decades. This explains that initial nutritional therapy with adaptive feeding does not reduce mortality. In conclusion, adaptive feeding in severely burned patients improves nutritional therapy in severely burned patients by shortening the time from injury to initiation of enteral nutrition.

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1. 1. This work was supported in part financially by the Nursing Research Project of Shanghai Jiao Tong University School of Medicine (Jyhz2126) and Nursing Leader Training Project of Shanghai Jiao Tong University School of Medicine.

**Topic:** Nursing care and physiotherapy

## 000121

## Non-tubercular *mycobacterium* causing "*Pseudo*-outbreak" in onco-critical care setting—a vertical audit

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**Introduction:** In haemato-oncological setting, different atypical bacteria & fungus can cause infection due to varied level of immunosuppression caused by cancer & its therapies. Identifying atypical bugs from non-sterile clinical samples may complicate clinical decision making, specially in critically ill patients with organ failure. Non–tuberculous mycobacteria are mostly coloniser & does not require treatment except in rare case scenario. Besides, their treatment protocol involves multiple drugs over long period of time. There are different case series & case reports mentioning 'outbreak' & 'pseudo-outbreak' caused by non-tubercular mycobacteria due to breach in infection control protocols. We identified 9 cases of non- tuberculous mycobacteria from 48 bronchoscopy samples over a span of 3 months.
**Objectives:** Aim of this vertical audit was to identify gaps in infection control protocols while handling fiberoptic bronchoscope in Intensive Care Unit (ICU).
**Methods:** A structure & process audit was planned in ICU in view of a 'microbiological outbreak', starting from bronchoscope log (date of utilisation with patient details), technician involved in the cleaning, cleaning steps (physical cleaning of the scope with RO water, preparation of the disinfectant solution & its usage, review of quality of the disinfectants with dipstick and regular audit of the steps), quality of the water used and training of the technicians and housekeeping staff involved in the cleaning along with review of the current bronchoscope cleaning protocol.
**Results:** All the bronchoscopy related documents during the stipulated time period were reviewed. 48 bronchoscopy specimens were sent for microbiological tests and 9 samples grew non-tuberculous mycobacteria—Mycobacterium simiae (6 cases) and Mycobacterium lentiflavum (3 cases). The disinfectant preparation was suboptimal as the date of preparation and disposal were not documented properly. The rinse water was found to be contaminated with Pseudomonas sp.; but none of the aforementioned patients developed Pseudomonas infection. Discrepancy between disinfectant solution & its quality checking system (dipstick) was observed as both were of different companies/brands with doubtful compatibility. Appropriate size bronchoscope brush for cleaning of the working channels was not available. Based on audit report, flexible bronchoscope disinfection protocol was modified and implemented in critical care unit (Table 1). Adequate hands-on training was done for ICU technicians. Follow up audit for 3 months did not show any positive report. None of the patient had received treatment for atypical mycobacterial infection.
**Conclusions:** Contamination through the semi-invasive airway equipments can be challenging with significant potential clinical impact. Strict vigilance is needed in terms of implementation of disinfection protocols. Proper outbreak evaluation is needed to identify the breach in protocol followed by training.

**Table 1 (abstract 000121)** Cleaning protocol for disposable fiberoptic bronchoscope

| Sl No | Components | Steps |
|---|---|---|
| 1 | Physical cleaning of bronchoscope after procedure | Remove of all the visible contamination and blood clots and emerge in clean (RO) water; flush thoroughly all the lumens of the scope |
| 2 | Enzymatic cleaning solution & brush | Flush all the lumen with "jet flush" with enzymatic cleaning solution to remove all kinds of organic materials. It is followed by thorough cleaning of all the lumen with reusable brush<br>Wipe and make it dry |
| 3 | Glutaraldehyde solution<br>Alternate option - 0.23% peroxyacetic (peracetic) acid | Bronchoscope to be immersed in 2.45% glutaraldehyde solution for 30 minutes<br>Supervised preparation of glutaraldehyde solution with regular quality check of the solution (e.g., Cidex test) at regular time interval – maximum life span of the solution 14 days (date & time of preparation to be marked)<br>Through cleaning with RO water – outside and of all lumens |
| 4 | ETO sterilisation | Send for ETO sterilisation<br>Keep in dedicated bronchoscope cupboard |
| 5 | Documentation | Maintain detail registry of the patients and with no of usage of the scope |
| 6 | Policy | Written policy should be present regarding Cleaning and usage of disposable fiberoptic bronchoscope (with document control)<br>Regular training and teaching of stakeholders<br>Regular audit of protocol compliance |

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**Topic:** Infections and prevention

## 000123

### Tracheostomy allowing weaning from mechanical ventilation: a retrospective analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000123

**Introduction:** Tracheostomy is performed in approximately 10%-15% of patients who are admitted to Intensive Care Units (ICU). Both surgical and percutaneous techniques are widely used, with a trend toward fewer complications and costs in percutaneous techniques. There are emergent and elective indications for tracheostomy, including facilitation of weaning from mechanical ventilation (MV), improving patient safety and comfort, and reducing overall costs of care. Despite several studies on the benefits of early versus late tracheostomy, the optimal timing is not well established, with some authors indicating that tracheostomy should be performed after 21 of intubation.
**Objectives:** All the tracheostomies in our Centre were performed using a surgical technique, after a referral to Ears Nose and Throat (ENT) Surgery, with the need to schedule an operating theatre. Our primary endpoint was to evaluate the number of days needed for weaning from MV after tracheostomy. The secondary endpoints included the evaluation of the timing the tracheostomy was performed, days for ICU discharge after the procedure and mortality.
**Methods:** We conducted a retrospective analysis of adult patients who underwent elective tracheostomy for facilitation of wean from MV during their admission to our ICU between January 2012 and December 2022. Data were collected from the local database and were analyzed using IBM SPSS software.
**Results:** Among 2736 patients admitted to ICU, 46 surgical tracheostomies were performed (2%). The average age was 68 years old, 54% of the patients were males and 46% were females. The average SAPS II was 58.2 (SD 16) with a predicted mortality of 64%. The referral for ENT Surgery was made on average after 18 days of intubation (SD 11.7) with tracheostomy performed after 22 days of intubation (SD 13.7). On average, patients were free of MV after 2.39 days of the tracheostomy (SD 2) and discharged from the ICU after 5 days of the procedure (SD 2.9). There was a strong correlation between the number of days of intubation before tracheostomy and the total days of MV (Pearson's $R$ 0.98, $p$-value < 0.01, CI 99%) and between the number of days of intubation before tracheostomy and the total ICU stay (Pearson's $R$ 0.93, $p$-value < 0.01, CI 99%). The number of days of intubation doesn't seem to be correlated with the number of days needed for MV weaning after tracheostomy (Pearson's $R$ 0.1) and with the number of days needed for ICU discharge after tracheostomy (Pearson's $R$ 0.2). The observed mortality at day 30 was 33%. 63% of the patients were fit for Hospital discharge. Early tracheostomy (before day 21) wasn't associated with increased mortality.
**Conclusions:** We observed that tracheostomy led to a fast liberation of MV, allowing ICU discharge with a high Hospital discharge rate, independently of the previous number of days of intubation, without an increase in mortality. The data showed a delay between the referral to ENT Surgery and the procedure, with an increase in the number of MV days, ICU stay, and risks and costs associated with prolonged MV. According to the data obtained, we performed a change in our local tracheostomy protocol, starting to perform a percutaneous technique.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000126

### Appropriateness of respiratory physiotherapy positioning for acute lobar collapse

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**Introduction:** The primary role of a physiotherapist in mechanically ventilated patients with acute lobar atelectasis (ALA) is to optimize lung recruitment. This is achieved through the delivery of a range of treatment modalities, aimed at recruiting collapsed lung regions [1–3]. Positioning is an important part of a physiotherapist's respiratory treatment repertoire, as it works to increase lung volumes, improve V/Q matching and promote secretion clearance to achieve lung re-recruitment. Typically, the affected or more affected lung is positioned uppermost to achieve re-recruitment [4–7]. Physiotherapists rely on traditional assessment tools like lung auscultation and interpretation of chest radiographs to inform treatment selection. These tools lack diagnostic accuracy [8–11]. which could limit the ability of a physiotherapist to select appropriate treatments, including selecting the correct position to target lung regions affected by ALA. Lung ultrasound

(LUS) is an emerging technology for use by physiotherapists in the intensive care setting. It has high diagnostic accuracy 8–11 and can be used as a monitoring tool to detect lung aeration change [11]. The addition of LUS to physiotherapy respiratory clinical assessment could more accurately locate treatable ALA and aid in the selection of more appropriate respiratory physiotherapy positioning treatments for patients in the ICU setting [12,13].
**Objectives:** (1) To determine the number of clinical physiotherapist treatment positions found to be in agreement with LUS identified aeration loss; (2) To determine the diagnostic accuracy of CXR and lung auscultation against lung ultrasound as the reference standard, for the identification of location of aeration loss in mechanically ventilated patients with ALA.
**Methods:** This prospective cohort study was conducted in a tertiary teaching hospital in Sydney. Mechanically ventilated adult patients in intensive care (ICU) with ALA were included. Clinical physiotherapists selected standard care respiratory treatment positions based on clinical assessment, which included lung auscultation, interpretation of chest radiograph and physiological measures. Treatment positions selected were recorded. LUS was performed before and following treatment delivery using a standardized scanning protocol, with the location of lobar pathology detected on LUS also recorded. The clinical physiotherapist was blinded to LUS Results: Positioning as selected by the clinical physiotherapist was compared against the location of pathology from LUS Results: Respiratory physiotherapy treatment position selection was considered appropriate if the position chosen by the clinical physiotherapist targeted the affected lung with pathology as identified on LUS.
**Results:** 43 participants were included in this study. A majority of patients had bilateral lung aeration loss (88.4%). Only 3 of the 38 patients with bilateral lung pathology were treated in the appropriate alternate side-lying position. None of the 3 patients with a unilateral right lung pathology were positioned appropriately. One of the two patients with unilateral left lung pathology was positioned appropriately. Overall, 4 out of 43 patients (9.3%) were positioned appropriately when clinical physiotherapist position selection was compared against LUS Results: The rate of true positives for CXR and auscultation were highest in the lower lobes. Lung auscultation had higher sensitivities, positive predictive values and likelihood ratios (16.7–97.4%, 7.1–90.5%, 0.47–1.44) than CXR (0–59.5%, 0–95.7%, 0–2.59) in a majority of lobes when detecting lobe location of aeration loss when compared against LUS. CXR had higher specificities and negative predictive values (16.7–100%, 6.3–88.4%) than lung auscultation (0–64.9%, 0–88.9%) in a majority of lobes when detecting lobe location of aeration loss when compared against LUS.
**Conclusions:** Physiotherapists did not deliver appropriate positioning in mechanically ventilated patients with ALA in a majority of cases. The diagnostic accuracy of lung auscultation and CXR in detection of the location of aeration loss associated with ALA is low when compared with LUS. Correctly locating lung aeration loss is essential in ensuring appropriate respiratory physiotherapy positioning treatment selection. Given the low discriminatory ability of lung auscultation and CXR in locating aeration loss, physiotherapists should be considering additional assessment tools like LUS to increase their diagnostic ability.

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**Topic:** Nursing care and physiotherapy

## 000129

### Predictive validity of the simplified Radiographic Assessment of Lung Edema score for the mortality in critically ill COVID-19 patients with the B.1.617.2 (Delta) variant in Vietnam: a retrospective observational study


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**Introduction:** Evaluating the prognosis of COVID-19 patients who may be at risk of mortality using the simple chest X-ray (CXR) severity scoring systems provides valuable insights for treatment decisions.
**Objectives:** This study aimed to assess how well the simplified Radiographic Assessment of Lung Edema (RALE) score could predict the death of critically ill COVID-19 patients in Vietnam.
**Methods:** We performed a retrospective observational study of critically ill COVID-19 adult patients presenting at an intensive care centre in Vietnam from July 30 to October 15, 2021. We calculated the areas under the receiver operator characteristic (ROC) curve (AUROC) to determine how well the simplified RALE score could predict hospital mortality. In a frontal CXR, the simplified RALE score assigns a score to each lung, ranging from 0 to 4. The overall severity score is the sum of points from both lungs, with a maximum possible score of 8. We also utilized ROC curve analysis to find the best cut-off value for this score. Finally, we utilized logistic regression to identify the association of simplified RALE score with hospital mortality.
**Results:** Of 105 patients, 40.0% were men, the median age was 61.0 years (Q1–Q3: 52.0–71.0), and 79.0% of patients died in the hospital. Most patients exhibited bilateral lung opacities on their admission CXRs (99.0%; 100/102), with the highest occurrence of opacity distribution spanning three (18.3%; 19/104) to four quadrants of the lungs (74.0%; 77/104) and a high median simplified RALE score of 8.0 (Q1–Q3: 6.0–8.0). The simplified RALE score (AUROC: 0.747 [95% CI: 0.617–0.877]; cut-off value $\geq$ 5.5; sensitivity: 93.9%; specificity: 45.5%;

PAUROC < 0.001) demonstrated a good discriminatory ability in predicting hospital mortality. After adjusting for confounding factors such as age, gender, Charlson Comorbidity Index, serum interleukin-6 level upon admission, and admission severity scoring systems, the simplified RALE score of ≥ 5.5 (adjusted OR: 18.437; 95% CI: 3.215–105.741; $p = 0.001$) was independently associated with an increased risk of hospital mortality.
**Conclusions:** This study focused on a highly selected cohort of critically ill COVID-19 patients with a high simplified RALE score and a high mortality rate. Beyond its good discriminatory ability in predicting hospital mortality, the simplified RALE score also emerged as an independent predictor of hospital mortality. For pinpointing those most at risk of progressing and dying among critically ill COVID-19 patients, the simplified RALE score can be utilized effectively.

**Reference(s)**
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**Topic:** Imaging in intensive care

## 000134

### Effectiveness of carbon dioxide per-conditioning before recanalization in hyperacute ischemic stroke rat model

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000134

**Introduction:** Recent research has increasingly focused on the clinical use and neuroprotective effects of mild hypercapnia; however, its efficacy in ischemic stroke remains unclear.
**Objectives:** We aimed to investigate whether carbon dioxide ($CO_2$) per-conditioning reduced oxidative stress, blood–brain barrier breakdown, and neurologic deficit in a rat model of middle cerebral artery occlusion (MCAO).
**Methods:** Rat models received intermittent inhalation of mixed gas (20% CO2, 20% O2, 60% N2) or room air during the MCAO period. After the surgery, arterial blood gas analysis and behavior test were conducted, and animals were euthanized for calculating infarct size, western blot analysis, and immunohistochemistry.
**Results:** Our results showed that CO2 per-conditioning reduced infarct size and neurological deficit. The number of 8-hydroxy-2-deoxyguanosine (8-OHdG) positive cell and matrix metalloproteinase 9 (MMP-9)/platelet derived growth factor receptor beta (PDGFR double positive cell expressions were significantly decreased after CO2 per-conditioning. The expression of tight junction protein and PDGFR were significantly elevated after CO2 per-conditioning.
**Conclusions:** This study underscores that $CO_2$ per-conditioning not only protects the ischemic penumbra from ischemia–reperfusion injury, thereby diminishing neurologic deficits, but also maintains the integrity of the blood–brain barrier and neurovascular unit, alongside mitigating oxidative stress in a hyperacute stroke rat model. $CO_2$ per-conditioning in the acute ischemic stroke appears to hold significant potential and warrants additional investigation for its clinical application.

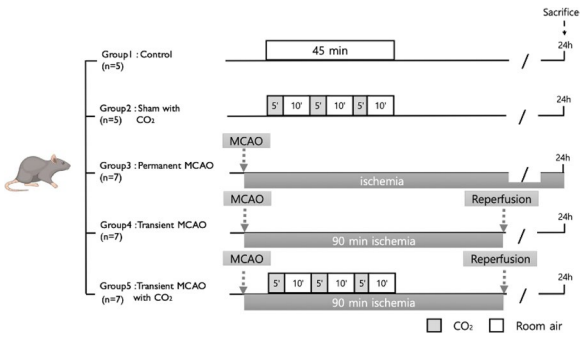


**Fig. 1 (abstract 000134)**

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**Topic:** Translational biology

## 000137

### Short-term gains and long-term outcomes of immediate operating room extubation in living-donor liver transplantation: a retrospective cohort study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000137

**Introduction:** Living donor liver transplantation (LDLT) has become a viable alternative to deceased-donor transplantation (DDLT). Enhanced recovery after surgery (ERAS) protocols that include early extubation contribute to the short-term benefits, but the impact of immediate extubation in the operating room (OR) on long-term outcomes in LDLT patients remains unexplored.
**Objectives:** This study aimed to investigate whether immediate extubation in the OR is associated with long-term overall survival (OS) in patients undergoing LDLT.
**Methods:** This retrospective cohort study included 205 LDLT patients. Patients were categorized based on extubation location: operating room (OREX) or intensive care unit (NOREX). Primary outcomes focused on overall survival (OS), with secondary outcomes encompassing length of ICU and hospital stays, and various postoperative outcomes.

**Results:** Among 277 patients, 72 were excluded, and finally 205 were included in the present study (Fig. 1). 98 (47.8%) patients were extubated in the OR after LDLT. Logistic regression analysis revealed that extubation in the OR significantly reduced the incidence of 30-day composite complications (OR: 0.32, 95% CI: 0.17–0.61, $P<0.001$) Also, postoperative hospital stay, ICU stay, and duration of mechanical ventilation in the ICU were significantly shorter in the OREX group. Extubation in the OR was not an independent factor associated with OS on univariate analysis (HR: 0.50, 95% CI: 0.24–1.05, $P=0.066$). In the multivariate analyses, preoperative platelet (HR: 1.01, 95% CI: 1.00–1.01, $P=0.012$), preoperative creatinine (HR: 2.15, 95% CI: 1.12–4.13, $P=0.021$), and duration of surgery (HR: 1.20, 95% CI: 1.010–1.43, $P=0.037$) were associated with worse OS (Fig. 2). The Kaplan–Meier curve showed that the 5-year OS rates were higher in patients of OREX group than those of NOREX group [OREX: 91.3% (95% CI: 85.7–97.3), NOREX: 81.0% (95% CI: 73.6–89.1)] (Fig. 3).

**Conclusions:** In LDLT surgery, immediate extubation in the OR reduced 30-day composite complications, and shortened ICU and hospital stays, although this beneficial effect did not improve overall survival compared with extubation in the ICU.

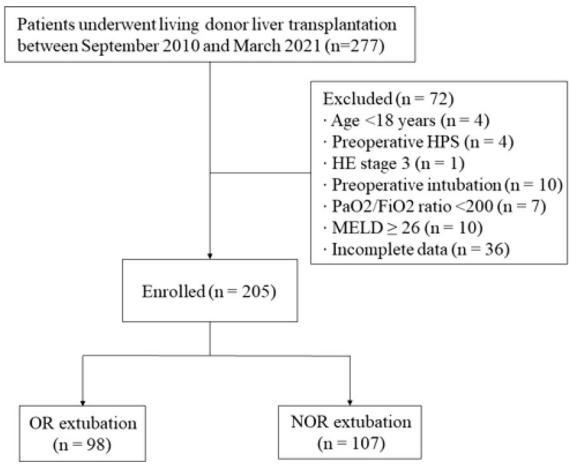


**Fig. 1 (abstract 000137)** Flow chart for the study

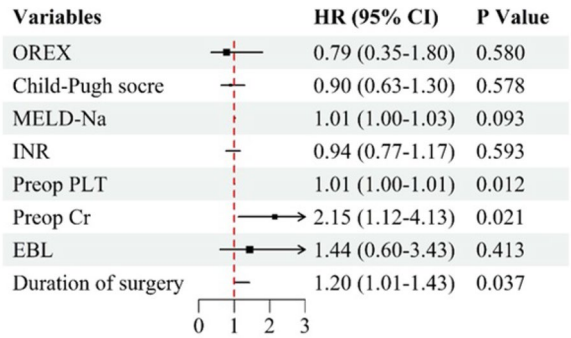


**Fig. 2 (abstract 000137)** Forest plot of perioperative prognostic factors for overall survival in patients undergoing living donor liver transplantation

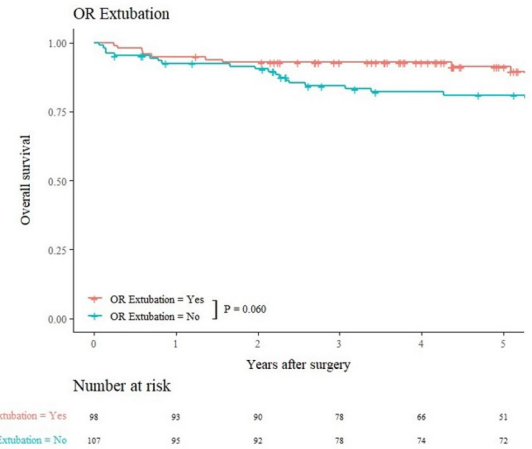


**Fig. 3 (abstract 000137)** Kaplan–Meier analysis of 5-yr overall survival in patients who were extubated in the operating room or not during living donor liver transplantation

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**Topic:** Perioperative care

## 000138

## Comparison of core temperature using tracheal thermometer and pulmonary artery catheter in adult patients undergoing coronary artery bypass graft surgery

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000138

**Introduction:** Core temperature is an important parameter for patients under anesthesia. The monitoring of esophageal and pulmonary artery blood temperature can be used for core temperature measurement in general anesthesia. However, these methods are challenging during cardiac surgeries involving transesophageal echocardiography (TEE) and cardiopulmonary bypass (CPB). An endotracheal

tube with a thermometer on the cuff allows for the measurement of tracheal temperature, which can be a suitable alternative to core temperature measurement.

**Objectives:** The aim of this study is to assess the clinical reliability and accuracy of the thermometer in the endotracheal tube in comparison to the core temperature measured using a pulmonary artery catheter.

**Methods:** Eleven patients who underwent coronary artery bypass graft (CABG) surgery were enrolled. The patients were intubated using an endotracheal tube equipped with a thermometer on the cuff, and a pulmonary artery catheter was also inserted. Temperature measurements of both the trachea and pulmonary artery blood were recorded at five-minute intervals for one hour before starting the cardiopulmonary bypass. The agreement between the two temperature measurement methods was investigated using the Bland–Altman method, and the correlation was evaluated using the concordance correlation coefficient (CCC).

**Results:** A total of 11 patients, with a total of 143 pairs of data included for analysis. The agreement between the tracheal and pulmonary artery temperature measurements using the ETT thermometer and PAC, was found to be significant. The mean difference between the tracheal and pulmonary artery temperatures was − 0.10 ℃. The 95% limit of agreement (LoA) calculated as ± 1.96 standard deviations (SD) ranged from − 0.34 ℃ to 0.14 ℃. The 95% confidence interval (CI) for the lower and upper LoA was − 0.38 ℃ to − 0.31 ℃ and 0.11 ℃ to 0.18 ℃, respectively (Table 1). These values indicate the range within which most temperature differences between the two methods fell. Additionally, the maximum allowed difference (Δ) was set at 0.5 ℃. Since the majority of temperature differences fell within the LoA and were well below the maximum allowed difference, it suggests a good agreement between the two measurement methods (Fig. 2). Furthermore, the concordance correlation coefficient (CCC) was 0.95, it means a substantial strength of agreement (Fig. 3).

**Table 1 (abstract 000138)** The differences between tracheal and pulmonary artery temperatures

| | **TT vs. TP** |
|---|---|
| Mean differences, ℃ (95% confidence interval) | − 0.10 (− 0.12 to − 0.08) |
| Lower limit of agreement, ℃ (95% confidence interval) | − 0.34 (− 0.38 to − 0.31) |
| Upper limit of agreement, ℃ (95% confidence interval) | 0.14 (0.11 to 0.18) |
| Concordance correlation coefficient (CCC) | 0.95 |

**Conclusions:** The agreement between the tracheal and pulmonary artery temperature measurements using the endotracheal tube thermometer and pulmonary artery catheter was found to be clinically reliable and accurate. This indicates that the tracheal temperature measurement can effectively represent the core temperature of the patients. The use of an endotracheal tube equipped with a thermometer on the cuff can be a good alternative and standalone method for measuring core temperature.

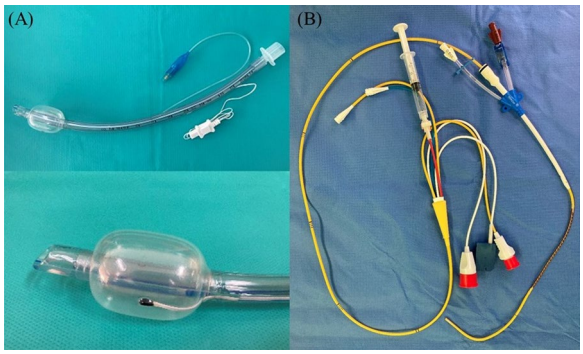


**Fig. 1 (abstract 000138)** (A) Endotracheal tube equipped with a thermometer on the cuff. (B) Pulmonary artery catheter with a 9 French central catheter

**Fig. 2 (abstract 000138)** Bland–Altman plot. The maximum allowed difference (Δ) was set at 0.5 ?. Since the majority of temperature differences fell within the LoA and were well below the maximum allowed difference, it suggests a good agreement between the two measurement Methods: *TT*, tracheal temperature; *TP*, pulmonary artery temperature; SD, standard deviation

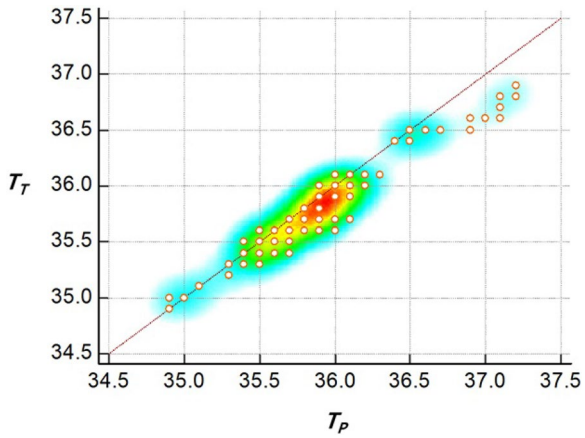


**Fig. 3 (abstract 000138)** Scatter diagram for concordance correlation coefficient. The concordance correlation coefficient (CCC) was 0.95, it means a substantial strength of agreement. *TT*, tracheal temperature; *TP*, pulmonary artery temperature; Red colors, high incidence levels; Blue colors, low incidence levels

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**Topic:** Perioperative care

## 000139

### Effect of propofol on the osteogenic differentiation of human dental pulp stem cells under inflammatory conditions


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000139


**Introduction:** Human dental pulp stem cells (hDPSCs) has recently been in the spotlight as an attractive tool for bone tissue regeneration. While bone marrow-derived MSC collection was invasive, hDPSC collection has the advantage of being easy and minimally invasive because it can be collected from discarded premolars or third molars. Propofol is an intravenous anesthetic commonly used in dental sedation and it has anti-inflammatory property. However, there have been no studies on propofol in pulp inflammation.
**Objectives:** The purpose of this study was to investigate the effect of propofol on the osteogenic differentiation of hDPSCs induced by lipopolysaccharide (LPS) and tumor necrosis factor-alpha (TNF-α) in vitro.
**Methods:** The concentration of propofol (10, 50, and 100 μM) was treated at cultured cells. For osteogenic differentiation, hDPSCs were cultured with osteogenic differentiation medium (ODM, 10 mM β-glycerophosphate, 0.1 mM ascorbic acid, and dexamethasone 100 nM) for 4, 7, 14, and 21 days. The cytotoxicity and proliferation of propofol on hDPSCs were measured using the MTT assay. Alkaline phosphatase (ALP) staining, Alizarin Red S (ARS) staining, RT-PCR, and Western blot were performed to investigate the effects of propofol on the osteogenic differentiation and mitogen-activated protein kinases (MAPK) pathway of hDPSCs inflamed with LPS and TNF-α. Data were obtained from at least three independent experiments performed in triplicate. To analyze statistical significance, student's t-test was used and $P < 0.05$ was considered significant.
**Results:** LPS and TNF-α significantly decreased the mRNA expressions of ALP, Runx2, OPN, BMP2, and DMP1 compared to ODM group at 7 and 14 days. And these downregulation of mRNA expressions were inhibited significantly by propofol (100 uM) at 7 and 14 days. The protein expression levels of ALP, Runx2, OPN, BMP2, and DMP1 were significantly decreased by LPS and TNF-α compared to the levels in the ODM group at 14 days. 100 uM propofol significantly increased the protein expression of osteogenic-related genes compared to LPS and TNF-α group in hDPSCs at 14 days. LPS and TNF-α treatment significantly decreased the ALP staining compared to ODM group at 4 and 7 days and all concentrations of propofol (10, 50, and 100 uM) significantly increased ALP staining compared to LPS and TNF-α group at 4 and 7 days. 100 uM propofol on LPS and TNF-α-treated hDPSCs significantly decreased the relative protein level of p-ERK/ERK and p-JNK/JNK compared to LPS and TNF-α group. Whereas relative protein level of p-p38/p38 was significantly increased by LPS and TNF-α compared to ODM group and this increase was strengthened by propofol (Fig. 1).
**Conclusions:** Propofol promotes osteogenic differentiation in inflammation induced hDPSCs through enhanced p38 MAPK activation, It suggests that propofol can enhance bone regeneration.

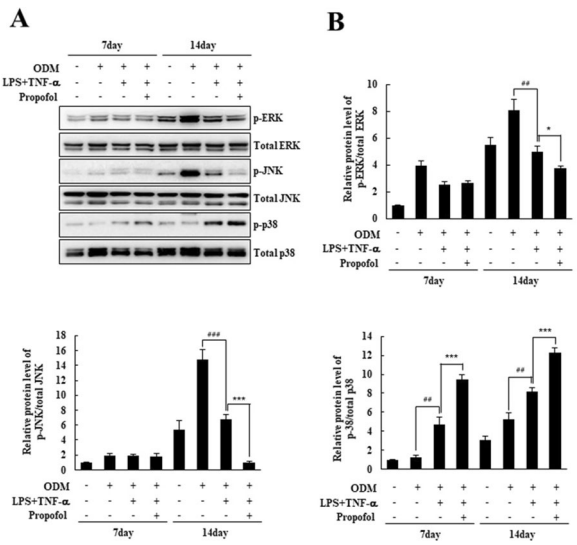


**Fig. 1 (abstract 000139)** 100 uM propofol on LPS and TNF-α-treated hDPSCs significantly decreased the relative protein level of p-ERK/ERK and p-JNK/JNK compared to LPS and TNF-α group. Whereas relative protein level of p-p38/p38 was significantly increased by LPS and TNF-α compared to ODM group and this increase was strengthened by propofol

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**Topic:** Poisoning/Toxicology/Pharmacology

## 000140

### Diagnostic ussefulness of the multiplex PCR panel in critical patients with bacteremia

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000140

**Introduction:** Early appropriate antimicrobial treatment impacts the prognosis of patients with primary or secondary bacteremia. There is ample experience in the use of rapid diagnostic tests like the multiplex PCR in respiratory infections, which shows good concordance with conventional culture. The use of these rapid techniques in bloodstream infection might improve the treatment.
**Objectives:** Primary objective: To analyze the concordance in blood cultures between the BioFire® BCIR2 Panel and conventional blood culture (CBC).
Secondary objectives: To determine the prevalence of pathogens isolated in CBC not detected by the BCIR2 panel and recording the difference in the timing of both results.
**Methods:** Retrospective study of a prospective database of blood samples from patients admitted to intensive care unit with suspected bacteremia. Upon automated detection of growth in blood cultures, multiplex PCR and CBC (gold standard) were simultaneously performed. Sensitivity (Sen), specificity (Spe), positive (PPV) and negative predictive values (NPV) of rapid techniques were calculated. Pathogens isolated in culture not detected by BCIR2 are described, and the difference in the timing of the final results of both test are analyzed.
**Results:** A total of 28 blood cultures were investigated. The median age was 67 (1st IQR 57–3rd IQR 73), 57.1% males, and secondary bacteriemias in 71.4%. We obtained 100% S, E, NPV, and PPV for the rapid test in all cases. However, in three instances, the culture provided additional information. In two cases, microorganisms not included in the panel, grew in CBC: *Fusobacterium necrophorum* and *Clostridium jeddahitimonense*, and in one case, the microorganism detected by BCIR2 had ampC, a resistance mechanism not included in the panel. The median time to obtain definitive results from CBC was 5 days (1.3), while BCIR2 requires 1 h to analyze the sample.
**Conclusions:** This study reveals excellent concordance between the BioFire® BCIR2 Panel and CBC in blood cultures of critically ill patients with bloodstream infection, yielding accurate results in 1 h. Although the rapid test showed 100% sen and spe, there were cases where the culture provided additional information about microorganisms or resistance mechanisms not included in the panel. This underscores the importance of considering results comprehensively and the complementarity usefulness between diagnostic techniques.

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**Topic:** Infections and prevention

## 000142

### Clinical and therapeutic implications after implementing a multiplex PCR diagnostic panel in blood cultures

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000142

**Introduction:** Early microbiological diagnosis improves outcomes in bacteremia for timely and effective treatment, particularly in critically ill patients. Multiple PCR panel allows early targeted antibiotics prescription. Timely diagnostics also promote antimicrobial stewardship by preventing unnecessary broad-spectrum treatments.
**Objectives:** Primary Objective: To describe prescription behavior in response to the results of the BioFire® BCIR2 Panel in blood cultures.
Secondary Objective: To determine the incidence of multi-drug resistant bacteria in blood cultures.
**Methods:** Retrospective study of a prospective database of blood samples from patients admitted to intensive care with suspected bacteremia. Upon automated detection of growth in blood cultures, a multiplex PCR (BCIR2) was applied. Rapid test results were provided to attending intensivists and modifications of antibiotic therapy were documented. These were categorized as "escalation", "de-escalation", or "no modification" for cases already on antibiotic therapy, and "initiation" versus "no initiation" for those not on antibiotics before the rapid test was performed.
**Results:** 28 blood cultures were available for analysis. In the 23 cases receiving antibiotic therapy, 6 (26.1%) were de-escalated, 8 (34.8%) were escalated, and in 9 (39.1%) no modification was performed. In 5 cases not receiving antibiotics, directed therapy was started in 4 (80%) and not prescribed in one instance (labelled as catheter infection rather than bacteremia).
In total, antibiotic therapy was modified in 64.3% of the cases. Antibiotic therapy was changed as a result of the information provided by the rapid test in 71.4% of cases, in 21.4% of cases to cover for other concomitant infections, and in 7.1% to cover for microorganisms or resistance genes not included in the panel. Risk factors for multidrug resistant bacteria (MRB) were present in 71.4% of the sampled patients, but only in 21.4% MRB were documented by BCIR2. The resistance mechanism was VIM-type carbapenemase in all cases.
**Conclusions:** The implementation of a multiplex PCR in blood cultures provides information supporting timely targeted therapy in critically ill patients with bacteremia and avoids inappropriate treatment. It is essential to remember that not all potential pathogens or resistance mechanisms causing bacteremia are included by the panel.

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**Topic:** Infections and prevention

## 000143

### Early Urinary Output as a Prognostic Marker in Cardiogenic Shock: Highlighting the Importance of the Golden Hours

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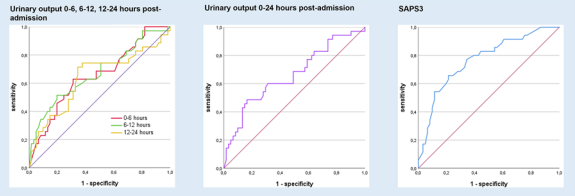
***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000143

**Introduction:** Mortality remains high in Cardiogenic shock (CS). Besides early revascularization, other interventional strategies have not demonstrated convincing survival benefits and a relevant number of cases is not caused by acute myocardial infarction (AMI). Identifying patients who can benefit from certain therapies remains challenging and therapeutic decisions must be based on reliable prognostic markers that are readily available early on. Many of the mortality-related predictive parameters or their combinations only partially meet these requirements. In contrast to quantifying acidotic conditions due to hypoperfusion, fluid balance has been analyzed sparsely.
**Objectives:** Prognostic value of routinely taken urinary output (UO) within the first 24 h post-admission for in-hospital mortality in CS regardless of etiology.
**Methods:** Retrospective registry data were analyzed, containing data from admissions between 01/2017 and 12/2019 of two tertiary care Intensive Care Units (ICU). Among 847 patients, 96 met the criteria for CS and had UO documented completely within the first 24 h. Exclusion criteria included age under 18, pregnancy, and attempted suicide. Mean UO (ml per hour) for time periods 0–6, 6–12, and 12–24 h after admission were analyzed using univariate logistic regression models, Areas Under the Receiver Operating Characteristics Curve (AUROC) calculated and compared using the DeLong test.
**Results:** 71.9% of patients were male. Median age was 68 years in the deceased group and 63 years in the survivors. In-hospital mortality was 36.5%. CS was AMI-related in 45.8%. Median Simplified Acute Physiology Score 3 (SAPS3) was 81 points in the deceased group and 66 points among survivors. 35.4% underwent extracorporeal membrane oxygenation therapy during their stay. UO at 0–6 h, 6–12 h, and 12–24 h post-admission and the SAPS3 score were significant predictors of mortality in univariate logistic regression. AUROCs for UO parameters were similar across the first 24 h, as was the mean UO of 0–24 h, and lower compared to SAPS3. In exploratory multivariate models with SAPS3 and each UO parameter alone, only the average UO 6–12 h post-admission remained significant.
**Conclusions:** UO demonstrates notable potential for predicting in-hospital mortality in CS patients, particularly in the critical initial 6 to 12 h following admission. This finding underscores the importance of early hours after the onset of shock for determining and potentially improving patient outcomes. Although the SAPS3 score provides a more thorough evaluation, its application in acute settings is challenged by its complexity and the interpretational variability associated with some of its components. Accordingly, our study suggests that reevaluating straightforward, early and readily available predictors like UO is warranted.




AUROCs regarding in-hospital mortality for tested urinary outputs (ml/hour), total urinary output over 24 h post-admission (ml/hour) and SAPS3, reference line for area under the curve (AUC) 0.5; exact AUCs with 95% confidence intervals (CI) stated below:

— UO 0-6h AUC 0.65 (95% CI 0.54–0.77);
— UO 6-12h AUC 0.67 (95% CI 0.56–0.79);
— UO 12-24h AUC 0.64 (95% CI 0.52–0.76);
— UO 0-24h AUC 0.66 (95% CI 0.54–0.78);
— - SAPS3 AUC 0.77 (95% CI 0.67–0.87)

**Topic:** Cardiovascular issues in ICU

## 000147

### Investigation of the Effect of Adsorbent and Sepsis Filtered CRRT on Mortality and Renal Recovery in Patients with Acute Renal Failure due to Septic Shock in the Intensive Care Unit

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000147

**Introduction:** Sepsis and septic shock is a leading cause of mortality in the intensive care unit. Promising new therapies continue to be investigated for the management of septic shock. Specific adsorption therapies use membranes with the ability to retain and/or elim#inate molecules directly involved in the pathogenesis of sepsis. They are membranes aimed at removing endotoxin, molecular patterns, and cytokines, or both. Membranes that mainly eliminating the endotoxin, cytokinesor the bacteria themselves.We tried to evaluate a novel Adsorban through a retrospective evaluation of patient's data in our centre. We used it as an adjuvant therapy in our patients with septic shock due to varied causes.
**Objectives:** The aim of this study was to evaluate the efficacy of therapeutic Adsorban in the management of patients with septic shock. In this study, we aimed to present the effect of Adsorbent therapy, which is still being discussed in the treatment of septic shock, on renal recovery and mortality with our results.
**Methods:** We retrospectively analysed data of **S**eptic shock between 2022 to 2023 had received Adsorban as adjuvant therapy along with standard of care. Patients included in the study were diagnosed according to The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3).In this retrospective study, patients diagnosed with septic shock and receiving CRRT treatment were divided into two groups: septic shock-oxiris and septic shock-adsorbent. A rapid decrease in PCT, WBC and CRP was achieved in both groups. Additionally, the need for NE decreased in both groups and patients. Demographic data, procalcitonin, CRP and leukocyte levels before and after therapeutic cytokine removal and duration of Adsorban application were recorded.
**Results:** 500 patients were screened in the last year. The data of 12 patients who received Adsorbent Treatment from 2500 patients were accessed.After the adsorbent treatment, the fever of the patients

decreased and the need for antipyretic decreased. White blood cell and PCT values were found to be low in all patients who received adsorbent treatment. Decreases in the hourly vasopressor drug needed by the patients were detected, but it was not statistically significant. After CRRT, an increase in urine output was observed at the end of an average of 12 h, and creatinine values decreased after hours.
**Conclusions:** Although blood purification is a controversial issue in septic shock patients, its use in patients is becoming increasingly common. There are no guidelines for the use of different membranes such as adsorbent or oxiris with CRRT. However, removing cytokines and bacterial products from the blood will definitely have positive effects. However, when these treatments are started late in patients, their effect on survival does not seem to be positive. In our study, we found that the need for NE decreased along with the decrease in PCT, CRP and WBC in adsorbent and oxiris.

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**Topic:** Sepsis

## 000148

### A retrospective observational cohort review of protein provision in parenteral nutrition (PN) prescribed in an adult intensive care unit (ICU) in University Hospital Southampton (UHS) NHS Foundation Trust

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):** 000148

**Introduction:** Whilst the ideal protein provision to ICU patient remains uncertain, the European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines recommend 1.3 g/kg/day to be delivered progressively to ICU patients [1]. For obese patients (Body Mass Index, BMI > 30); the recommended protein provision is 2 g/kg/day ideal body weight (IBW) [1]. Hartl et al. [2] divides protein provision into low (< 0.8 g/kg per day), medium (0.8–1.2 g/kg/day), and high (> 1.2 g/kg/day) [2]. More evidence for ideal protein provision in ICU is needed as current evidence stems from small observational studies. The effect of higher protein dosing in critically ill patients with high nutritional risk (EFFORT protein) randomised controlled trial (RCT) [3] compared standard protein doses to higher protein doses (1.2 g/kg/day vs > 2.2 g/kg/day or more). The EFFORT RCT did not demonstrate statistical difference in the primary outcome which was incidence of time to discharge alive.
**Objectives:** The aim of this project was to establish the protein provision in PN prescribed to ICU patients in UHS.
**Methods:** The project was registered as a service evaluation (SEV/0667) with need for full ethics approval waived. Data was retrieved from the pharmacy preparation suite details of patients who were fed by the parenteral route and were deemed to be meeting their full calorific requirement. Patients were categorised by their BMI / protein requirements.
For patients with a BMI ≤ 30, patients were categorised into low/medium and high protein provision as per Hartl et al. [2], with the expectation that they would be provided ≥ 1.2–1.3g/kg/day (which is the recommendation from the ESPEN guidelines on critical care nutrition [1]).
For patients with a BMI > 30, their IBW was calculated, to determine if they received ≥ 2 g/kg/day protein of their IBW.
**Results:** Data on protein provision was retrospectively collected from 50 patients. Of the 50 patients reviewed, 34 had a BMI of ≤ 30. The results reported that of these 34 patients:

- 6 (17%) met the provision of more than 1.2 g/kg protein per day.
- 27 (80% of the 34) received protein amounts in the "medium" category i.e., between 0.8–1.2 g/kg/day
- 1 patient (3% of the 34) was in the low protein provision category (less than 0.8 g/kg/day).

None of the patients who had a BMI > 30 met the recommendation from the ESPEN guidelines to provide 2g/kg/day IBW.
ESPEN guidelines recommend that for critically ill patients, protein is delivered at 1.3 g/kg/day progressively; out of the 34 patients with a BMI ≤ 30, 2 (6%) were provided with ≥ 1.3g/kg/protein per day.
**Conclusions:** This retrospective observational review established that patients receiving PN at UHS did not typically meet the recommendation from ESPEN to provide ≥ 1.3 g/kg protein per day; less than 1 in 5 patients were provided the recommended protein advised by international nutrition guidelines and unfortunately no patients with a BMI > 30 met their protein required. Further work should focus on enhancing protein provision for ICU patients at UHS, especially in patients with a BMI > 30.

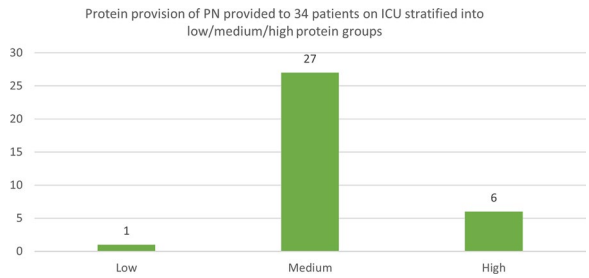


**Fig. 1 (abstract 000138)** Proportion of 34 patients (out of the 50 reviewed, that had a BMI of less than 30), and provision of protein through PN. Defined as per Hartl et al. as low (less than 0.8g/kg protein per day), medium (0.8–1.2g/kg protein per day), and high (> 1.2g/kg protein per day) protein provision

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4. Dr McKenzie received research funding from a Southampton Research Leaders Programme.

**Topic:** Metabolism, endocrinology, liver failure and nutrition

**000149**

## A prospective randomized controlled study to compare two supraglottic airway devices LMA-ProtectorTM and LMA-ProSealTM in anaesthetised patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000149

**Introduction:** LMA ProSealTM has been in use for a long time and has stood the test of time. LMA ProtectorTM promises high oropharyngeal leak pressures and gastric access like LMA ProSeal. It is a composite of various supraglottic devices; it has a preformed curved shaft like LMA FastrackTM, LMA SupremeTM and LMA AuraGainTM, it is a single use device like LMA SupremeTM and LMA UniqueTM. Besides, LMA ProtectorTM has two unique features: a dual gastric port and an in-built intracuff pressure monitor.
We found sparse literature with LMA protector and there are only a few research papers comparing LMA Protector with its similar cousin LMA ProSeal and their results are contrary with respect to oropharyngeal leak pressures.
**Objectives:** We undertook this study with the primary objective to determine and compare the oropharyngeal leak pressures (OLP) of LMA ProsealTM and LMA ProtectorTM and secondary objective of determining the insertion characteristics of the two devices and postoperative symptoms of sore throat in patients undergoing surgical procedures under general anesthesia.
**Methods:** 80 American Society of Anesthesiologists (ASA) I–II patients weighing more than 30 kg undergoing elective surgery under general anaesthesia were recruited. Patients were randomized in the LMA Protector or LMA Proseal group. After induction of anaesthesia, OLP was measured in both the groups. The insertion characteristics and postoperative sore throat with both SGDs were also recorded and compared.
**Results:** OLP was significantly higher in LMA Protector group compared to LMA ProSeal group ($34.8 \pm 3.5$ cm$H_2O$ vs $31.7 \pm 4.5$ cm$H_2O$ $p = 0.001$).
LMA insertion time was significantly longer with LMA Protector ($25.7 \pm 5.2$ s vs $23.4 \pm 5.3$ s $p = 0.047$). Ease of LMA insertion was comparable. Gastric tube insertion was grade 1 in majority of patients. Incidence and severity of postoperative sore throat at 2 and 24 h was similar in both the groups.
**Conclusions:** In comparison to LMA ProSealTM, LMA ProtectorTM achieved a better oropharyngel seal by achieving a higher oropharyngeal leak pressures. Insertion characters of both the devices were similar.

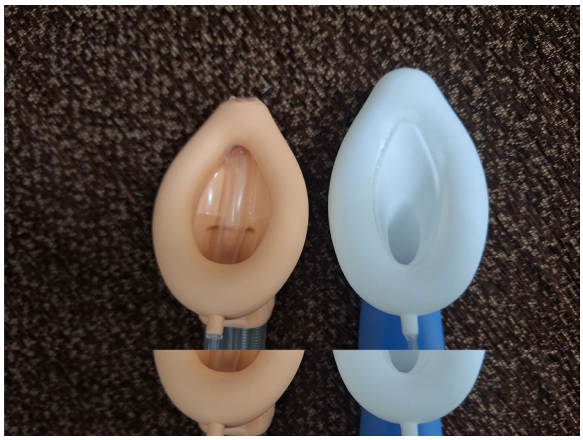

**Fig. (abstract 000149)** Difference in size of LMA Protector and LMA Proseal size 3

**Reference(s)**

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11. Both LMA ProSeal And LMA Protector were available in Hospital supply of our institue and no grant was taken from anywhere for the purpose of the study.

**Topic:** Perioperative care

## 000150

### Care and Neuroprognostication after cardiac arrest in a Tertiary UK centre: identifying areas of improvement

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000150

**Introduction:** Around 80% of patients successfully resuscitated remain comatose after return of spontaneous circulation (ROSC). Accurate Neurological prognostication in comatose cardiac arrest patients is important to identify those with the potential of having poor outcome. International guidelines [1, 2] have supported a multi-modal approach to neuroprognostication. Based on the current guidelines, local guidelines were developed in our institution to provide care post-resuscitation and a pathway for prognostication.
**Objectives:** As part of a quality improvement project, this audit was designed to measure adherence to local guidelines on the care and prognostication in comatose cardiac arrest patients and to identify focus points for improvement.
**Methods:** Approval was sought within the department to audit adult (> 18 years old) comatose patients after CA presenting to our institution and admitted to ICU from April 2022 till March 2023. We identified several aspects of care that wanted to audit, therefore data collected focused on: demographics, location of CA (in-hospital (IHCA) or out-of-hospital (OOHCA)); ICU management focused on: temperature control to avoid fever (< 37.5) for 72 h [3], normocapnia, presence of myoclonus < 72 h, regular monitoring of corneal reflexes and pupillary reflexes, time from admission to first Echo, ICU LOS and neurological outcome on discharge from ICU/hospital, withdrawal of life sustaining therapies (WLST). Based on local guidance to aid neuroprognostication, we looked if the following tests were performed: SSEP, 2 EEG and timings, NSE and CT head, MRI.
**Results:** A total of 186 patients (59.7% Males, median age 61 years) were included, 67% ($n = 114$) were OOHCA. Of these, 83% ($n = 155$) had temperature control (< 37.5C) and 53% ($n = 99$) had normocapnia maintained. Regular pupillary reflexes were measured in 100% of patients, whereas corneal reflexes were monitored in 0%. One EEG was performed in 35.5% ($n = 66$) of patients, and 20% ($n = 37$) had both EEG, only 13% had an SSEP within 24h. NSE was requested in 16 patients (9%), with a turnover mean time from request to results of 13 days, including an outlier value of 240 days since request. 85% patients had CT Head scans and 15% had MRI head scans. 16% patients had developed Status Myoclonus within 72 h.
**Conclusions:** As part of an ongoing quality improvement project, these results have identified areas of focus on both bedside care and education within our institution. With regards care, despite very good and good adherence to temperature control and normocapnia, there's a lack of regular nursing documentation of corneal reflex examination. In terms of tests to aid prognostication, we identified that both NSE (9%) and SSEP (13%) are underutilised despite being part of our local policy and international guidelines. Next steps would include streamlining current adjunct tests and nursing documentation before auditing practice.

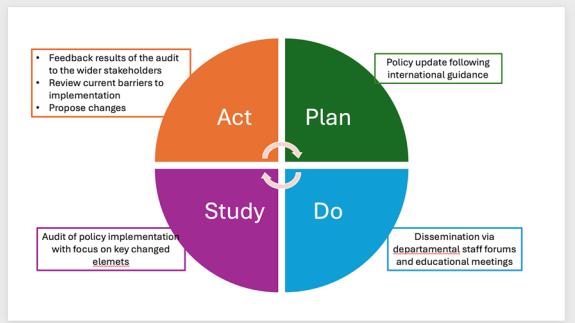


**Fig. (abstract 000150)** PDSA cycle for implementation of new Post cardiac arrest care and neuroprognostication guidelines

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4. Authors would like thank the Critical Care Audit team.

**Topic:** Cardiac arrest

## 000151

### Cost effectiveness of ECCO2R in a UK healthcare setting

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000151

**Introduction:** This study extends on the original research by Ethgen et al. (2) on the cost-effectiveness of ultra-protective lung ventilation (ULPV) strategies with extracorporeal carbon dioxide removal (ECCO2R) by applying cost analysis from a UK National Health Service (NHS) perspective. This economic evaluation complements existing clinical studies and value in facilitating ultra-lung protective ventilation (2).
**Objectives:** The study utilised a decision-analytic model adapted for the UK NHS healthcare setting that tracks expected health states when ECCO2R with ULPV versus mechanical ventilation (MV) in patients with moderate ARDS in the ICU was used.
**Methods:** Health outcomes were based on ventilation settings, duration of ventilation, length of stay, in the Intensive Care Unit (ICU) and hospital, and complications associated with ECCO2R (Table 1).
**Results:** Base case analysis (Table 1) demonstrated ECCO2R-enabled ULPV is cost-effective compared to conventional MV by £1,133. Lifetime cost per Quality Annual Life Year (QALY) was £15,023 in the ECCO2R ULPV group, versus the £20,000 NICE QALY threshold. The analysis found this intervention aimed at enhancing ULPV adherence

in ICU's would result in an additional 0.629 quality-adjusted life years (QALYs) per patient, with an incremental cost-effectiveness ratio (ICER) of £4,100 (− 7664–£14,670) per QALY gained. Comparatively, the study found 3.086 QALYs for ULPV care and 2.457 QALYs for non-LPV care (Table 1).

Table 1 Base case analysis.

While few studies assess cost-effectiveness of MV versus ULPV with ECCO2R (2, 3), this study used numerous parameters informed by the LUNG SAFE study as the primary source (1). This international study provided data on 2377 ARDS patients, including baseline characteristics, MV settings, length of stay, and survival outcomes.

Limitations of the LUNG SAFE study to define the MV comparator in the analysis was plateau pressures were not monitored in 60% of ventilated ARDS patients, and a significant proportion of plateau pressure reached above 30 cm H2O. Influencing a possible overestimation of benefits associated with ECCO2R.

Despite these limitations, this study (1) still demonstrated the potential economic advantages of ULPV strategies with ECCO2R technology in managing ARDS patients within the UK NHS healthcare setting (Table 1).

**Conclusions:** In conclusion, this study presents data that shows how ULPV ventilation with ECCO2R can benefit survival, provide fewer days in the ICU and hospital, and lower costs in a UK NHS. Further research is needed to explore the long-term cost-effectiveness of ECCO2R and other ULPV strategies in the management of ARDS.

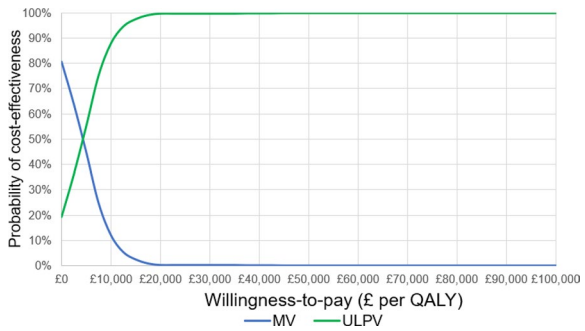


**Fig. 4 (abstract 000151)** Cost effectiveness acceptability curve (CEAC)

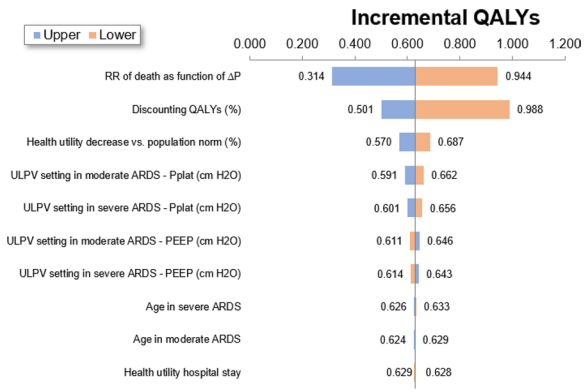


**Fig. 1 (abstract 000151)** Tornado diagram

**Table 1 (abstract 000151)** Base case analysis

| Absolute | *MV* | *ULPV* | *ULPV-MV* |
|---|---|---|---|
| **Survival** | **53.1%** | **66.5%** | **+13.4pp** |
| **LDs** | **39.8** | **45.7** | **+5.9** |
| — Ventilated | **9.2** | 5.3 | -3.9 |
| — Non-ventilated | 30.6 | 40.4 | +9.7 |
| **QALDs** | **17.1** | **20.3** | **+3.2** |
| **LoS (days)** | | | |
| — ICU | **11.7** | 12.3 | +0.6 |
| — Hospital | **17.9** | 20.1 | +2.2 |
| **Costs** | | | |
| — Ventilation | £17,747 | £10,362 | -£7,385 |
| — ECCO2R | £0 | £5,000 | £5,000 |
| — ICU | £10,014 | £10,501 | £487 |
| — Hospital (Non-ICU) | £2,566 | £3,257 | £691 |
| — $ECCO_2R$ complications | £0 | £200 | £200 |
| **Total** | **£30,327** | **£29,194** | **-£1,133** |

| Absolute | *MV* | *ULPV* | *ULPV-MV* |
|---|---|---|---|
| **LYs** *(undiscounted)* | 7.550 | 9.461 | +1.911 |
| **QALYs** | 2.457 | 3.086 | +0.629 |
| **Lifetime cost** | £15,023 | £18,822 | £3,799 |
| **Total cost** | £45,350 | £48,141 | £2,792 |

| Absolute | | | |
|---|---|---|---|
| *Lifetime cost* | *MV* | *ULPV* | *ULPV-MV* |
| **Cost/LY** | £6,007 | £5,088 | £1,461 |
| **Cost/QALY** | £18,454 | £15,600 | £4,442 |

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000152

## Evaluating professional burnout amongst healthcare professionals in Intensive Care Unit during COVID-19 Pandemic—A Single Centre Review.

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000152

**Introduction:** Burn-out is a syndrome conceptualized from chronic workplace stress that has not been successfully managed. Studies have shown consistently that 30%–50% of clinicians are estimated

to have burnout symptoms, with a dose–response relationship with poorer patient safety outcomes. To add to professional burnout, pandemics further impose an immense psychological burden on health care staff due to a mix of workplace stressors and personal fears. For HCW in intensive care units (ICU), an even higher rate of burnout (33–70%) has been observed. Hence, we sought to evaluate professional burnout HCWs experienced during COVID pandemic and investigate the risk factors to guide future analysis and interventions.

**Objectives:** Our primary objective was to evaluate professional burnout with secondary outcomes measuring positive associations contributing such as stress, anxiety, depression and various demographic factors.

**Methods:** The study used a convenience sampling method to conduct a single-center, cross-sectional survey in Sengkang General Hospital (SKH) ICU in December 2021. A standardized questionnaire was administered to doctors, nurses and allied healthcare professionals (AHP). The survey consisted of four parts, demographic and background questions followed by 3 validated psychometric instruments: Maslach Burnout Inventory—Human Services Survey (MBI-HSS) for burnout, Cohen Perceived Stress Scale (CPSS) for stress and Patient Health Questionnaire Screening (PHQ-4) for depression and anxiety.

MBI-HSS is graded on a 7-point Likert scale. The 22 questions are divided into 3 domains, emotional exhaustion EE (9 questions), depersonalization DP (5 questions) and personal accomplishment PA (8 questions). We define Professional Burnout as either a high EE score with a high DP score; or a high EE score with a low PA score.

CPSS consists of 10 questions graded on a 5-point Likert scale and we define a summated score of $\geq 20$ as a high perceived level of stress.

The PHQ-4 is a four itemed questionnaire answered on a 4-point Likert scale, by combining the two-item measure (PHQ-2) and two-item measure for anxiety (GAD-2). Total score $\geq 3$ for first 2 questions suggests anxiety. Total score $\geq 3$ for last 2 questions suggests depression. We employed standard descriptive statistics to summarize the response to survey questions. Comparison of variables with professional burnout, stress, anxiety and depression was performed with Chi Square Test for categorical variables and Logistic Regression for continuous variables.

**Results:** Our total number of respondents is 76 healthcare workers, with 64.5% being nurses (49/76), 19.7% (15/76) doctors, and 15.8% (12/76) allied healthcare professionals. A total of 74.2% (49/66) nurses responded, 68.1% (15/22) of doctors, and 100% (12/12) allied healthcare professionals responded to our survey.

Overall burnout rate in our study population was 56.6% with allied healthcare professionals at the highest risk of developing burnout (66.7%, 8/12), compared to nurses (55.1%, 27/49) and doctors 53.3% (8/15),]. However, these differences were not statistically significant, with $p$ value of 0.739. Next, the overall stress rate in our study population was 86.6%, with physicians reporting the highest stress scores of 93.3%, followed by allied health professionals at 91.7% and nurses at 83.7% ($p = 0.541$).

We did not observe a strong positive correlation between burnout and stress, indicating that there is no strong definite association between high stress out levels with burnout ($p = 0.652$). However, there was a positive association of higher stress levels with the type of housing ($p = 0.036$), with condominiums owners reporting highest stress scores and those living in landed properties reporting lowest stress scores. We also observed that 82.9% of HCW are at risk of anxiety and depression with nurses having the greatest risk of anxiety ($p = 0.014$). There was also a positive association of burnout with anxiety and depression ($p < 0.01$). Predictors for burnout showed no significant association with demographic factors.

**Conclusions:** By raising awareness of the psychological impact that COVID has on HCWs in ICU, we hope that this highlights the need for dedicated psychosocial support.

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**Topic:** Health Services Research and Outcome

## 000154

## Intensive Care Unit Documentation Audit—What's Missing?


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**Introduction:** Patient care is at the forefront of important guidelines set out by various health boards and Intensive Care health professionals. Documentation in the hospitals is a vital part of this and remains a problem within healthcare despite continuous efforts of improvement (1).

**Objectives:** Our project aim was to monitor documentation within the ICU department at Ysbyty Glan Clwyd Hospital over 5 months and compare data to the standards set by the ward itself and the health board recommendations. The most important objective for us was to see what is missing and what implications this has, to improve the quality of patient care within the ICU.

Specifically, we looked at ICU ward-specific documentation including Short Clinical Assessments (SCA) and the Intensive Care National Audit and Research Centre (ICNARC) sheets, as well as missing information boxes on the daily review. The SCA and ICNARC are crucial information documents to identify at-risk patients and to improve specific care plans (2). Additionally, there are similar implications to fill out the boxes of the daily review.

When looking at the health board requirements, we looked at the This Is Me document as well as missing bleeps and legibility. The This Is Me document allows for the staff to understand the patient's needs, fears

and concerns. Furthermore, the missing bleeps and legibility are crucial parts to get right in documentation to ensure patient safety and continuity of care.

**Methods:** As part of our student-selected component in the third year of our medical degree, we visited the ICU on alternating Fridays for 5 months. We used an online form to document our findings as we looked through clerking sheets, admission documents, and daily reviews. The study was checking for missing information as well as the legibility of what had been written. We produced a total of 100 responses which left us with a reliable set of data to look at.

**Results:** ICU Ward Specific Documentation:

The most prominent finding during the audit was missing or incomplete documents including the SCA and the ICNARC sheet. The SCA was missing or incomplete 89.3% of the time, and the ICNARC missing or incomplete for 42.9% of entries. Additionally, the daily review sheets had a large amount of missing documentation in almost all of those audited. 76% of note-taking we looked at had blank information boxes or incomplete information. Most commonly, this was the patient rehabilitation section with only 28% of documents being filled out, and a blood sample requirement section being filled only 8% of the time out of the 100 audits.

BCU Health Board Specific Documentation:

The This Is Me documentation at the very start of the patient note folder was incomplete 90% of the time out of the 100 audits, and the bleep number of the documenting clinician was recorded once 45% of the time, or not at all 55% of the time when comparing 4 consecutive documentation entries. Alongside this, document legibility was poor with only 45% of entries made being legible enough to read. This finding excluded nursing notes as they were found to be 100% legible.

**Conclusions:** In conclusion, documentation remains to be a challenge in the hospital setting. It is appreciated that ICU documentation is extremely vast and with the evergrowing time constraints within the NHS (3), documentation is found to be lacking in sufficiency. In a look to the future, we aim to implement awareness of these findings and have already raised them in the ICU Clinical Governance meeting. We implemented posters and posed ideas of handover reminders, patient loved ones collaboration on this is me documentation, and using blood sheets as a time-efficient tool, in a hope to improve documentation and thus patient care for the future of medicine.

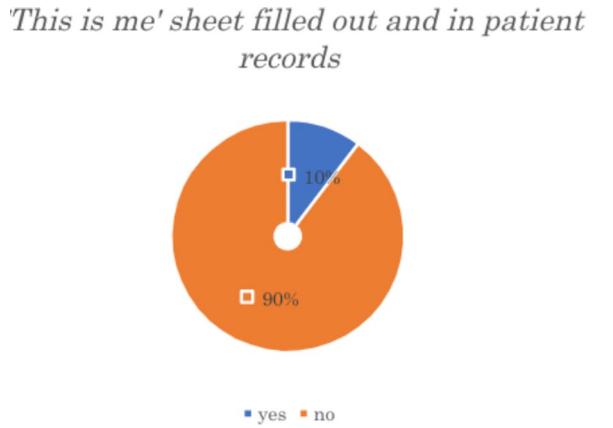


**Fig. (abstract 000154)** Diagram showing the percentage of This Is Me sheets filled out in documentation


**Fig. (abstract 000154)** Diagram showing in blue the level of missing information regarding the "tomorrow's bloods" section (92%) of the daily review sheet, in comparison to the red, where 8% had been completed

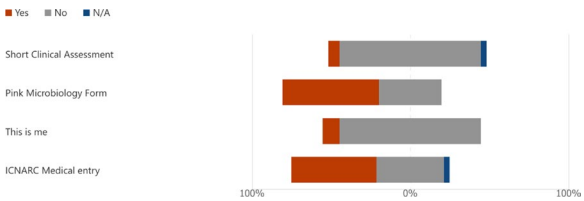


**Fig. (abstract 000154)** Diagrams showing missing information on admission, including the SCA at 89.3% missing, and the ICNARC entry missing 42.9% of the time as shown by grey colour

**Reference(s)**

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4. We would like to give thanks to the Intensive Care Unit at Ysbyty Glan Clwyd for allowing us to undertake this audit. We would like to give special acknowledgement to Dr John Glen for guiding us through this audit and helping us to find a crucial date set.

**Topic:** Health Services Research and Outcome

## 000155

### Nutrition support and adequacy in underweight critically ill children admitted to the pediatric intensive care unit

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**Introduction:** The nutritional support provided to children in the pediatric intensive care unit (PICU) is affected by disease severity, baseline nutritional status, and invasive therapeutic interventions. In the first week of admission, achieving 60% enteral adequacy of calories and protein is associated with a survival benefit. We hypothesize that malnourished children are likely to achieve > 60% calorie and protein adequacy before compared to children with a normal nutritional status at baseline during their first week of admission to the PICU.

**Objectives:** To evaluate nutrition support adequacy in malnourished children during their first week of admission to the PICU.

**Methods:** Retrospective cohort study of children admitted (index) to Texas Children's Hospital PICU between Jan 2016 to Dec 2017. Inclusion criteria included mechanical ventilation (MV) > 48 h, PICU length of stay (LOS) > 7 days, and > 2 yrs. of age. Nutritional status was evaluated by CDC growth charts (Weight for Age [WFA] z-scores, underweight defined as WFA $z$-score < − 2). Nutrition support included enteral and parenteral nutrition, and propofol if on TPN, adequacy defined as (intake/prescription × 100). All calculations used dietitians' prescriptions and actual body weight. Optimal adequacy was defined as ≥ 60%. Comparison by Mann–Whitney.

**Results.**

Out of 4199 patient admissions, 164 children (45% female) met inclusion criteria. Anthropometric evaluation on admission was WFA z-score of -0.45 ± 2.20 [SD], with 80% normal nutritional status and 20% underweight. Patient characteristics are included in Table 1. Malnourished children vs nourished children on day 7 had a median caloric intake (kcal/kg/day) of 37 (31–52, IQR) vs 24 (14–40); $p = 0.0022$ and a protein intake (g/kg/day) of 1.63 (1.08–2.27) vs 1.20 (0.63–2.10); $p = 0.0393$. Total calorie adequacy (%) in malnourished vs nourished

children for days 1, 3, 5, and 7 were: 0 (0–0) vs 0 (0–0), $p=0.86$; 35 (0–69) vs 17 (0–55), $p=0.39$; 66 (4–101) vs 64 (27–99), $p=0.56$; and 95 (63–114) vs 71 (34–102), $p=0.0170$; respectively. Total protein adequacy (%) in malnourished vs nourished children for days 1, 3, 5, and 7 were: 0 (0–0) vs 0 (0–0), $p=0.90$; 37 (0–99) vs 15 (0–67), $p=0.27$; 76 (22–106) vs 74 (25–132), $p=0.53$; and 109 (72–152) vs 80 (42–140), $p=0.0393$; respectively. For both groups, calorie and protein adequacy of $\geq$ 60% was reached on day 5.

**Table 1 (abstract 000155)** Patient characteristics

| | All | Nourished at baseline ($n=131$) | Malnourished at baseline ($n=33$) | *P* value |
|---|---|---|---|---|
| Age (years) | 11.7 (8–15) | 11.4 (8–15) | 14.6 (9–18)* | *0.0119* |
| Weight (kg) | 37 (23–55) | 38 (25–61) | 31 (17–42)* | *0.0006* |
| MV (days) | 9.3 (6.5–16) | 9.4 (6.6–16) | 8.8 (6.4–18) | *0.7866* |
| PICU LOS (days) | 12 (9–20) | 12 (9–20) | 12 (10–22) | *0.7320* |
| Hospital LOS (days) | 30 (19–53) | 32 (19–52) | 27 (20–55) | *0.4766* |
| PIM2 ROM (%) | 3.7 (3–6) | 3.8 (3–9) | 3.4 (1–4)* | *0.0403* |
| Chronic condition n (%) | 109 (66.4) | 80 (61.1) | 29 (87.9)* | *0.0035* |
| Mortality, n (%) | 20 (12.2) | 19 (14.5) | 1 (3.03) | *0.0804* |

Values are median (IQR 25th–75th). MV: mechanical ventilation; LOS: length of stay; PIM 2 ROM: Pediatric Index of Mortality, Risk of mortality. * Comparison analysis by Mann–Whitney

**Conclusions:** In this cohort of critically ill children, 1 out of 5 were malnourished. Optimal nutrition delivery was reached on day 5 and malnourished children reached higher intakes and adequacies compared to nourished children on day 7. Earlier interventions should be enacted to ensure prompt nutrition support to underweight critically ill children.

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000157

## Improving Compliance with Emergency Bag Checks in Critical Care

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**Introduction:** Attending emergency situations outside the critical care unit is common part of ICU workload. Emergency "grab" bags are therefore commonplace. Properly stocked emergency equipment is an essential requirement to ensure vital resuscitation equipment is available for these difficult situations. It is our local policy for our emergency bags to be checked and quality assured daily. A recent audit demonstrated that compliance with Emergency Bag checks was 24%. This aspect of ICU housekeeping has been audited frequently with similar Results: To embed sustainable change, rather than audit, we applied quality improvement methodology to ensure we continually assess and reflect upon our performance.
**Objectives:** To improve compliance in Intensive Care with daily Emergency Bag by applying quality improvement methodology.
**Methods:** Following repeated short audit projects demonstrating poor compliance, a quality improvement team was formed. Following a focus group meeting a number of change ideas were implemented:

- New resuscitation bags with streamlined content
- Simplified checking system utilising Microsoft Forms QR code to allow rapid electronic checking
- Continuous compliance measurement allowing monthly reporting
- Regular education and discussion within our MDT meetings
- Pre-allocated person to improve ownership of checks

**Results:** Outcomes are recorded as percentage compliance with daily checks over a set time. Compliance for the period prior to these interventions was 24%. Compliance has improved to 61% on recent re-audit for the period of February, March and April 2024, demonstrating these changes have significantly improved compliance.
**Conclusions:** Compliance has improved but ongoing work is essential to ensure patient safety and comply with local policy. This is an ongoing area of quality improvement, data is continually collected allowing fora dynamic approach to PDSA cycles. The implementation of change is challenging and compliance is affected by factors including workload and lack of familiarity of contents. It is essential that the importance of checks is reinforced to all staff and new staff are educated on the importance of these checks.

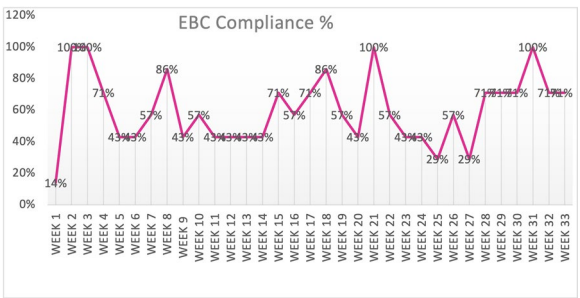


**Fig. (abstract 000157)** Run chart showing complaince with Emergency Bag Checks

**Topic:** Information systems and Data Science

## 000158

## Smart Alarms in Intensive Care and Perioperative Medicine: A Rapid Scoping Review

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**Introduction:** As demand for intensive care increases and complexity of patient comorbidities increases [1], the reliance on sophisticated monitoring equipment intensifies. These devices are essential for the continuous surveillance of vital signs, yet their effectiveness

is deflected by a high incidence of false alarms, contributing to alarm fatigue among healthcare workers amid sensory overload [2]. There is a need for smarter alarm systems that sift through available data streams, alerting only for true physiological deterioration requiring intervention. The propagation of smart alarms promises a paradigm shift away from threshold-based alarms towards a new way of caregivers' alarm response and prioritization [3]. However, a unified concept or clear definition is currently lacking.

**Objectives:** We aim to explore the concept of smart alarms in perioperative and intensive care monitoring in the literature by investigating their current theoretical definitions and practical implementations.

**Methods:** Rapid scoping review of the literature through Pubmed search on 03/04/2024 (search string: "Smart alarm*" OR "smart alert*" OR "intelligent alert*" OR "intelligent alarm*", year $\geq$ 2000 for up-to-date concepts) [4]. Screening for inclusion criteria: smart alarm implementation or theoretical definition in perioperative and intensive care vital sign patient monitoring. Reviews, non-perioperative normal ward and outpatient settings were excluded. We extracted study type, used terms, smart alarm definition and implementation, scope and transferability. Subsequently, we distilled the common key characteristics of smart alarms, culminating in a coherent narrative synthesis of the concept of smart alarms the literature.

**Results:** Out of 76 papers found, 19 met inclusion criteria (Fig. 1). Most used term is "smart alarm". Papers mainly fall into two categories: Proof-of-concept with implementation and commentary with definition. Only two publications present both a smart alarm implementation and definition. Notably, there is no consistent definition of a smart alarm across published research. However, recurring features characterizing smart alarms include (Table 1):

1. Integration of multiple data sources (e.g., vital sign monitors, patient characteristics)
2. Based on artificial intelligence (AI) or machine learning (ML) (often models making acutely clinically significant, real-time predictions declared as smart alarms)
4. More context-sensitive than threshold-based alarms (e.g. consecutive, sustained or prioritized alarms)
5. Provision of reasoning for alarm generation or treatment suggestion

**Conclusions:** Literature encompasses limited explorations of specific application scopes and differing definitions but lacks a concise concept of smart alarms. There is consent about their potential to improve patient safety by raising situational awareness and mitigating alarm fatigue. However, further research is needed for a more precise definition and wider implementation of smart alarms, especially clinical, context-sensitive implementations combining a wider range of data modalities.

**Table 1 (abstract 000158)** Results Table with study types, used terms as synonym of smart alarm, scope of smart alarm definition or transferability of alarm implementation if applicable, included key characteristics of smart alarm of included publications. (Characteristics*: 1: Integration of multiple data sources, 2: ML/AI-based, 3: Context-sensitive/prioritization, 4: Indicate cause/suggest treatment)

| First author/year | DOI (or other identifier) | Explicit definition | Implementation | Study type | Terms used | Scope of definition and concept transferability of implementation | Characteristics* |
|---|---|---|---|---|---|---|---|
| Wang/2023 | 10.1002/nop2.1792 | + | - | Descriptive survey study | Smart alarm | Wide scope | 1 |
| Conway/2022 | 10.1111/jan.15243 | + | + | Parallel cluster-randomized trial | Smart alarm | Wide scope, transferable | 1,4 |
| Conway 2021 | 10.2196/29200 | - | + | ML prediction study | Smart alarm | Wide scope | 1,2 |
| Esperanza/2020 | 10.4187/respcare.07404 | + | - | Commentary | Smart alarm, intelligent alarm | Wide scope, fixed methodology | 1,2 |
| Rance/2019 | PMCID: PMC6436169 | - | + | Technical paper/proof of concept | Smart alarm | Not easily transferable | 1 |
| Cannesson/2019 | 10.1136/bmjopen-2019-031988 | - | + | Research protocol | Smart alarm | Transferable | 2 |
| Subirà/2019 | 10.4187/respcare.05949 | + | - | Commentary | Smart alarm, smart alert | Wide scope | 1,2 |
| Koutsiana/2019 | 10.1088/1361-6579/ab4119 | - | + | ML prediction study | Smart alarm, smart alert, intelligent alarm system | Transferable | 2,3 |
| Zaouter/2017 | 10.1213/ane.0000000000001737 | - | + | Proof of concept | Smart alarm | Transferable | 4 |
| Zaleski/2017 | 10.2345/0899-8205-51.s2.44 | + | - | Commentary | Smart alarm | Narrow scope | 1,3 |
| Chopra/2014 | 10.1001/jama.2014.710 | + | - | Commentary | / | Wide scope | 1,2,3,4 |
| Scalzo/2013 | 10.1109/tbme.2012.2210042 | - | + | ML prediction study | Smart alarm, intelligent monitoring | Transferable | 2 |
| Scalzo/2013 | 10.1088/0967-3334/34/4/465 | - | + | Proof of concept | Smart alarm | | |
| Herasevich/2013 | 10.1007/s10877-013-9445-6 | + | - | Commentary | Smart alarm, smart alert, intelligent alarm system | Wide scope | 1,3 |
| Block/2012 | 10.1016/j.jelectrocard.2012.08.002 | + | - | Commentary | Smart alarm | Very wide scope | 1,2,3,4 |
| Dherte/2011 | 10.1016/s0034-7094(11)70008-3 | - | + | Proof of concept | Smart alert, smart alarm | Transferable | 1 |
| Li/2009 | 10.1730S/bjbms.2009.2752 | + | + | Proof of concept | Intelligent alarm, intelligent alert | Narrow scope | 1 |
| Celi/2001 | 10.1097/00003246-200108001-00007 | + | - | Commentary | Smart alarm | Narrow scope | 1,4 |
| Krol/2000 | 10.1023/a:1005535224082 | - | + | Proof of concept | Smart alarm | Transferable | 1 |

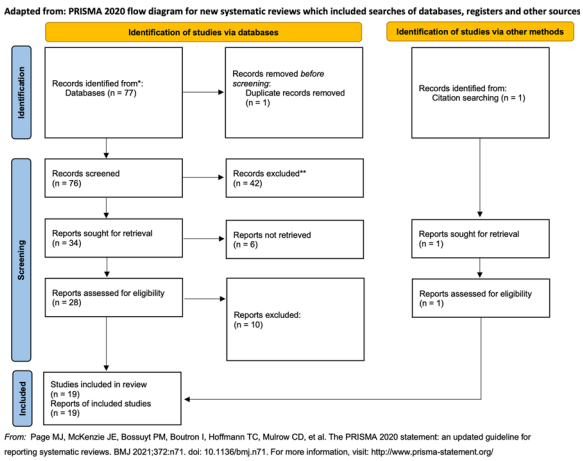


**Fig. 1 (abstract 000158)** Flow diagram of the search and screening process. Adapted from PRISMA 2020 Flow diagram for new systematic reviews for scoping reviews

**Reference(s)**


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Last authorship is shared by Poncette and Flint.

**Topic:** Information systems and Data Science

## 000159

### Assessment of Left Atrial Strain and the effect of fluid expansion measured by speckle tracking echocardiography in septic shock (LASS study)


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**Introduction:** Septic cardiomyopathy determines a deterioration of systolic and diastolic function involving both ventricles and atria. Left atrial strain measured by speckle tracking echocardiography is a technique that allows clinicians to early recognize alterations of atrial deformation that could impact on the complex hemodynamic manifestation and treatment of severe sepsis or septic shock (1). In particular, the introduction of dynamic indexes of fluid responsiveness has changed the management of fluid and vasoactive administration during the different phases of septic shock.

**Objectives:** The goal of this prospective study (LASS) was to analyze the incidence of atrial dysfunction in patients with severe sepsis

or septic shock at ICU admission and to evaluate the effect of fluid administration on Peak Atrial Longitudinal Strain (PALS) (2).

**Methods:** Patients with diagnosis of severe sepsis or septic shock following Surviving Sepsis Campaign Guidelines have been included (3), excluding age < 18 years old, anamnesis of valve, arrhythmic or cardiac disease. A sample aged matched non-septic cohort of patients was used as control. Peak longitudinal atrial strain (PALS) was measured in apical four chamber window at the end of reservoir phase of atrial filling and expressed as percentage (Fig. 1). A PALS less than 38% was considered as altered (2). Fluid expansion was obtained administering 250 ml of crystalloids in 15 min. Hemodynamic parameters including mean arterial pressure (MAP), Stroke Volume (SV), Heart rate (HR) and vasoactive dosage were assessed. Patients were considered responders if a variation of SV > 10% was measured after fluid expansion. Non-parametric statistical analysis was used to compare values of PALS between septic patients and non-septic patients. A ROC curve was built to assess the efficacy of PALS to predict fluid responsiveness.

**Results:** 44 septic patients with a median age of 60 (52 to 80) admitted to Spedali Riuniti ICU (Livorno) were included. The source of infection was abdomen 50%, urinary tract 30%, blood 10%, other 10%. At admission median PALS was 30% (22 to 40 iR) in septic patients and 35% (22 to 66 IR) in control group. This difference was not statistically significant (p = 0.5). 47% of septic patients had PALS < 30% at admission (Fig. 1A). After fluid expansion 30 septic patients were responders (increase of SV from 66 ml 55–85 to 86 ml62-105 IR) $p < 0.01$ and 10 were not responders (SV 71 ml 53 to 90 to 75 ml 66 to 90) $p = 0.2$. Mean arterial pressure increased in both responders and non-responders (MAP from 55 to 70 mmHg median values in responders and mean arterial pressure from 58 to 65 mmHg in non responders). Reduction of heart rate (from 110 bpm IR 120–90 bpm to 100 bpm IR 90–105 bpm) and norepinephrine dosage (from 0.3 mcg/kg/min IR 0.5 to 0.1 to 0.2 mcg/kg/min IR 0.07 to 0.3 mcg/kg/min $P = 0.04$) after fluid expansion. No significant variation of PALS was observed in fluid responders and non-responders when all septic patients were included in the analysis (from 22 IR 16–48 to 25 IR 16–56% in non-responders $p = 0.3$ and 34% IR 25 to 40% to 30% IR 24 to 40% p = 0.2 in responders) (Fig. 1B). Patients with PALS < 38% at admission showed a significant increase of its value after volume expansion (from 22% IR 19–25% to 27% IR 25–31%) $p = 0.04$, (Fig. 1D) (Fig. 2), but without the ability to discriminate fluid responsiveness (ROC AUC = 0.5) (Fig. 3). Septic patients with PALS > 38% at admission didn't show a significant variation of atrial strain after fluid bolus (from 40% IR 37–31% to 37–56% $p = 0.6$ (Fig. 1C).

**Conclusions:** PALS is reduced in more than 50% of septic patients admitted to ICU basing on the accepted normal values. Otherwise in our analysis there was no difference comparing septic patients and aged-matched cohort of non-septic patients, suggesting the possibility of high prevalence of atrial dysfunction in ICU. Interestingly PALS values didn't predict fluid responsiveness. Volume expansion had the ability to improve atrial function if PALS was altered at admission (PALS < 30%), but without correlation with the initial state of fluid responsiveness. In conclusion PALS could be an interesting guide for a multimodal resuscitation of diastolic function in sepsis to be expanded in future studies.

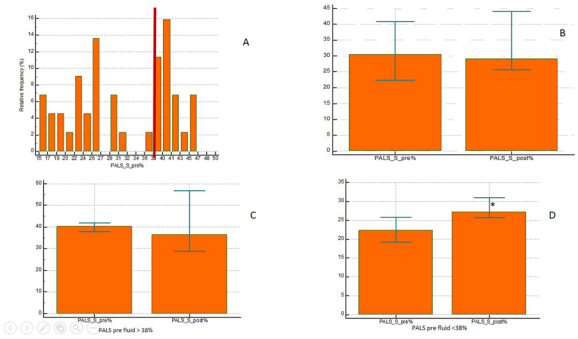


**Fig. 2 (abstract 000159)** Distribution of PALS in septic patients at ICU admission. Red line identifies lower normal limit. B No effect on PALS determined by volume expansion on global cohort of septic patient. C No effect on PALS after fluid bolus in septic patients with atrial strain > 38% at admission. D Significant increase of PALS after fluid bolus in septic patients with atrial strain < 38% at admission

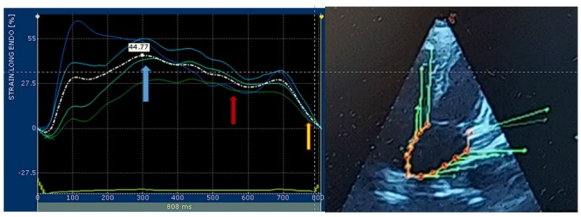

**Fig. 1 (abstract 000159)** Normal Left Atrial Strain curve assessed by speckle tracking analysis. Atrial strain is composed of reservoir phase (PALS) during systole (blue arrow), conduit phase (red arrow) followed by atrial contraction (yellow arrow) during diastole

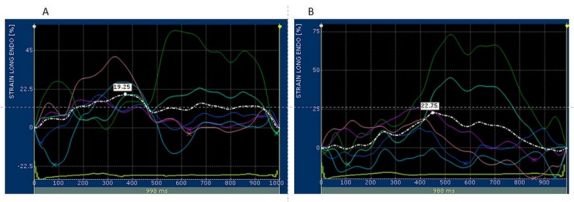


**Fig. 3 (abstract 000159)** Example of amelioration of atrial strain curve in a septic patient with altered PALS at admission (A) after volume expansion (B)

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59–70.e8, ISSN 0894–7317, https://doi.org/https://doi.org/10.1016/j.echo.2016.09.007.
3. Esicm Award 2019
4. Surviving Sepsis Campaign GUidelines 2021

**Topic:** Sepsis

## 000161

### Identifying important components and outcomes of rehabilitation for COVID-19 critical illness survivors and their caregivers: A nominal group technique and focus group study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):** 000161

**Introduction:** People who survive COVID-19 critical illness may have reduced quality of life due to physical, cognitive and psychosocial impairments [1, 2]. Some UK hospitals deliver outpatient post-intensive care rehabilitation programmes to support people recovering from critical illness [3]. It is essential to identify components and outcomes important to patients who attend these programmes and their caregivers [4, 5].
**Objectives:** To identify important components and prioritise outcomes for patients attending outpatient post-intensive care physical rehabilitation programme and their caregivers.
**Methods:** People who had survived COVID-19 critical illness ($n=6$) and their caregivers ($n=2$), following participation in a 6-week outpatient post-intensive care physical rehabilitation programme. Age range 49–70 years and length of stay in intensive care range 7–52 days. In-person nominal group technique was completed following the five stages; introduction, silent idea generation, round robin, clarifications and scoring. Participants voted privately on the priority of their 6 'top' outcomes (6 being scored as the most important and 1 being the least important to them). A focus group discussion identified key components.
**Results:** Twelve important outcomes were identified and ranked (see Table 1). Additionally, four key components which outpatient post-intensive care rehabilitation programmes should provide were identified; psychological support, investigating ongoing symptoms and impairments, timely follow up and having a safe place to exercise.

**Table 1 (abstract 000161)** Important outcomes for COVID-19 critical illness survivors and caregivers, ranked from Nominal Group Technique vote

| Outcomes ranked from vote | Number of participants who voted per outcome | Sum of scores per outcome (maximum score = 48) |
|---|---|---|
| 1. Improved stamina/fatigue | 6 | 27 |
| 2. Mental health | 6 | 24 |
| 3. Reassurance | 6 | 23 |
| 4. Understanding what happened to their body | 6 | 21 |
| 5. Improved breathing | 5 | 21 |
| 6. Improved fitness | 4 | 17 |
| 7. Independence in activities of daily living | 5 | 16 |
| 8. Coming to terms/acceptance | 3 | 10 |
| 9. Sense of achievement | 3 | 3 |
| 10. Caregivers confidence in communication | 2 | 2 |
| 11. Fear of COVID-19 | 1 | 2 |
| 12. Confidence | 1 | 1 |

**Conclusions:** The range of outcomes highlights the complex nature of COVID-19 critical illness and the need for post-intensive care rehabilitation to address more than just physiological needs.
Due to the timing of our study, all our participants had COVID-19 critical illness. Participants admitted to intensive care with a wider range of critical illnesses may have identified and prioritised different key components and outcomes.
Rehabilitation features important to survivors and caregivers should inform the design of rehabilitation services. In addition to previously recommended core outcome sets, this study highlighted the need to measure reassurance, self-efficacy to exercise, sense of achievement and the survivor's understanding of 'what happened to their body' while in intensive care.

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**Topic:** Nursing care and physiotherapy

## 000164

### Prediction of Mortality Using the Sequential Organ Failure Assessment Score in Critically ill COVID-19 Patients

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):** 000164

**Introduction:** The global health burden due to the COVID-19 pandemic urged physicians to look for accurate and predictable methods for triaging patients. Many scoring tools, such as APACHE II, SOFA, MPM, and SOFA, are present, yet there is a lack of an accurate and validated scoring system for predicting mortality in COVID-19 patients.
**Objectives:** To determine the accuracy and reliability of the SOFA score in predicting the risk of mortality in ICU-admitted COVID-19 patients.

**Methods:** Total 62 patients with a positive RT-PCR for COVID-19, admitted into the intensive care unit (ICU), were included in this descriptive cross-sectional study conducted in the COVID ICU of Aga Khan University Hospital, Karachi. Written informed consent was obtained after explaining the risks and benefits of the study to the patient/next of kin. SOFA score at the time of admission and 48 h after admission was calculated. The outcome variable, i.e., mortality, was assessed in association with the SOFA score.
**Results:** The study had a predominantly male population, 54.8% ($n=34$). Most of the patients, 69.4% ($n=43$), had severe COVID-19. The SOFA score > 7 at admission and 48 h after admission were observed in 46.8% ($n=29$) patients. Of the total 62 COVID-19 patients, the majority were found to have severe nature of the disease, i.e., 69.4% ($n=43$), followed by moderate/mild cases 30.6% ($n=19$). Depending on the requirement of the patient, 74.2% ($n=46$) were invasively ventilated while 77.4% ($n=48$) were on non-invasive ventilation. Overall the mortality rate of the present study was 43.5% ($n=27$). Scores both at admission and 48 h after admission for the survivors had a significant difference with the non survivors.
**Conclusions:** The SOFA score on admission and 48 h after had a significant positive association with the severity of COVID infection and its risk of mortality.

**Topic:** Information systems and Data Science

## 000167

## Cardiac Surgery as a Means of Reversing Frailty—The CURE-Frailty Trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000167

**Introduction:** Assessment of frailty is continuously gaining importance in the care of surgical patients. Frailty is associated with a diminished physiological reserve, making patients more vulnerable to external stressors. As a result, frailty is associated with unfavorable postoperative outcomes, including mortality, perioperative adverse events and hospital length of stay. Consequently, cardiac surgery in frail patients is always a high-risk undertaking. Alleviation of symptoms of cardiovascular disease, however, might cause a simultaneous reduction of frailty, due to significant clinical overlap between frailty and heart failure. Reducing frailty potentially leads to an improved functional status and increased quality of life, important patient-centered outcomes which are often overlooked. The possibility to treat and reverse frailty has been previously discussed, but the number of studies examining frailty postoperatively is limited. Therefore, cardiac surgery as potential treatment of frailty deserves to be investigated.
**Objectives:** The aim of this study was to examine the reversibility of frailty through cardiac surgery.
**Methods:** We analyzed 76 patients undergoing elective open or interventional cardiac surgery in this prospective observational single center study. Frailty was measured using the Clinical Frailty Scale (CFS), while subjective health was assessed with the Short Form 12 Patient Questionnaire (SF-12). Follow-up was conducted at hospital discharge, as well as 6 and 12 months postoperatively. The primary endpoint of this study was a change in CFS between baseline and final follow-up. Secondary endpoints included change in subjective health, as well as surgical outcome parameters, such as mortality and length of stay.
**Results:** At baseline, 44 patients (57.9%) were classified as frail, using a cutoff at CFS $\geq 4$. Median CFS at baseline was 4, decreasing to CFS 3 six and twelve months postoperatively ($P=0.006$) (Fig. 1). At the final follow-up, 21 patients (27.6%) presented as frail, 39 patients (51.3%) as non-frail and 16 patients (21.1%) were either deceased or had been lost to follow-up (Fig. 2). General health and physical activity also improved significantly ($P<0.001$). Mortality was higher in the frail group, although not significantly (3.12% vs. 15.9%, $P=0.076$).
**Conclusions:** Frailty and cardiovascular disease are strongly related. Cardiac surgery has the potential to reduce disease symptoms and reverse frailty as a result. Still, frail patients face higher risks in the perioperative setting, making frailty assessment necessary to identify their needs and plan their care accordingly. Furthermore, the importance of postoperative quality of life as an essential patient-centered outcome must be emphasized.

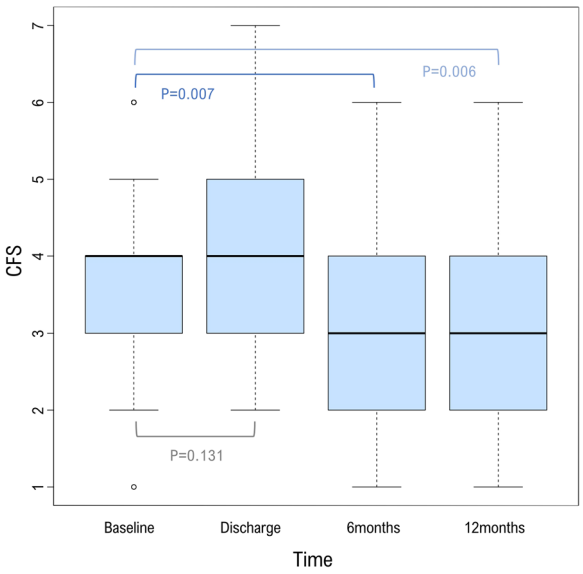


**Fig. 1 (abstract 000167)** Boxplot showing frailty distribution at each time point. P-values were calculated using Wilcoxon rank sum test

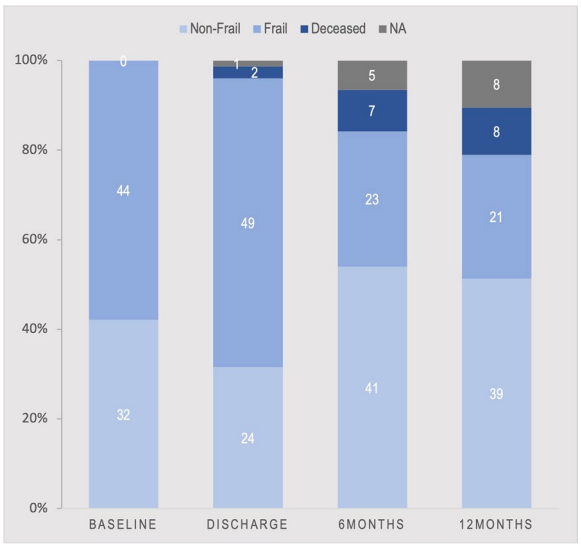


**Fig. 2 (abstract 000167)** Frailty status according to CFS at baseline, hospital discharge, 6 months and 12 months after surgery

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**Topic:** Perioperative care

## 000168

### Description of respiratory complications after cytoreductive surgery and intraperitoneal hyperthermic chemotherapy. A decade of learning

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000168

**Introduction:** Cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) are therapeutic options for peritoneal carcinomatosis in patients with digestive, ovarian, and primary peritoneal cancer. Although effective, these treatments carry significant risks, including considerable morbidity and mortality. However, the incidence, predisposing factors, and management of respiratory complications that may arise after CRS and HIPEC have not yet been clearly established (1, 2).
**Objectives:** To describe the respiratory complications associated with hyperthermic intraperitoneal chemotherapy (HIPEC) in patients admitted to the ICU in the last decade.
**Methods: Design:** Prospective observational study in a Spanish ICU of patients admitted after cytoreduction and HIPEC from January 2013 to December 2023.
**Variables to study:** Demographic data, APACHE, comorbidities, type of cancer, index of peritoneal carcinomatosis, need for blood products, fluid balance, days of stay, need for mechanical ventilation and mortality were collected. We define respiratory complications as the presentation of nosocomial pneumonia, ARDS, atelectasis, acute respiratory failure, and pleural effusion.
**Analysis:** Quantitative variables are described with mean and standard deviation or with median and interquartile range using the U-Mann–Whitney test for analysis. For categorical variables, percentages were calculated and compared using Fisher's exact test. In all cases, values of $p < 0.05$ were considered statistically significant.
**Results:** A total of 123 patients were accepted in the ICU during the chosen period. Of the total 61% were men, with an average age of 59.5 ± 10.5 years. The average APACHE score was ± 8.5 (6.0–12.0), and the Charlson index was 6. Of the sample, 15.4% (19) had gynecological-origin cancer, while 84.6% (104) had digestive-origin cancer.
Out of the total, 66 patients experienced respiratory complications: 3% (2) had pneumonia, 18% (12) had atelectasis, 83.3% (55) experienced acute respiratory failure and 36.36% (24) had pleural effusion.
As we can see in Table 1, there were no differences observed in the type of cancer, the rate of peritoneal carcinomatosis, postoperative fluid balance, the requirement for blood products, the need for vasopressors, or the need for intubation upon admission. Similarly, there were no differences in hospital and ICU stay or in the need for mechanical ventilation.
Mortality in the ICU within 30 days was remarkably low (0.8%) and was not associated with respiratory complications.
**Conclusions:** Patients undergoing cytoreduction and HIPEC often experience some type of respiratory complications. However, in our sample, no correlation was observed with an increased need for mechanical ventilation, longer hospital stays, or an increase in mortality.

**Table 1 (abstract 000168)**

| | Patients (123) | Respiratory complications | | p |
|---|---|---|---|---|
| | | YES (66) | NO (57) | |
| Sex (Male) | 61 (49.6%) | 31 (47.0%) | 30 (52.6%) | 0.531 |
| Age | 59.5±10.5 | 59.4±10.3 | 59.4±10.9 | 0.971 |
| APACHE II | 8.5 (6.0 - 12.0) | 9.0 (7.0 – 12.0) | 8.0 (5.0 – 11.0) | 0.028 |
| Charlson index | 6.0 (6.0 - 6.0) | 6.0 (6.0 - 6.0) | 6.0 (6.0 - 6.0) | 0.221 |
| Background | | | | |
| Mellitus diabetes | 17 (13.8%) | 10 (15.2%) | 7 (12.3%) | 0.645 |
| Arterial hypertension | 52 (42.3%) | 29 (43.9%) | 23 (40.4%) | 0.688 |
| Dyslipidemia | 47 (38.2%) | 28 (42.4%) | 19 (33.3%) | 0.301 |
| Obesity | 9 (7.3%) | 6 (9.1%) | 3 (5.3%) | 0.502 |
| Respiratory disease | 10 (8.1%) | 6 (9.1%) | 4 (7.0%) | 0.751 |
| Heart disease | 3 (2.4%) | 1 (1.5%) | 2 (3.5%) | 0.596 |
| Arrhythmias | 1 (0.8%) | 1 (1.5%) | 0 (0.0%) | 1,000 |
| Renal disease | 1 (0.8%) | 0 (0.0%) | 1 (1.8%) | 0.463 |
| Malnutrition | 18 (14.6%) | 9 (13.6%) | 9 (15.8%) | 0.736 |
| SOFA entrance | 1.0 (1.0 - 2.0) | 2.0 (1.0 - 3.0) | 1.0 (0.0 - 2.0) | 0.000 |
| SOFA (worse) | 2.0 (1.0 - 3.0) | 2.0 (1.0 - 4.0) | 1.0 (0.0 – 2.0) | 0.000 |
| ICU stay | 5.0 (4.0 - 5.0) | 5.0 (4.0 - 5.0) | 4.0 (3.0 - 5.0) | 0.908 |
| Hospital stay | 10.0 (8.0 - 13.0) | 10.0 (8.0 – 13.0) | 10.0 (8.5 - 13.0) | 0.297 |
| ICU/hospital mortality | 1 (0.8%) | 0 (0.0%) | 1 (1.5%) | 1.000 |

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**Topic:** Perioperative care

## 000170

### Incidence and duration of hypotension following coronary artery bypass surgery and its association with acute kidney injury

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000170

**Introduction:** Acute kidney injury (AKI) is a common complication after cardiac surgery. It has a reported incidence of 22% (1) and is associated with increased morbidity and mortality (2). It has been shown to prolong duration of intensive care admission and hospital stay (3) and has a negative impact on healthcare resources. Reducing incidence of AKI has the potential to improve patient and health care system outcomes. A number of risk factors for AKI post cardiac surgery have been demonstrated (3,4). Hypotension is a potentially modifiable risk factor, however most research has focused on intra-operative hypotension.
**Objectives:** This study aimed to quantify the amount of hypotension in the first 24 h after cardiac surgery by evaluating the number & duration of hypotensive episodes in adult patients following on-pump coronary artery bypass and determine any correlation between the amount of hypotension and post-operative acute kidney injury.
**Methods:** The study was approved by the institutional R and D department as a service evaluation not requiring ethics committee approval. 20 patients were included and received usual standard of care following on-pump coronary artery bypass grafting. The patients were monitored using FlowtracTM (Edwards Lifesciences, Irvine, CA, USA) from ICU admission for up to 24 h. Hypotension was defined as > 1 min with mean arterial pressure (MAP) < 65 mmHg. The time-weighted average (TWA) of hypotension was calculated using Acumen Analytics software (Edwards Lifesciences, Irvine, CA, USA) and is defined as (depth of hypotension below MAP 65 x time)/monitoring duration. Baseline and post-operative measurements of serum creatinine (SCr) were recorded as per usual care. AKI was defined used KDIGO criteria. Patients with end stage renal failure requiring dialysis and those undergoing off-pump bypass surgery were excluded.
**Results:** 16 men and 4 women were included with an average age of 66. The frequency distributions of TWA hypotension and SCr were heavily skewed and not easily transformed to normality, therefore non-parametric tests were used to compare distributions. 18 patients had > 1 hypotensive event, median time in hypotension was 140 min (IQR 44–306). The TWA of hypotension was 0.63 mmHg (0.19–1.61) (median (IQR)). There was not a clear relationship between SCr and TWA hypotension ($r = 0.56$, $p < 0.05$), however there was a more convincing association between TWA hypotension and presence and severity of AKI (Fig. 1).
**Conclusions:** This evaluation was limited by sample size but demonstrated a significant amount of postoperative hypotension and an association between the amount of hypotension and presence and severity of AKI. The results suggest that there is scope to modify this risk factor and reduce the impact of AKI in this population, along with associated resource burdens.

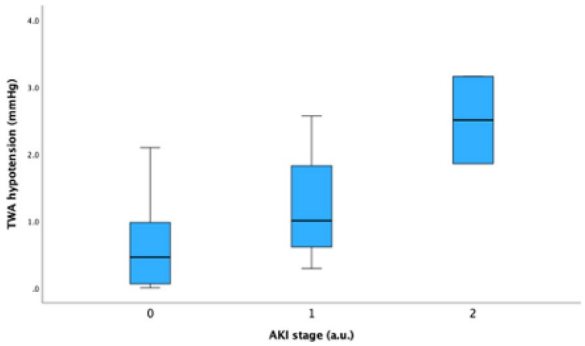


**Fig. 1 (abstract 000170)** Box and whisker plot of post-cardiac surgery acute kidney injury stage against time-weighted average of hypotension. $P < 0.05$ (Jonckheere-Terpstra test)

**Reference(s)**

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**Topic:** Acute Kidney Injury and haemofiltration

## 000171

## Impact of delays in sample processing on plasma markers of inflammation, chemotaxis, coagulation, and cell death

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**Introduction:** Traditional biosampling studies in hospitals involve the collection of patient biological samples at the bedside followed by local processing and storage (ie. centrifugation, aliquotting, freezing). However, community hospitals in Canada, which care for the majority of patients, often lack infrastructure for local processing of research specimens. A potential solution is a "simplified" biosampling approach whereby blood samples are collected and shipped immediately to a central site, prior to processing. However, the impact of delayed processing on sample stability is unknown.
**Objectives:** To determine whether delays in blood sample processing affect the stability of cytokines (IL-6, TNF, IL-10, IFN-γ), chemokines (IL-8, IP-10, MCP-1, MCP-4, MIP-1α, MIP-1β), cell-free DNA (cfDNA) (released by dying cells), and blood coagulation factors.
**Methods:** Venous blood was collected into two types of anticoagulant tubes (citrate and EDTA) and left at 23 °C room temperature (RT) or 4 °C for progressive intervals (up to 72 h) before processing. Plasma cytokines and chemokines were quantified using single or multiplex immunoassays. Blood clotting process was measured using a thrombin generation assay. cfDNA (released by dying cells) was measured using Picogreen DNA Quantification.
**Results:** Blood samples were collected from 7 healthy volunteers and 9 intensive care unit (ICU) patients. ICU admission diagnoses included sepsis, trauma, intracranial hemorrhage, gastrointestinal bleed, and hyperkalemia. After delayed processing, no significant changes were identified in plasma levels of cytokines, chemokines, or cfDNA; or in blood coagulation process irrespective of whether the samples were stored at RT or 4 °C.
**Conclusions:** Delayed processing (up to 72 h) at either RT or 4 °C did not significantly affect the stability of cytokines, chemokines, cfDNA, or blood coagulation factors in plasma samples from healthy volunteers and ICU patients. Thus, a "simplified" approach to biosampling is a feasible solution for conducting biosampling research at sites lacking local biosample processing capacity.

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2. We are grateful to the Canadian Network of COVID-19 Clinical Trials Networks for a summer studentship to VJG. We would like to thank Ms. Uzma Saeed for screening and recruiting ICU patients for this study.

**Topic:** Translational biology

## 000172

### Spontaneous breathing trial with pressure support on positive end-expiratory pressure and extensive use of non-invasive ventilation versus T-piece in difficult-to-wean patients from mechanical ventilation: a randomized controlled trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000172

**Introduction:** The aim of this study is to assess whether a strategy combining spontaneous breathing trial (SBT) with both pressure support (PS) and positive end-expiratory pressure (PEEP) and extended use of post-extubation non-invasive ventilation (NIV) (extensively-assisted weaning) would shorten the time until successful extubation as compared with SBT with T-piece (TP) and post-extubation NIV performed in selected patients as advocated by guidelines (standard weaning), in difficult-to-wean patients from mechanical ventilation.
**Methods:** The study is a single-center prospective open label, randomized controlled superiority trial with two parallel groups and balanced randomization with a 1:1 ratio. Eligible patients were intubated patients mechanically ventilated for more than 24 h who failed their first SBT using TP. In the extensively-assisted weaning group, SBT was performed with PS (7 $cmH_2O$) and PEEP (5 cmH2O). In case of SBT success, an additional SBT with TP was performed. Failure of this SBT-TP was an additional criterion for post-extubation NIV in this group in addition to other recommended criteria. In the standard weaning group, SBT was performed with TP, and NIV was performed according to international guidelines. The primary outcome criterion was the time between inclusion and successful extubation evaluated with a Cox model with adjustment on randomization strata.
**Results:** From May 2019 to March 2023, 98 patients were included and randomized in the study (49 in each group). Four patients were excluded from the intention-to-treat population (2 in both groups); therefore, 47 patients were analyzed in each group. The extensively-assisted weaning group had a higher median age (68 [58–73] vs. 62 [55–71] yrs.) and similar sex ratio (62% male vs. 57%). Time until successful extubation was not significantly different between extensively-assisted and standard weaning groups (median, 172 [50–436] vs. 95 [47–232] hours, Cox hazard ratio for successful extubation, 0.88 [95% confidence interval: 0.55–1.42] using the standard weaning group as a reference; $p = 0.60$, Fig. 1). All secondary outcomes were not significantly different between groups.
**Conclusions:** An extensively-assisted weaning strategy did not lead to a shorter time to successful extubation than a standard weaning strategy.

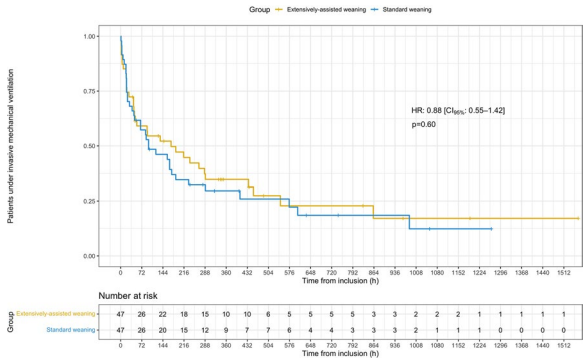


**Fig. 1 (abstract 000172)** Kaplan–Meier curve depicting the time to successful extubation. HR denotes hazard ratio and CI 95%, 95% confidence interval

**Topic:** Acute respiratory failure and mechanical ventilation

## 000174

### Assessment of Ventriculo-arterial Coupling Characteristics in Sepsis Patients Undergoing Fluid Resuscitation Through Stroke Volume and Calculated End-systolic Pressure interaction

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000174

**Introduction:** Ventriculo-arterial coupling (VAC) is determined by a formula involving ratio of arterial elastance/ventricular end-systolic elastance (Ea/Ees). Changes in Ea or Ees are connected to changes in ventricular end-systolic pressure-stroke volume (Pes-SV) interaction (1). Therefore, examining Pes-SV interaction can help us understand how VAC changes with treatments, like giving a fluid bolus.
**Objectives:** This study aimed to elucidate the alignment between nine pre-defined patterns of Pes-SV interaction and the observed response to fluid bolus concerning Pes-SV interaction in patients diagnosed with sepsis or septic shock.
**Methods:** We conducted a proof-of-concept study by utilizing data from three prior prospective studies. We documented alterations in arterial pressure and cardiac output (CO) before and after the administration of a fluid bolus, subsequently deriving values for Pes and stroke volume (SV). The primary outcome measured the percentage of patients exhibiting Pes-SV interaction responses to the fluid bolus that corresponded to the predefined nine patterns of Pes-SV interaction.
**Results:** Total 164 septic shock patients underwent fluid bolus were included. The responses to fluid bolus, with respect to Pes and SV, were categorized into nine predefined interaction patterns (Fig. 1). Table 1 displays the proportions of patients in each category from three data sources. Majority of patients (49.40%) manifested elevation both Pes and SV. Notably, in Fig. 2, subgroup of patients identified as worsening VAC, the highest proportion (47.50%) was found in the data source that included patients experiencing atrial fibrillation (AF). Within this worsening VAC subgroup, Ea was significantly increased (34.67%), contrasting with patients classified as improved VAC subgroup, where a negative change in Ea (− 5.74%), as illustrated in Fig. 3. Moreover, a noteworthy association was established between the three types of changes in VAC (stable, improved, or worsening) and fluid responsiveness ($\chi^2 = 27.81$, $P < 0.001$) as well as presence of AF ($\chi^2 = 21.79$, $P < 0.001$), shown in Fig. 4.

**Conclusions:** This study provides evidence for the existence of the nine proposed Pes-SV interaction patterns, potentially reflecting changes in VAC after fluid bolus in patients with septic shock. Our findings suggest that these patterns might offer valuable insights into qualitative VAC assessment.

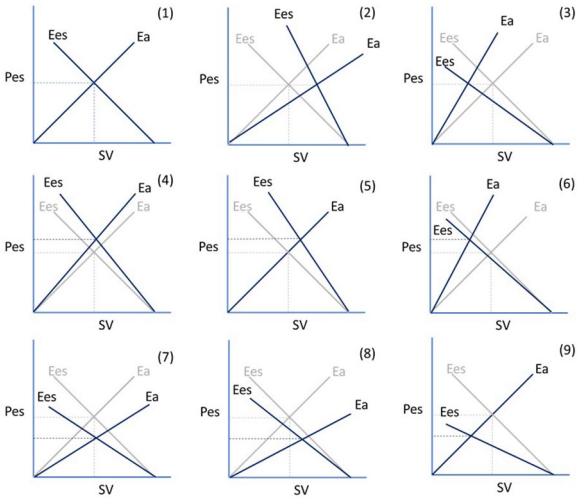


**Fig. 1 (abstract 000174)** Shows nine patterns of treatment response regarding the interaction between Pes and SV. The Ea and Ees are illustrated in slope of linear relationship between the Pes and SV. The light grey lines represent hypothetical baseline values. The dark blue lines represent the possibility of slope would be changed according to the interaction between the Pes and SV. The pattern number 1, 2, and 3 illustrate patterns with stable Pes with various change of SV. The pattern number 4, 5, and 6 illustrate patterns with increased Pes with various change of SV. The pattern number 7, 8, and 9 illustrate patterns with decreased Pes with various change of SV. Changes in patterns 1, 4, and 7 are defined as stable VAC. In patterns 2, 5, and 8, they are defined as improved VAC. Finally, in patterns 3, 6, and 9, they are defined as worsening VAC, respectively

**Table 1 (abstract 000174)** Illustrates the proportion of patients falling into the predefined nine patterns of Pes-SV interaction in response to a fluid bolus

| Patterns of Pes-SV interaction | All patients N = 164 | 1st data source N = 28 | 2nd data source N = 59 | 3rd data source N= 77 |
|---|---|---|---|---|
| no changing of Pes and SV n (%) | 1(0.60%) | 0 | 1(1.70) | 0 |
| constant of Pes, increase SV n (%) | 0 | 0 | 0 | 0 |
| constant of Pes, decrease SV n (%) | 0 | 0 | 0 | 0 |
| increase of Pes, constant SV n (%) | 6(3.70) | 0 | 3(5.10) | 3(3.90) |
| increase of Pes, increase SV n (%) | 81(49.40) | 22(78.60) | 9(15.30) | 50(64.90) |
| increase of Pes, decrease SV n (%) | 16 (9.80) | 1(3.60) | 11(18.60) | 4(5.20) |
| decrease of Pes, constant SV n (%) | 10 (6.10) | 0 | 6(10.20) | 4(5.20) |
| decrease of Pes, increase SV n (%) | 28 (17.10) | 4(14.30) | 13(22.00) | 11(14.30) |
| decrease of Pes, decrease SV n (%) | 22 (13.40) | 1(3.60) | 16(27.10) | 5(6.50) |

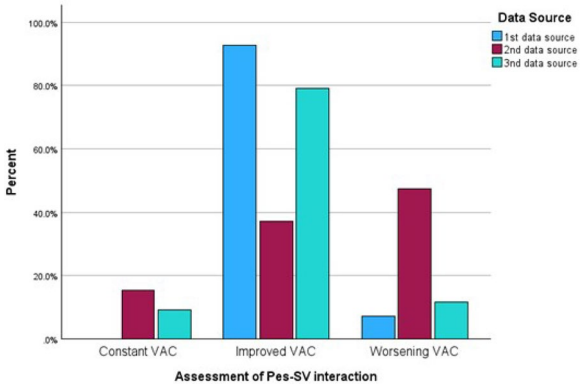


**Fig. 2 (abstract 000174)** Illustrates the proportion of patients classified into three groups characterized by the proposed VAC

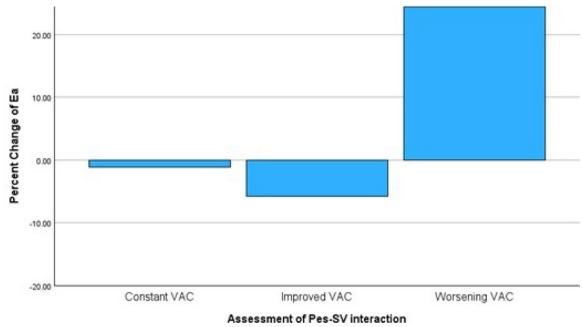


**Fig. 3 (abstract 000174)** Presents the percentage change of arterial elastance (Ea) in different patterns of the proposed VAC, characterized by Pes-SV interaction

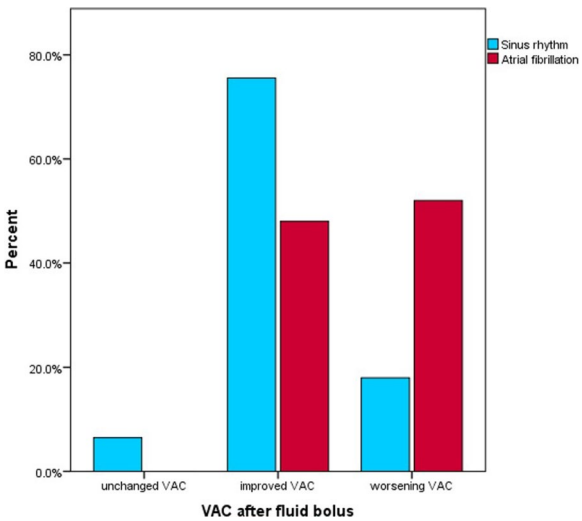


**Fig. 4 (abstract 000174)** Displays the varying proportions of patients with atrial fibrillation (AF) and sinus rhythm across each category, classified according to the proposed characteristics of volume-assisted closure (VAC) in response to a fluid bolus

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**Topic:** Sepsis

## 000175

### Enhanced Survival and Restored Liver Function in *Sepsis* through Selective Inhibition of Protein Kinase C alpha

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000175

**Introduction:** In 2019, bacterial pathogens accounted for 7.7 million fatalities worldwide, with sepsis contributing to 56.2% of associated deaths. The pivotal role of immune dysregulation, recently highlighted by Shankar-Hari and colleagues, and the systemic immunemodulatory properties of the liver's microenvironment underlay the clinical observation that hepatocyte dysfunction significantly exacerbates mortality rates, underscoring its importance in sepsis pathophysiology.
**Objectives:** Hepatic dysfunction, characterized by excretory liver failure and metabolic aberrations, is a common complication in sepsis, significantly amplifying mortality rates by compromising immune defenses. While experimental evidence suggests that restoring excretory liver functions can enhance immune response and sepsis survival, the mechanistic insights remain elusive.
**Methods:** Utilizing a murine peritoneal contamination and infection (PCI) model, we delved into the role of conventional Protein Kinase C alpha (PKC-α) in sepsis. We employed PKC-α knockout and Midostaurin, a clinically approved PKC inhibitor, to evaluate the kinase's impact on sepsis outcomes. Micromorphological liver stability was assessed through ultrastructural evaluations of canaliculi and microvilli. Additionally, the metabolization and elimination of deuterated chenodeoxycholic acid (CDCA-d4) were monitored to discern liver excretory function. Finally, we analyzed blood samples from AML patients, some of whom were treated with Midostaurin, to assess liver function using a sensitive technique called LC–MS.
**Results:** Both PKC-α knockout and selective inhibition significantly enhanced sepsis survival rates, with 60% of PKC-α knockout mice surviving 14 days post-infection and 47% of the inhibitor-treated mice compared to controls. Notably, both strategies preserved liver micromorphology, evidenced by intact canaliculi ultrastructures and microvilli counts. Furthermore, reduced plasma CDCA-d4 levels in both intervention groups postulated PKC-α modulation reinstated excretory liver functionality. Host immune response evaluations revealed that PKC-α knockout attenuates inflammation, evidenced by diminished cytokine levels and suppressed T cell activation, whereas PKC inhibition had no immune modulatory effects. In patients with AML experiencing a chemotherapy-induced liver acute phase response, Midostaurin-treatment significantly decreased bile acid levels by the end of the chemotherapy. These observations were corroborated by in vitro studies using a Hepatocyte model with polarized human HepaRG cells, where Midostaurin attenuated inflammation-induced canalicular remodeling.
**Conclusions:** PKC-α is a pivotal regulator of excretory liver function during sepsis. Targeting PKC-α emerges as a promising therapeutic avenue, potentially restoring liver functionality without compromising the immune response, thus potentially enhancing survival in sepsis. This translational insight underscores the therapeutic potential of PKC-α modulation in managing hepatic complications in sepsis.

**Reference(s)**
1. Michael Bauer recieved funding from the DFG Project No. 316213987/D01
2. Adrian Press received funding for this work from the Interdisciplinary Center for Clinical Research, Jena (Project ID: AMSP-05), and the Deutsche Forschungsgemeinschaft, (DFG), Project No. 542813223 and 316213987/B08
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**Topic:** Sepsis

## 000178

### Not a quite place: understanding noise level in a newborn intensive care unit (nicu) and the stability of newborn's vital parameters

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000178

**Introduction:** Adaptation to extrauterine life is challenging for preterm. Environmental stimuli, like noises, could lead to adverse health outcomes, causing vital parameters instability and neurodevelopment impairment.
American Academy of Pediatrics recommends a maximum environmental noise $\leq 45$ decibels (dB) in NICU. However, simply trying to reduce the environmental noise in a NICU may not be the optimal approach to the problem, considering that the principal studies available in the literature show no effectiveness in maintaining noise levels low over the years and considering that some noises like monitor alarm needs to be listened by healthcare personnel.
The study presented is the first part of a larger Randomized Controlled Trial (RCT—currently ongoing) that aims to protect newborns admitted to the NICU from excessive environmental noises.
**Objectives:** The primary study objective was to describe environmental noises in a NICU and the number of patients' tachycardia, tachypnoea, and desaturation events that could be related to excessive environmental noises.
The secondary objective is to calculate the sample size for the RCT study.
**Methods:** Observational study. Environmental noises were recorded with sound level meters. Registration was performed during the morning, afternoon, and night shifts of the working day, both inside the incubator and at the patient's bedside. The vital parameters of the patient enrolled were recorded with a video camera to allow further data analysis. The data were analysed with descriptive statistics, and the confounding variables (e.g., ventilatory support, gestational age, drugs administered, timing of patient hygiene, feeding, or procedures) were controlled. The sample size calculation will be conducted following the method proposed by Cundill and Alexander.
**Results:** The average environmental noise level was always $> 45$. The minimum level of environmental noises was never $\leq 45$ dB. Six patients were enrolled, and 22 registrations were performed (1 to 4 h long). Data cleaned from confounding variables show the following vital parameter alterations (therefore maybe related to excessive environmental noises): five patients showed tachycardia episodes, with an average of 15,69 episodes for recording (min. three max. 168); three patients showed tachypnoea episodes, averaging 34,67 (min. seven max. 180); five patients showed desaturation episodes, averaging 16,4 (min. one max. 145). The analysis to evaluate the sample size necessary to reach a power of 90% shows a range from 18 to 128 patients necessary (if we consider tachycardia or tachypnoea as primary outcomes to

evaluate). Therefore, more data is needed to calculate the sample size correctly.
**Conclusions:** Study shows how the environmental noise level in the NICU is always over the safety level recommended. Patients enrolled have shown an instability of the vital parameters. The relationship between the two observed variables must be investigated through further studies.

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9. This study was funded by the EuBrain Association. The funders had no role in the study design, data collection and analysis, the decision to publish, or in the preparation of the manuscript. The authors would like to acknowledge Eu-Brain for having believed in this study.

**Topic:** Nursing care and physiotherapy

## 000179

### Critical Care Nurses' Workload: Association between Nurses' Subjective and Objective Workload: A Prospective Observational Longitudinal Cohort Study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000179

**Introduction:** A high workload for critical care nurses (CCNs) is associated with increased adverse events like patient mortality, nosocomial infections, pressure ulcers and medication errors as well as lower patient safety and satisfaction (Rae et al., 2021; Ross et al., 2023; Chang et al., 2019). Understanding the factors that influence subjective workload as well as the association between subjective and objective workload could lead to new insights to reduce CCNs' workload.
**Objectives:** (1) To describe CCNs' subjective and objective workload per shift in a university-affiliated interdisciplinary adult intensive care unit in Switzerland and (2) to explore the association between objective and subjective workload.
**Methods:** This is a prospective longitudinal cohort study using online questionnaires and routine data between November 2022 and January 2023. CCNs completed the adapted Questionnaire on the Experience and Evaluation of Work 2.0 (QEEW2.0) to assess the subjective workload at baseline and after every shift for four weeks (van Veldhoven et al., 2015). The objective workload was assessed with the Therapeutic Intervention Scoring System-28 (TISS-28), Nine Equivalents of Nursing Manpower Use Score (NEMS), Swiss Society for Intensive Care Medicine (SGI)-patients' categories and nurse-to-patient ratio (NPR) (Kommission Patientenklassifizierung (KPK-CCP), 2006; Miranda et al., 1997; Reis Miranda et al., 1996). Data was analysed using multilevel mixed models.
**Results:** 60 CCNs with a total of 765 shifts were analysed. The CCNs' mean age was 33.5 years (SD = 7.4) and 95% ($n = 57$) were female. They cared for 956 patients during their shifts. The CCNs experienced a subjective high mental load (66 ± 26), moderate pace and amount of work (30 ± 25) and physical load (33 ± 25), and low emotional-moral load (26 ± 22) (0 = never loaded, 100 = always loaded). The baseline subjective workload values were higher than the day-to-day values. For example, the CCNs perceived the emotional-moral load on average 49 (SD = 11) at baseline and 26 (SD = 22) after their shifts (0 = never loaded, 100 = always loaded). The mean objective shift load using the TISS-28 was 43 ± 16 points (equivalent to 456 min of work), the NEMS 36 ± 14 points, the SGI-category 1.1 ± 0.5 nurses needed per patient and the NPR 1.2 ± 0.4. We found positive associations between all objective workload variables to day-to-day subjective pace and amount of work, physical and mental load, but none to emotional-moral load and subjective performance. Effects from only objective workload were highest for pace and amount of work and mental load. Mental load is highest explained by objective workload including human factors. Effects from only human factors, showed the lowest effect on pace and amount of work.
**Conclusions:** Measured objective workload is associated with only certain subjective workload domains. To promote and retain CCNs in the profession, nursing management should give a high priority to understanding subjective workload and strategies for reducing it.

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**Topic:** Nursing care and physiotherapy

## 000180

### Risk Factors for Critical Care Delirium after Cardiac Surgery: a two-year retrospective study

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**Introduction:** Delirium is a multi-causal condition that is frequently encountered in intensive care units (ICU) following cardiac surgery and is associated with high mortality rates, significant morbidity, prolonged hospital length of stay, elevated inpatient costs, and functional and cognitive decline up to a year post-surgery. Due to the burden that this condition places on patients and the healthcare system, there is an urgent need to undertake further studies to explore the multifactorial causes of delirium and better understand its pathophysiology.
**Objectives:** The primary aims were to: (1) Ascertain the current incidence of ICU delirium post-cardiac surgery; (2) Explore the mean patient ICU and hospital length of stay (LOS) in patients who experienced delirium; (3) Investigate critical care and hospital mortality rates in those patients with ICU delirium. Our secondary aims included identifying predisposing and contributing factors to ICU delirium post-cardiac surgery such as patient demographic data, pre- and intra-operative factors and daily ICU blood test results.
**Methods:** Between October 2023 and March 2024, a large dataset was collected retrospectively from patients' medical records for the period spanning September 2021 to September 2023. Daily measurements were obtained for blood tests and delirium (using the Confusion Assessment Method-ICU tool). Data were assigned to two different cohorts (delirium and non-delirium) to further investigate group differences. The project was locally registered as a service evaluation. Data were analysed using the Mann–Whitney test for continuous variables and Pearson's Chi-Square test or Fischer's Exact test for categorical variables using SPSS v29.
**Results:** Data were retrieved for a total of 899 patients. The mean age of patients was 63.08 (SD ± 10.71), most were men (77%) and commonly underwent cardiac bypass graft surgery (55%). From the results obtained, one in six patients developed ICU delirium after cardiac surgery ($n = 151$). Delirium was more prevalent in older patients, with a mean age of 66.74 (SD ± 9.88) compared to 62.79 (SD ± 10.46) in the non-delirium cohort, whilst no significant differences were observed between gender and the presence of delirium ($p = 0.487$). Intra-operative factors, including increased cardiopulmonary bypass and cross-clamp time, respectively 110 min (83.68–143.0) and 71.72 min (54.07–103.27), were found to be statistically associated with delirium ($p < 0.001$). The type of procedure performed was also found to be significant across the groups ($p < 0.001$), specifically when comparing single-valve procedures to complex operations involving two or more procedures in one. Patients who experienced ICU delirium had a substantially longer ICU LOS of 10.46 (SD ± 12.0) compared to patients without delirium (3.34, SD ± 1.80) ($p < 0.001$), which subsequently impacted their hospital LOS. Similarly, the hospital mortality outcome also demonstrated an association with delirium (delirium 3.97% vs non-delirium 1.34%, $p = 0.038$). Inflammatory blood markers, including C-reactive protein and white blood cells, were not statistically associated with the presence of ICU delirium. Raised renal blood test markers, such as creatinine and blood urea nitrogen, were shown to be significantly elevated in patients with ICU delirium ($p < 0.001$). ICU delirium post-cardiac surgery was also associated with higher levels of some electrolytes including sodium, calcium and phosphate ($p < 0.001$).
**Conclusions:** Delirium occurring in ICU post-cardiac surgery is associated with older age, complex and prolonged procedures, and patients exhibiting elevated renal and electrolyte blood markers. Delirium is significantly associated with prolonged patient LOS, leading to poorer patient health outcomes, including increased mortality. These factors should be taken into consideration to aid clinical decision-making regarding the prevention and management of delirium in post-cardiac surgery patients.

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**Topic:** Sedation, analgesia and delirium

## 000182

### The Pro-inflammatory Phenotype of Alveolar IL-1β + Neutrophils Mediated by the Interaction of Intracellular Lipid Metabolism Reprogramming and Extracellular High-inflammatory Macrophages: A Significant Indicator of Poor Prognosis in Immunosuppressive CARDS

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**Introduction:** Acute Respiratory Distress Syndrome (ARDS) is characterized primarily by lung injury resulting from systemic or local inflammation. Severe COVID-19 associated ARDS (CARDS) presents with high mortality rates and treatment complexities, often with limited efficacy from current therapies. Currently, there is a gap in research comparing the single-cell landscape of bronchoalveolar lavage fluid (BALF) among ARDS patients with varying prognoses.
**Objectives:** This study aimed to compare the BALF single-cell landscapes of severe CARDS and non-CARDS patients to investigate the dynamic changes in BALF single-cell profiles during different stages of severe CARDS.
**Methods:** This prospective study included 4 CARDS patients and 4 non-CARDS patients. BALF were collected on admission day (t1) and at a time point where the absolute difference in Murray Lung Injury Score (Δ MS, |Murray score (t2)—Murray score (t1)| ) was ≥ 1 point (t2). Exacerbation was defined as Δ MS ($t2 - t1 \geq 1$ point, and remission as Δ MS ($t2 - t1 \leq -1$ point. Patients received anesthesia and analgesic treatment before obtaining BALF, which underwent immediate single-cell RNA sequencing (scRNA-seq) analysis.
**Results:** All patients received mechanical ventilation therapy, with baseline lymphocyte counts uniformly low. Single-cell sequencing revealed neutrophils as predominant in BALF of all ARDS patients, followed by macrophages, T cells, and epithelial cells. Comparing neutrophil subtypes in BALF between exacerbation and remission groups of CARDS patients, a significant increase in IL-1β + neutrophils was observed in exacerbation group BALF compared to baseline, indicating an association between high-inflammatory neutrophils and poor prognosis in CARDS patients. Differential gene expression analysis showed significant upregulation of IL-1β, IF16, ISG15, GBP1, IL1RAP, and IL1R2 in IL-1β + neutrophils. Scmetabolism and Compass analysis suggested inhibited glucose metabolism and elevated fatty acid oxidation levels in IL-1β + neutrophils. Enhanced activity of fatty acyl-CoA desaturase and ACSL1 in IL-1β + neutrophils suggested neutrophil lipid metabolism reprogramming as a major cause of their high inflammatory levels. By associating ligands in the microenvironment with differentially expressed genes (DEGs) in IL-1β + neutrophils, IL-6

from IFIT + CXCL10 + M1 macrophages was found to induce a pro-inflammatory phenotype in IL-1β + neutrophils. OLINK validation revealed a significant increase in BALF supernatant and plasma IL-6 in the exacerbation group compared to the remission group after treatment, suggesting macrophages exacerbate the pro-inflammatory phenotype in neutrophils.

**Conclusions:** This study demonstrates neutrophil predominance in severe ARDS BALF, with IL-1β + neutrophils being a major indicator of poor CARDS prognosis. Neutrophil lipid metabolism reprogramming drives their high inflammation, while IFIT + CXCL10 + M1 macrophages exacerbate inflammation in IL-1β + neutrophils by releasing iL-6, suggesting potential therapeutic targets for CARDS.

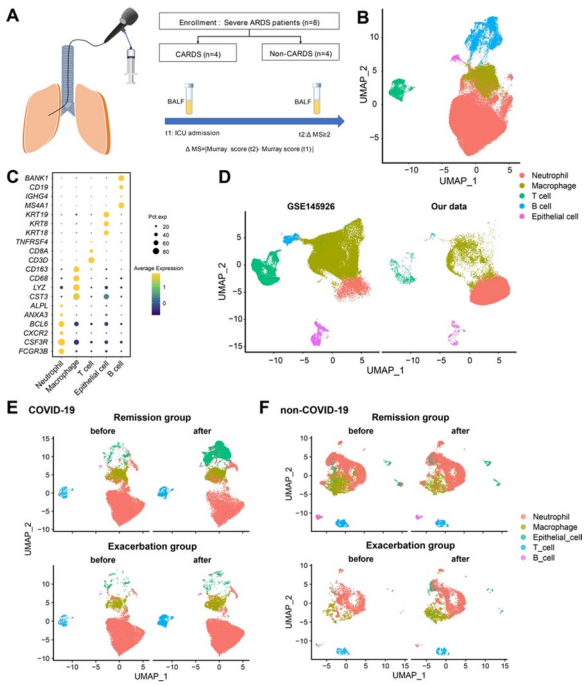


**Fig. 1 (abstract 000182)** Comparison of BALF single-cell profiles in severe ARDS patients with different prognoses. (A) Patient inclusion and specimen collection process diagram. (B) UMAP of single cells in BALF of all patients included. (C) ?Dot plot visualizing averaged expression of canonical markers across neutrophils, macrophages, T cells, B cells, and epithelial cells. (D) Comparison of BRAF single-cell profiles between our CARDS patients before treatment and GSE145926. (E) Comparison of single-cell profiles (before and after treatment) between the lung-injury exacerbation group and remission group in CARDS patients. (F) Comparison of single-cell profiles (before and after treatment) between lung-injury exacerbation group and remission group in non-CARDS patients

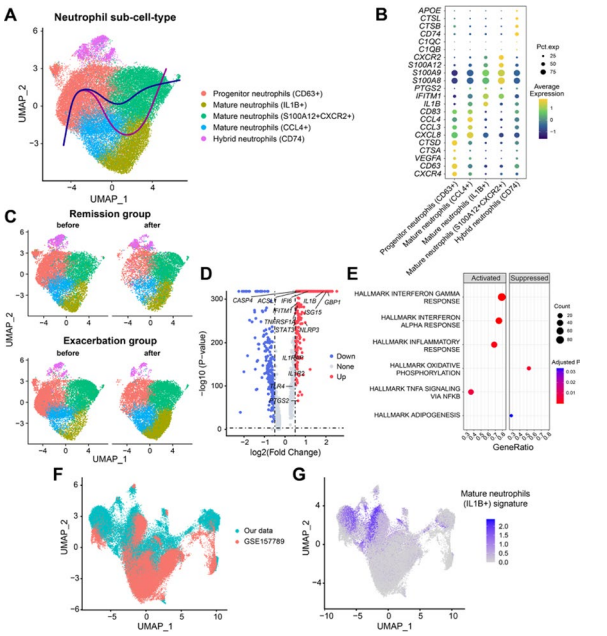


**Fig. 2 (abstract 000182)** Analysis of neutrophil subtypes in BALF patients with CARDS. **(A)** UMAP of BALF neutrophils in CARDS patients. **(B)** Dot plot visualizing averaged expression of canonical markers across BALF patients. **(C)** Comparison of single-cell neutrophil profiles (before and after treatment) between lung-injury exacerbation group and remission group in CARDS patients. **(D)** Volcano plot showing differentially expressed genes (DEGs) in IL-1B + neutrophils. **(E)** GSEA results showing the upregulation and downregulation gene sets of IL-1B + neutrophils. **(F)** UMAP of the combination of neutrophils in our data and in single-cell data of Sinha et al. (GSE157789) after removing the batch effect. **(G)** The expression profiles of IL1B + neutrophil signature in the combined data

Next, we compared the expression of IL1B signaling pathway related genes in BALF between CARDS and non-CARDS patients. The expression of *IL1B*, *IL1R1*, and *IL1RAP* genes in BALF of CARDS patients was significantly increased compared to non-CARDS patients (Fig. 3). Also, in non-CARDS patients, the proportions of IL1B + neutrophils in both the remission group and exacerbation group are fairly low, and there was no significant change before and after treatment (Fig. 3B). Considering the changes in cell type proportions of non-CARDS patients with

different prognoses in Fig. 3F, we further believe that the association between IL1B + neutrophils and prognosis is mainly a phenomenon unique to CARDS.

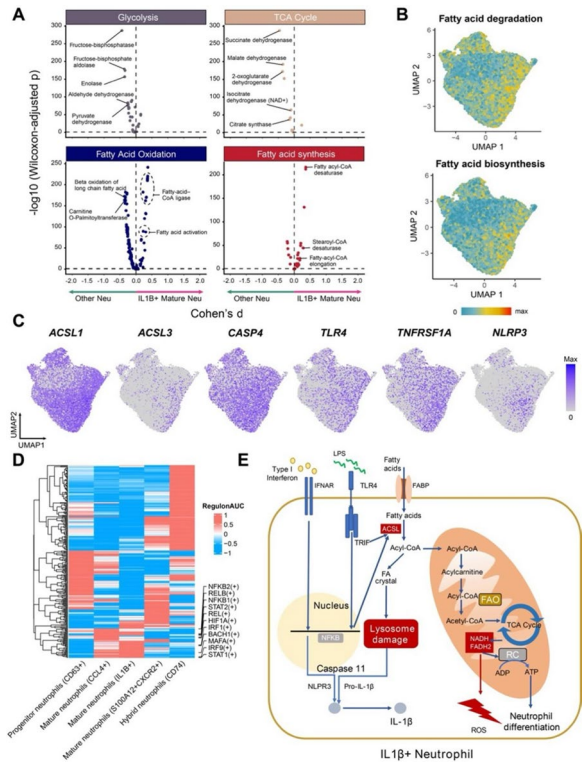


**Fig. 3 (abstract 000182)** Metabolic and regulatory network analysis on IL1B + neutrophils. **(A)** Compass-score differential activity test results comparing IL-1B + neutrophils and other types of neutrophils. **(B)** Quantifying metabolism activity at the single-cell resolution using the "scMetabolism" package. **(C)** Expression of ACSL1, ACSL3, CASP4, TLR4, TNFRSF1A, and NLRP3 in IL-1B + neutrophils. **(D)** Heatmap of regulon activity across five neutrophil groups, showing the active transcription factors of IL-1B + neutrophils. **(E)** Schematic diagram of the mechanism in IL1B + neutrophils for receiving extracellular signals, undergoing genetic regulatory changes, releasing IL-1β, and metabolic state changing

**Topic:** Acute respiratory failure and mechanical ventilation

## 000183

### Kynurenic acid alleviated endothelial injury through GPR35 in fluid resuscitation of *sepsis*

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**Introduction:** Capillary leakage caused by endothelial injury is the pathological basis of sepsis. Fluid resuscitation, as the primary treatment for sepsis, can improve cellular metabolic disorders, but the mechanism is unclear. The aim of this study was to expound the metabolic changes in fluid resuscitation of sepsis and further find ways to alleviate endothelial injure in sepsis.
**Methods:** General characteristics of patients and circulation indicators were collected. Inflammatory indicators were detected using ELISA. Differential metabolites from fluid resuscitation were detected by non-targeted GC–MS and enriched in relevant metabolic pathways through KEGG. The expression of key enzymes in the tryptophan pathway during different stages of fluid resuscitation was detected by qPCR and WB. Differential metabolites and clinical indicators was detected through correlation analysis. The effects of the metabolites on endothelial cells were confirmed using in vitro and in vivo experiments. In vitro experiments, the effect of kynurenic acid (KYNA) on proliferation of HUVEC through CCK8 assay and cell migration by scratch test. The effect of KYNA on the expression of junction protein was detected by WB. Cecum ligation and puncture (CLP) was constructed. In vivo experiments, the effect of KYNA on vascular leakage was conducted using H&E and evans blue staining. The receptor of KYNA was screened by transcriptome sequencing. The expression of KYNA receptor GPR (G-protein coupled receptor) 35 was detected by WB and immunofluorescence. The shRNA vector of GPR35 was constructed to detect the downstream target genes by transcriptome sequencing. The molecular binding relationship between GPR35 and aldehyde dehydrogenase (ALDH) 1L2 was clarified through molecular docking. The effect of KYNA on endothelial cell was confirmed by ATP content. Cellular metabolic status was detected through seahorse experiments.
**Results:** It was found that tryptophan metabolism pathway was enriched in patients with sepsis who have good clinical outcomes through fluid resuscitation, and there is a transition from kynurenine (KYN) to KYNA. A significant negative correlation was observed between KYNA and IL-1β. KYNA was negatively correlated with the content of lactic acid, the results indicated that KYNA plays an anti-inflammatory role and could improve microcirculation in fluid resuscitation. It was found that the abundance of KAT undergoes dynamic changes at different stages of liquid resuscitation. In the second stage of fluid resuscitation, the level of KAT protein is significantly upregulated. There is a decrease in KAT abundance in the third stage, and a drastic decrease in KAT abundance in the fourth stage; Interestingly, the abundance trend of KYNA at different stages is completely consistent with KAT, indicating that KAT should be activated to mediate the involvement of KYNA in fluid resuscitation in sepsis. High level of expression of both KYNA and IL-1β indicates the optimization period. The stable period is defined by a high level of KYNA but a low level of IL-1β. In vivo and in vitro experiments confirmed that KYNA had anti-inflammatory effects on lipopolysaccharide (LPS)-treated HUVECs and reduced IL-1β and TNF-α in septic mice caused CLP. H&E staining indicated that KYNA could reduce the infiltration of inflammatory cells in the lung, alveolar collapse, and pulmonary vascular congestion in CLP-induced sepsis. Evans blue staining showed that KYNA could alleviate fluid leakage from lung tissue. The expression of GPR35 was increased by KYNA stimulated. Transcriptome sequencing showed that inhibiting GPR35 significantly reduced the expression of mitochondrial ALDH1L2. GPR35 and ALDH1L2 can be tightly bound through molecular docking experiments. ATP content was increased which stimulated by KYNA. After the treatment with KYNA, the overall activation level of mitochondrial aerobic phosphorylation in endothelial cells was significantly enhanced, indicating that KYNA regulates mitochondrial homeostasis in endothelial cells.
**Conclusions:** The conversion of KYN to KYNA was confirmed in fluid resuscitation. The potential application of KYNA was explored in improving capillary leakage in sepsis, providing new ideas for elucidating the mechanism of fluid resuscitation in treating capillary leakage in sepsis and optimizing the treatment of sepsis.

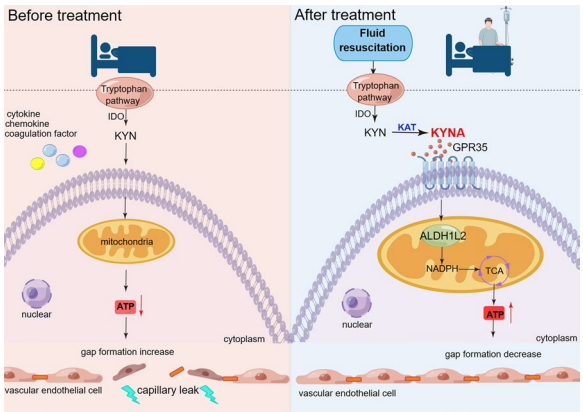


**Fig. (abstract 000183)** Mechanism diagram

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10. Medical engineering cross research fund of "Jiaotong University star" program of Shanghai Jiaotong University (Grant No. YG2021QN84)

**Topic:** Sepsis

## 000187

### Characteristics and Outcomes of Critically Ill Patients Undergoing Emergency Colorectal Cancer Surgery: A Single-Center Retrospective Study

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**Introduction:** Patients requiring emergency colorectal cancer surgery are at high risk of postoperative complications and mortality. However, data on the characteristics and outcomes of these patients admitted to the intensive care unit (ICU) are limited.
**Objectives:** This study aimed to investigate the factors associated with ICU admission and mortality in patients undergoing emergency colorectal cancer surgery.
**Methods:** We retrospectively analyzed 95 patients who underwent emergency colorectal cancer surgery at our institution between January 1, 2021, and December 31, 2023. Patients were divided into two groups based on ICU admission. Demographics, cancer characteristics, surgical details, and outcomes were compared between the groups. Univariate and multivariate analyses were performed to identify factors associated with ICU admission and mortality.
**Results:** Of the 95 patients, 37 (38.9%) required ICU admission. Patients in the ICU group had significantly longer operation time (median 170 vs. 135 min, $p=0.003$), higher intraoperative blood loss (median 190 vs. 60 ml, $p=0.003$), and a higher proportion of bowel perforation as the indication for surgery (27/37 [73.0%] vs. 29/58 [50.0%], $p=0.027$) compared to the non-ICU group. Postoperative mortality was significantly higher in the ICU group (9/37 [24.3%] vs. 1/58 [1.7%], $p<0.001$). Age, sex, cancer location (colon vs. rectum), stage, and histologic grade did not differ significantly between the groups. In multivariate analysis, operation time $\geq$ 180 min (odds ratio [OR] 3.24, 95% confidence interval [CI] 1.18–8.92, $p=0.023$) and blood loss $\geq$ 200 ml (OR 4.71, 95% CI 1.54–14.37, $p=0.007$) were independent predictors of ICU admission.
**Conclusions:** In patients undergoing emergency colorectal cancer surgery, longer operation time and higher intraoperative blood loss were associated with a higher risk of ICU admission. These findings suggest that early recognition and management of high-risk patients may improve outcomes in this critically ill population. Prospective multicenter studies are needed to validate these results and develop risk stratification models for patients requiring emergency colorectal cancer surgery.

**Topic:** Perioperative care

## 000189

### Thermal evaluation of fluid administration in a rat model of kidney ischemia

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**Introduction:** Renal ischemic reperfusion (IR) injury is one of the major sources of renal cell injury and can lead to renal failure associated with acute kidney injury (AKI). Acute normovolemic hemodilution (ANH) is a blood conservation technique shown to reduce transfusion and bleeding associated with surgery. Despite numerous advantages of hemodilution, little is known about the effect of ANH on renal failure associated with ischemia.
**Objectives:** In our study, we aimed to evaluate the relationship between fluid administration and I/R injury through thermal imaging.
**Methods:** Anesthetized Wistar albino rats ($n=7$) were divided into 7 groups: Sham-operated control (C), aortic occlusion (30 min) (ISC), 90 min reperfusion following aortic occlusion (30 min) (I/R), ANH induced by normal saline (NS) (HEM-1), ANH induced by a balanced crystalloid solution (HEM-2), ANH induced by NS following I/R (HEM-1 + ISC), and ANH induced by a balanced solution following I/R (HEM-2 + ISC). Hemodilution was targeted at a hematocrit level of 25%. Besides systemic hemodynamic parameters, serum creatinine and urea levels as indicators of renal dysfunction were measured. Also, renal tissue thermal characteristics were determined by thermal imaging.
**Results:** The target hematocrit levels were successfully achieved, resulting in a significant decrease in the hemodilution groups. When the fluid volumes and hemodilution periods were compared in the hemodilution groups, no significant difference was found to be among the HEM-1, HEM-2, HEM-1 + ISC, and HEM-2 + ISC groups. Mean arterial pressure (MAP) showed significant differences compared to respective baseline levels in all intervention groups (I/R, $p<0.01$; HEM-1, $p<0.01$; HEM-1 + ISC, $p<0.001$; HEM-2, $p<0.05$ and

HEM-2 + ISC, $p < 0.01$). However, the urea/creatinine ratios in the I/R, HEM-1, HEM-1 + ISC and HEM-2 + ISC groups were higher compared to their respective baselines ($p < 0.05$). In addition, mean temperatures showed significant decreases compared to respective baseline temperatures in the I/R, HEM-1, HEM-1 + ISC, and HEM-2 + ISC groups.

**Conclusions:** Regardless of fluid type and presence of ischemic period, fluid administration affects macrohemodynamics. Ischemic damage cannot be prevented by fluid administration. Moreover, thermal imaging can be a monitoring tool for kidney function during surgical scenarios.

**Keywords:** renal ischemia/reperfusion, thermal imaging, hemodilution.

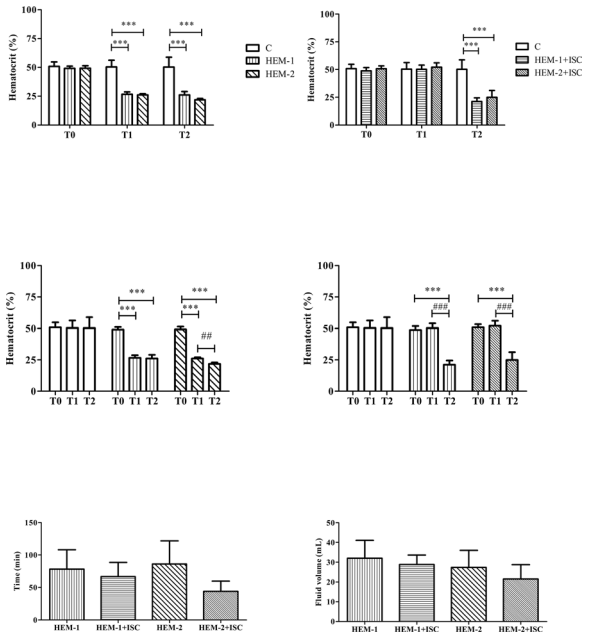


**Fig. 1 (abstract 000189)** Hematocrit levels and hemodilution times all of hemodilution groups (T0, baseline; T1, after 30 min ischemia; T2; end of surgery; ***$p < 0.001$, compared to T0; ##$p < 0.01$, compared to T1)

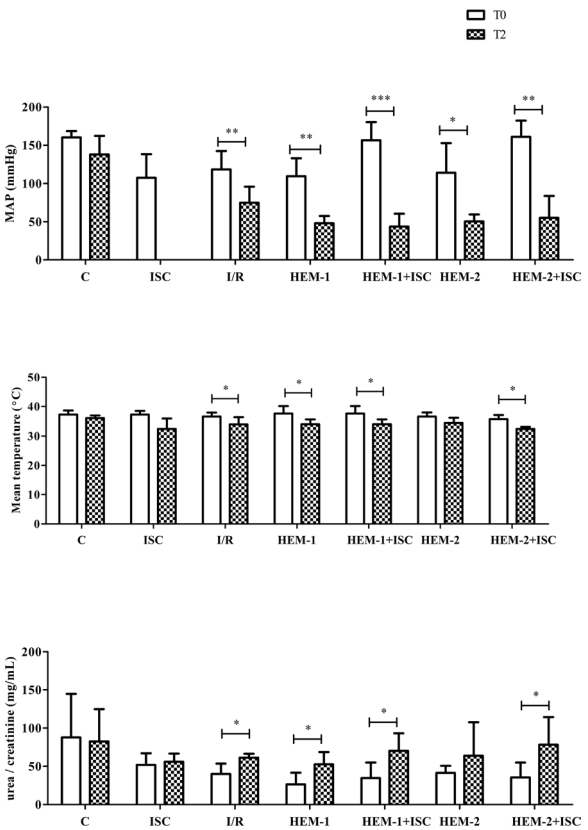


**Fig. 2 (abstract 000189)** Hemodynamic parameters, mean temperature and urea/creatinine in all of groups (T0, baseline; T2; end of surgery; ***$p < 0.001$, **$p < 0.01$ and *$p < 0.05$; compared to T0)

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**Topic:** Acute Kidney Injury and haemofiltration

## 000190

### Extracellular matrix crosslinking in unresolving acute respiratory distress syndrome

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**Introduction:** In persistent and unresolving ARDS, impaired lung healing and excessive fibroproliferation contributes to pathogenesis. Structural changes of lung tissue can impair gas-exchange and reduce pulmonary compliance. Fibroblast activation and production of ECM (extracellular matrix) components and their subsequent crosslinking play an essential role in regulating pulmonary function (1). Excessive crosslinking of ECM fibres could lead to a stiffer matrix and less airspace. Lysyl hydroxylase and lysyl oxidase (LOX) family enzymes play a role in crosslinking of collagen (2–3). Pyridinoline is collagen crosslink that makes collagen less susceptible to degradation—thus impacting the reversibility of fibrosis.
**Objectives:** We aimed to assess the abundance and crosslinking status of collagen in unresolved ARDS and compare it to controls and to idiopathic pulmonary fibrosis, an irreversible condition characterized by excessive collagen crosslinking.
**Methods:** Explanted lungs from transplanted patients with COVID-19 ARDS, post-mortem sections from non-COVID-19 ARDS, and explants from transplanted IPF patients were used. As controls, macroscopically normal regions of lung resections from patients with lung cancer were used. Experiments were approved by the Ethics Committee of the University Medical Center Groningen. Lung tissue was analysed using a hydroxyproline-based biochemical assay for for total collagen and UPLC for analysis of pyridinoline. Tissue sections were stained for LOX, LOXL1, and LOXL2 and analyzed in ImageJ. The area and intensity were defined by level of gray scale of positive pixels, divided by the total area. Airspace area was calculated in FIJI ImageJ by subtracting the tissue area from the total area of the sample. Parametric (T-test, Pearson) and non-parametric tests (Mann–Whitney *U*, Spearman Rank) were performed by IBM SPSS statistics 28. For total collagen, pyridinoline/collagen ratio, and airspace area, 20 non-COVID-19 ARDS, 12 COVID-19 ARDS, 10 IPF, and 11 control explant samples were included. For LOX, LOXl1 and LOXl2 area and intensity, 12 COVID-19 ARDS, 10 IPF, and 9 control samples were used.
**Results:** Total collagen levels were higher in non-COVID-19 ARDS (Fig. 1A, $P=0.022$) but not COVID-19 ARDS ($p=0.14$) compared to controls, while levels in IPF were significantly higher than all other groups. However, the number of collagen crosslinks per collagen molecule was not different between non-COVID-19 ARDS, COVID-19 ARDS and controls, but an increased number was seen in IPF (Fig. 1B).
The percentage airspace area was lower in COVID-19 ARDS and IPF samples compared to the control group (Fig. 1C, $P=0.032$ and $P=0.015$ respectively), but there were no differences between these patient groups ($p=0.664$). LOX-stained area and intensity were lower in COVID-19 ARDS and IPF, compared to controls (Fig. 1D, G, both $P<0.001$), with no differences between COVID-19 ARDS and IPF. LOXL1 stained area was lower in COVID-19 ARDS compared to controls (Fig. 1E, $P=0.017$), with no dissimilarities between COVID-19 and IPF.
LOXL2 area and intensity was significantly higher in COVID-19 ARDS compared to IPF (Figure IF & J, $P=0.015$ and $P=0.025$, respectively), while the LOX2L intensity was also higher compared to controls ($P=0.009$).
Airspace area inversely correlated with total collagen (Table 1, $R=-0.517$, $P=0.012$), and correlated with LOX and LOXL1 area ($R=0.693$, $P<0.001$ and $R=0.469$, $P=0.028$, respectively, Table 1). Pyridinoline/collagen ratio was inversely correlated with LOXL2 area ($R=0.427$, $P=0.026$), while LOX area correlated with LOXL1 and LOXL2 area ($R=0.529$, $P<0.001$ and $R=0.353$ and $P=0.030$, respectively).
**Conclusions:** While total collagen content is higher in unresolved ARDS compared to controls and lower in IPF, collagen and pyridinoline crosslinking is less abundant in unresolved ARDS compared to IPF samples. Since the LOX and LOXL1 crosslinking system seems to be less present in unresolved ARDS and IPF patients compared to healthy controls and LOXL2 shows the opposite, the latter couldThese findings suggest that unresolved ARDS, is not characterized by excessive collagen crosslinking, and might thus be reversible (compared to IPF).

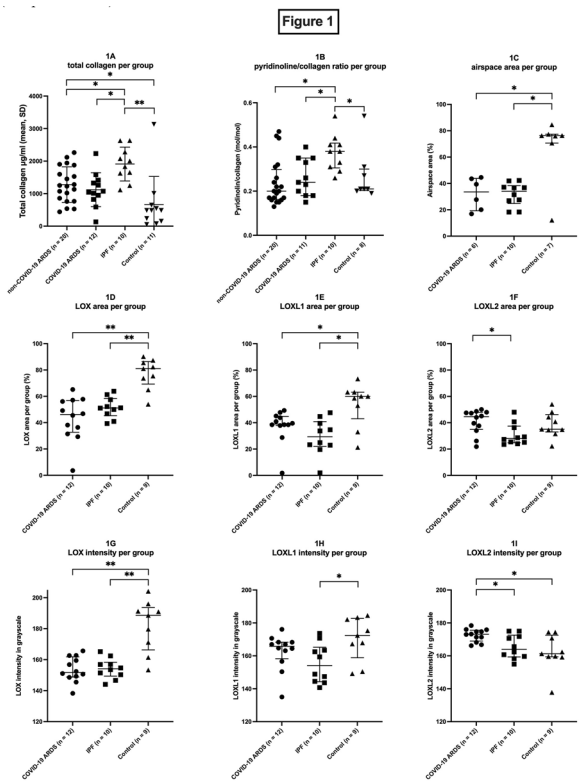


**Fig. 1 (abstract 000190)** ECM component crosslinking per group

**Table 1 (abstract 000190)** Correlations of crosslinking parameters

| | Total collagen (µg/ml) (53 of 61 samples) | Pyridinoline/collagen (mol/mol) (49 of 61 samples) | Airspace area (%) (23 of 61 samples) | LOX area (%) (38 of 61 samples) | LOXl1 area (%) (38 of 61 samples) | LOXl2 area (%) (38 of 61 samples) |
|---|---|---|---|---|---|---|
| Total collagen (µg/ml) (53 of 61 samples) | x | -0.101 (Spearman P=0.489) | **-0.517 (Spearman P=0.012)** | -0.267 (Pearson P=0.012) | -0.296 (Pearson P=0.106) | -0.409 (Pearson P=0.022) |
| Pyridinoline/collagen (mol/mol) (49 of 61 samples) | -0.101 (Spearman P=0.489) | x | -0.329 (Spearman P=0.125) | -0.264 (Spearman P=0.184) | -0.341 (Spearman P=0.080) | **-0.427 (Spearman P=0.026)** |
| Airspace area (%) (23 of 61 samples) | **-0.517 (Spearman P=0.012)** | -0.329 (Spearman P=0.125) | x | **0.693 (Spearman P<0.001)** | **0.469 (Spearman P=0.028)** | 0.013 (Spearman P=0.954) |
| LOX area (%) (38 of 61 samples) | -0.267 (Pearson P=0.012) | -0.264 (Spearman P=0.184) | **0.693 (Spearman P<0.001)** | x | **0.529 (Pearson P<0.001)** | **0.353 (Pearson P=0.030)** |
| LOXl1 area (%) (38 of 61 samples) | -0.296 (Pearson P=0.106) | -0.341 (Spearman P=0.080) | **0.469 (Spearman P=0.028)** | **0.529 (Pearson P<0.001)** | x | 0.272 (Pearson P=0.099) |
| LOXl2 area (%) (38 of 61 samples) | -0.409 (Pearson P=0.022) | **-0.427 (Spearman P=0.026)** | 0.013 (Spearman P=0.954) | **0.353 (Pearson P=0.030)** | 0.272 (Pearson P=0.099) | x |

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000191

## A Novel Hydrogen Gas Treatment delivered via Extracorporeal Membrane Oxygenation for Severe Acute Respiratory Distress Syndrome

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000191

**Introduction:** Acute Respiratory Distress Syndrome (ARDS) mortality remains high globally [1]. The current standard relies on supportive management up to Extracorporeal Membrane Oxygenation (ECMO) but lacks a definitive solution [2]. Recently, hydrogen gas has drawn fresh interest as it beneficially acts on multiple biological pathways in ARDS development [3]. A recent clinical trial demonstrated that hydrogen gas inhalation for mild-moderate ARDS via face mask improved the disease severity and respiratory symptoms [4]. However, the nebulised method poses great challenges for severe ARDS patients requiring ECMO, as the extensively collapsed alveoli hinder its application.

**Objectives:** This study aims to determine whether the administration of hydrogen gas (2%) via ECMO sweep gas can efficiently reduce severity in an ovine model of severe ARDS supported by ECMO, compared with conventional strategy using mechanical ventilation and ECMO alone.

**Methods:** This is a randomised controlled pre-clinical study over 48 h (from T0 to T48) with two groups: the hydrogen-treatment group ($n=8$) and the control group ($n=8$). Severe ARDS was induced by a validated 'double hit' oleic acid/lipopolysaccharide injury [5]. While adjusting positive end-expiratory pressure (PEEP) and tidal volume (TV) aiming the protective ventilation, T0 was when the international ECMO criteria6: $PaO_2/FIO_2 < 100$ mmHg, $PaCO_2 > 60$ mmHg, or uncontrolled hemodynamic instability due to respiratory acidosis, was met. ECMO was initiated at T1 by following the current standard guidelines for ECMO and mechanical ventilation [7, 8]. The primary outcome was respiratory mechanics (compliance and dead space ventilation). Fluid balance and the amount of vasopressor required to maintain hemodynamic were also measured.

**Results:** There was no difference in the baseline characteristics. The severity of ARDS triggering ECMO initiation was comparable (Fig. 1). The survival rate in both groups was the same (87.5%). ECMO flow was comparable and arterial oxygen (PaO2) maintained the same level for the entire period. With the same respiratory targets (i.e., plateau pressure < 24 cmH2O, driving pressure < 14 $cmH_2O$, and TV < 4 kg/ml), ventilatory settings (respiratory rate 10 times/min and PEEP 10 cmH2O), and mechanical power (J/min), static compliance after T42, and dead space after T18 non-statistically improved in the hydrogen-treatment group (Fig. 2). Following the same hemodynamic protocol for fluid resuscitation and vasopressor use and the consistent circulatory targets (i.e., heart rate < 120 beats/min and mean arterial pressure > 65 mmHg), total fluid balance and vasopressor requirement significantly decreased in the hydrogen-treatment group (Fig. 3).

**Conclusions:** Hydrogen gas delivered via ECMO sweep gas improved the respiratory mechanics. The hydrogen-treatment group required less fluid and vasopressor support, suggesting a potential anti-inflammatory effect of hydrogen that warrants further investigation.

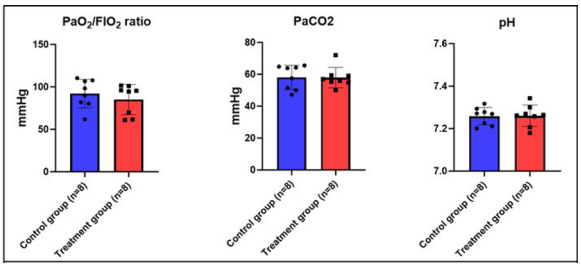


**Fig. 1 (abstract 000191)** Developed ARDS Severity before ECMO initiation. FIO2: fraction of inspired oxygen, PaCO2: partial pressure of carbon dioxide, PaO2: partial pressure of oxygen. The values of the PaO2/FIO2 ratio, PaCO2, and pH in arterial blood gas when the ECMO introduction was decided

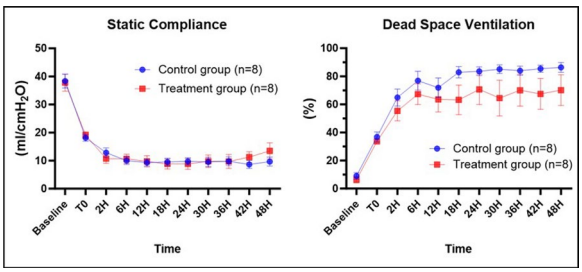


**Fig. 2 (abstract 000191)** Respiratory Severity. Statistic compliance after T42 and dead space ventilation after T18 were non-statistically better in the hydrogen-treatment group. ECMO was initiated at T1

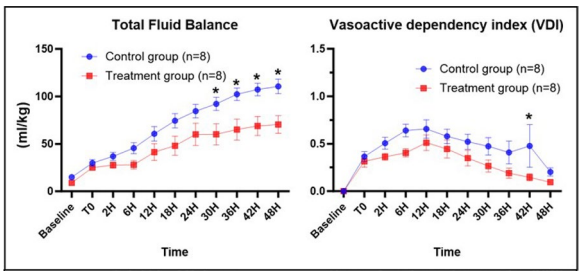


**Fig. 3 (abstract 000191)** Total Fluid Balance and Vasopressor Use. The hydrogen-treatment group had better haemodynamic stability and lower requirements for fluid resuscitation and vasopressor support. The vasopressor dependency index is the index value between the amount of vasopressor required and mean arterial pressure (MAP) at the time and is calculated as follows: ((norepinephrine dose × 100) + (vasopressin × 100) + (epinephrine × 100))/mean arterial pressure. ECMO was initiated at T1. * < 0.05

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9. This study was funded by MERA (Senko Medical Instrument Mfg, Tokyo, Japan), Japan Society for the Promotion of Science (Tokyo, Japan), and the Prince Charles Hospital Foundation (Common Good, Brisbane, Australia).

**Topic:** Acute respiratory failure and mechanical ventilation

## 000192

### Effect of fluid and driving pressure on cyclical "on–off" flow of pulmonary microcirculation during mechanical ventilation

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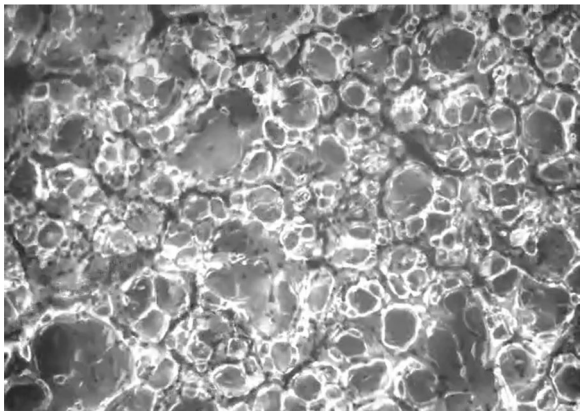
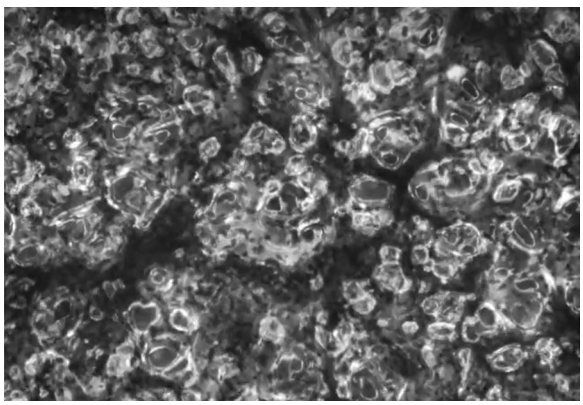
***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000192

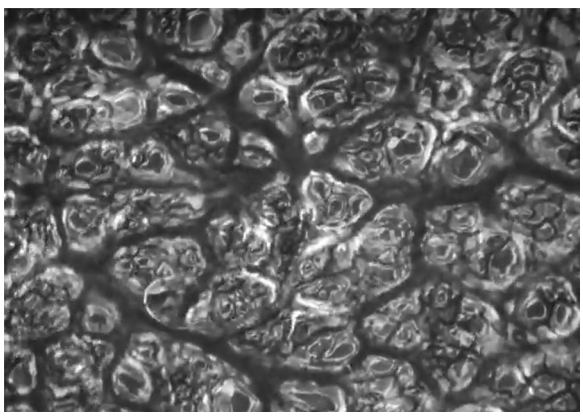
**Introduction:** This study aimed to identify the cyclical "on–off" flow of pulmonary microcirculation during inspiration and expiration by sidestream dark field imaging (SDF) technology in vivo and investigate the effects of volume status and driving pressure on cyclical "on–off" flow of microcirculation.
**Methods:** 24 ARDS-modeled rabbits were randomly divided into high-driving pressure group (HDP group) and low-driving pressure group (LDP group). Lung microcirculation measurements were performed using SDF microscope at two time points (T1 CVP 2–4 mmHg, T2 CVP 8–10 mmHg). From T1 to T2, 10 ml/kg saline was infused to increase CVP. The cyclical "on–off" pulmonary microcirculation was quantitatively assessed by the change of microcirculation between expiration and inspiration.
**Results:** Proportion of perfused vessels (PPV), microvascular flow index (MFI), Perfused vessel density (PVD),Total vessel density (TVD) at expiration were significantly higher than inspiration in HDP group. The HDP group has a higher ΔPPV and ΔPVD. After fluid loading, ΔPPV and ΔMFI decreased. TNF-α, IL-6, Ang-2 and vWF levels in the HDP group were higher. HDP group also has higher lung wet weight/body weight ratio, lung wet-to-dry weight ratio and more severe damage of pulmonary capillaries than the LDP group.
**Conclusions:** The difference in alveolar perfused microcirculation between inspiration and expiration defined as cyclical "on–off flow" can be detected. High driving pressure can enhance the cyclical "on–off" flow and fluid loading can relieve it. High driving pressure has the potential to cause injury to pulmonary capillaries due to the phenomenon of "on–off" flow, thereby exacerbating ARDS.



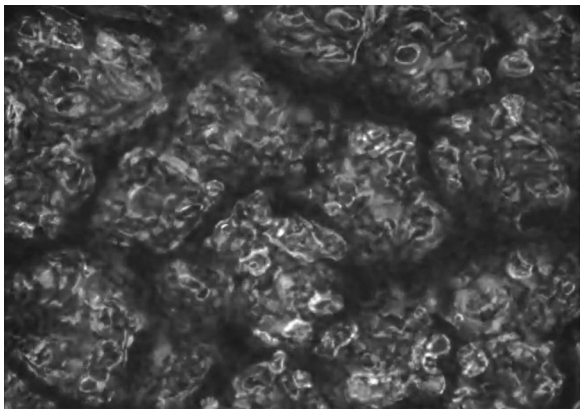
**Supplementary Video 1 (abstract 000192)** HDP at T1 during inspiration



**Supplementary Video 2 (abstract 000192)** HDP at T1 during expiration



**Supplementary Video 3 (abstract 000192)** LDP at T2 during inspiration



**Supplementary Video 4 (abstract 000192)** LDP at T2 during expiration

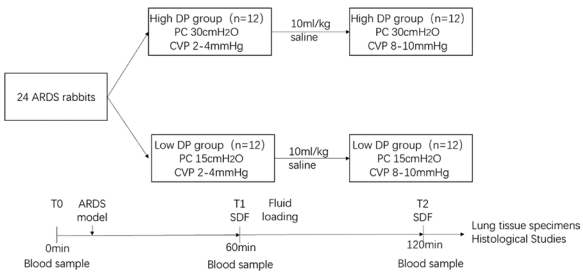



**Fig. 1 (abstract 000192)** Experimental Design
Twenty-four rabbits with acute respiratory distress syndrome (ARDS) were enrolled and stratified into two groups based on their received driving pressure (DP): a high DP group and a low DP group. Ventilation was performed using a pressure control model, with rabbits subjected to driving pressures of 30 $cmH_2O$ and 15 $cmH_2O$ for 60 min. Following the initial ventilation period, a 10 mL/kg saline solution was administered via intravenous injection, leading to an elevation in central venous pressure from 2–4 mmHg to 8–10 mmHg. Subsequently, rabbits underwent an additional 60 min of ventilation. In the end of the experiment, rabbits were sacrificed, and lung tissue specimens were collected for further analysis. Blood samples were obtained at three key time points: before the induction of ARDS, before fluid loading, and after 120 min of ventilation.
ARDS, acute respiratory distress syndrome; DP, driving pressure; PC, pressure control; CVP, central venous pressure.

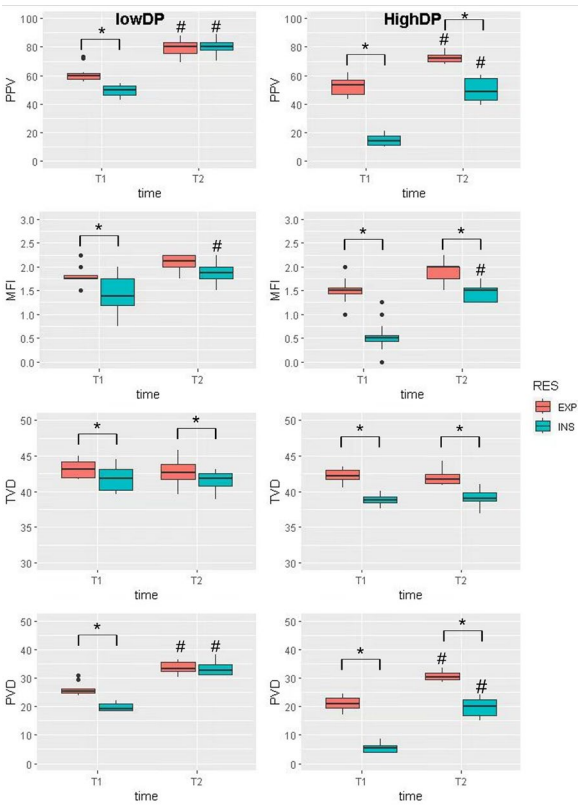



**Fig. 2 (abstract 000192)** SDF parameters in Two Ventilation Groups
SDF parameters, including PPV, MFI, TVD, and PVD, were assessed in two distinct groups. At the T1 time point, when both high and low driving pressure groups experienced low CVP, all indexes showed a significant increase during expiration compared to inspiration. After fluid loading at the T2 time point, ΔPPV, ΔMFI and ΔPVD (expiration–inspiration) narrowed both in the HDP and LDP group.
PPV, proportion of perfused vessel; MFI, microvascular flow index; TVD, total vessel density; PVD, perfused vessel density. * indicates a statistically significant difference between inspiration and expiration. # indicates a statistically significant difference between T1 and T2.

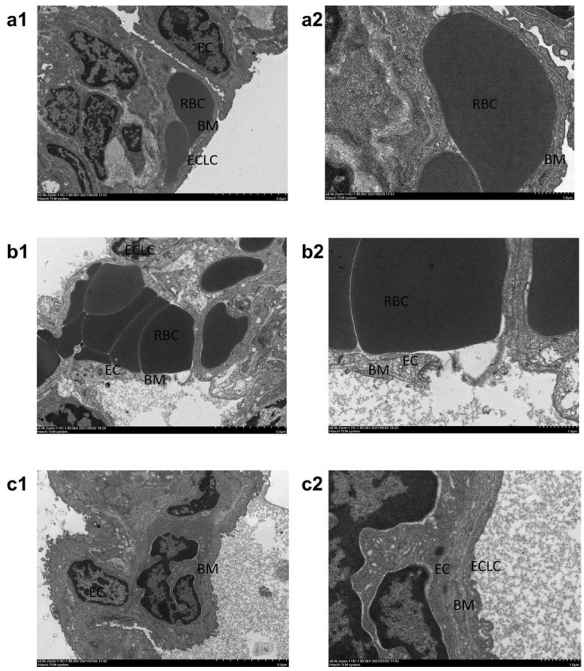



**Fig. 5 (abstract 000192)** Electron microscopy results
Among them, Fig. 5a1 shows a normal rabbit lung electron microscopy photo, the scale is 5.0um, the lung capillary structure is normal, endothelial cells (EC), capillary basement membrane (BM), lung epithelial cells (ECLC) morphological structure is basically normal and complete, red blood cells (RBC) can be seen in the capillary lumen, Fig. 5a2 is a magnified view of Fig. 5a1, the scale is 1.0 μm. Fig. 5b1 shows the pulmonary electron microscopy photo of the ARDS rabbit in the high-driving pressure group, the scale bar is 5.0um, red blood cells accumulate in the lumen of pulmonary capillaries, endothelial cells and lung epithelial cells are swollen, the capillary basement membrane structure is blurred, and some segments are broken, Fig. 5b2 is a magnified view of Fig. 5b1, the scale bar is 1.0um. Fig. 5c1 shows the pulmonary electron microscopy photo of the ARDS rabbit in the low-driving pressure group, the scale bar is 5.0um, some of the endothelial cell are swollen, but most of the structure of the capillary basement membrane is complete, Fig. 5c2 is a magnified view of Fig. 5c1, the scale bar is 1.0 μm.

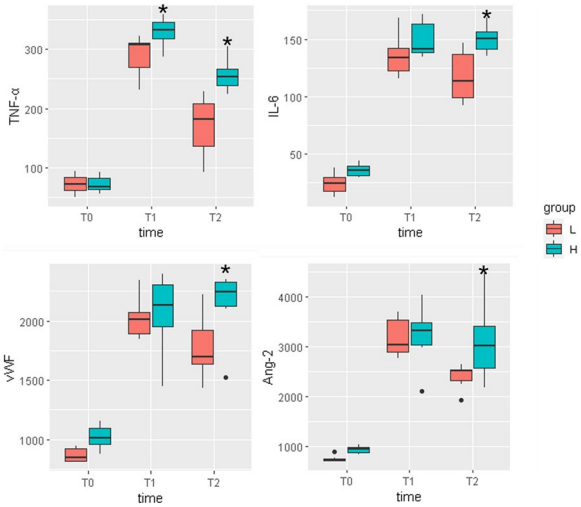



**Fig. 3 (abstract 000192)** Cytokine Profiling in Response to Ventilation Strategies
The cytokine levels in two distinct groups were assessed at three critical time points during the experiment. Blood samples were collected at T0, before the induction of ARDS; T1, following 60 min of ventilation with low CVP; and T2, after an additional 60 min of ventilation with high CVP. The cytokines analyzed included TNF-α, IL-6, Ang-2, and vWF, with a focus on elucidating differences between the two groups. At the T1 time point, it was observed that the high DP group exhibited a significant elevation in TNF-α levels compared to the low DP group. However, no significant differences were noted in the other cytokines at this juncture. At the T2 time point, the high DP group displayed higher levels of TNF-α, IL-6, Ang-2 and vWF in comparison to the low DP group.
TNF-α, tumor necrosis factor-α; IL-6, interleukin-6; Ang-2, angiopoietin-2; vWF, von Willebrand Factor.
* indicates a statistically significant difference between LDP group and HDP group.

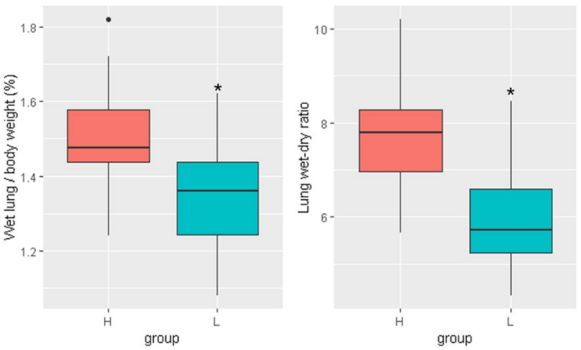



**Fig. 4 (abstract 000192)** Pulmonary Edema Comparison
Rabbits subjected to low DP group exhibited a significantly lower proportion of wet lung/body weight and lung wet-dry ratio compared to those exposed to high DP.
* indicates a statistically significant difference between the LDP group and the HDP group.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000193

## Long-term mortality and health-related quality of life after targeting a lower versus a higher oxygenation in ICU patients with COVID-19—results of the HOT-COVID trial

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**Introduction:** Coronavirus disease (COVID-19) can cause pneumonia and hypoxaemic respiratory failure necessitating oxygen therapy and admission to the intensive care unit (ICU). While targeted oxygenation in critically ill adults has been explored in several randomised clinical trials, only few COVID-19 patients have been included [1]. Concerns are growing about long-term sequelae in COVID-19, including its impact on health-related quality of life (HRQoL) [2]. The recent Handling Oxygenation Targets in COVID-19 (HOT-COVID) trial investigated the benefits and harms of a lower vs. a higher oxygenation target in adult ICU patients with COVID-19 and acute hypoxaemic respiratory failure [3]. In this trial, we found more days alive without life support in the lower-oxygenation group at 90 days, with secondary outcomes at this timepoint also supporting the lower oxygenation target, albeit not reaching statistical significance [3]. The present study report the pre-planned one-year mortality and HRQoL of the HOT-COVID trial [4].
**Objectives:** To assess effects of a lower vs. a higher oxygenation target in adult ICU patients with COVID-19 and acute hypoxaemic respiratory

failure on one-year all-cause mortality and HRQoL. We hypothesised that the lower oxygenation target would improve both long-term survival and HRQoL compared to the higher target.

**Methods:** The HOT-COVID trial was a multicentre, randomised trial which planned to allocate 780 patients 1:1 to an arterial partial pressure of oxygen ($PaO_2$) target of 8 kPa vs. 12 kPa throughout their ICU stay for up to 90 days, including readmissions [3,4]. HRQoL was assessed using EuroQol 5 dimensions 5 levels (EQ-5D-5L) questionnaire and EQ visual analogue scale (EQ-VAS) [5]. Both outcomes were assessed at one-year follow-up in the intention-to-treat population; we assigned the worst possible score to deceased patients and applied multiple imputation for missing values in the EQ-VAS analysis. Secondary analyses of HRQoL were performed in survivors only.

**Results:** The trial was terminated early due to slow enrolment. We obtained one-year vital status for 691/726 (95.2%) and HRQoL for 642/726 (88.4%) patients. At one year, mortality was 33.6% (117/348) in the lower-oxygenation group and 39.1% (134/343) in the higher-oxygenation group (adjusted risk ratio: 0.85; 98.6% confidence interval (CI); 0.66 to 1.09 points; $p = 0.11$). Kaplan–Meier survival curves are shown in Fig. 1. Median EQ-VAS scores were 50 (interquartile range (IQR) 0–80) in the lower-oxygenation group and 40 (IQR 0–75) in the higher-oxygenation group (adjusted mean difference: 4.8; 98.6% CI − 2.2–11.9; $p = 0.09$) (Fig. 1). Similarly, we found no statistically significant differences in the analysis of survivors only.

**Conclusions:** In adult ICU patients with COVID-19 and acute hypoxaemic respiratory failure, a lower vs. a higher oxygenation target did not statistically significantly increase one-year survival or HRQoL, but the results indicate a potential overall benefit with the lower oxygenation target.

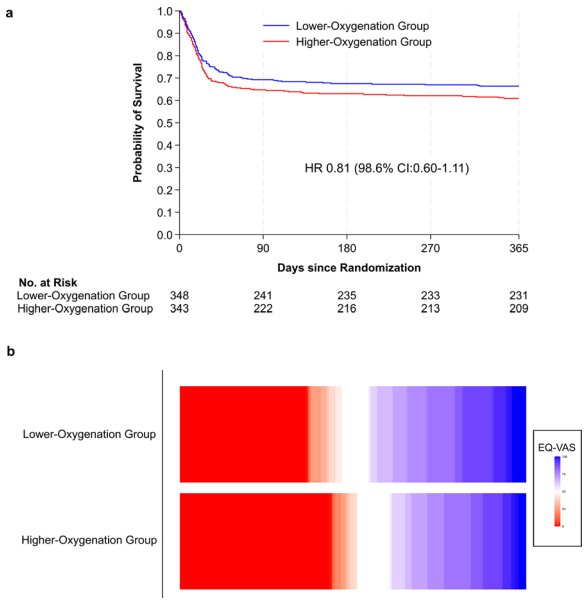


**Fig. 1 (abstract 000193)** Kaplan–Meier estimates of survival and heatmap of Euro-QoL Visual Analogue Scale data. a) Shown are the Kaplan–Meier plots of survival administratively censored at 365 days. Hazards ratio (HR) from Cox proportional hazards model adjusted for trial site. b) Shown is the distribution of EuroQol Visual Analogue Scale (EQ-VAS) data as horizontally stacked proportions in the two intervention groups; non-survivors were assigned a score of zero. Scores range from 0 to 100 and are represented by a colour scale ranging from red (worse outcomes) and blue (better outcomes) as illustrated in the legend. The horizontal axis represents the cumulated proportions of patients scoring at or below the corresponding value depicted in the legend

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000194

### Case Report: Successful Treatment of Cerebral Phaeohyphomycosis with Voriconazole

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000194

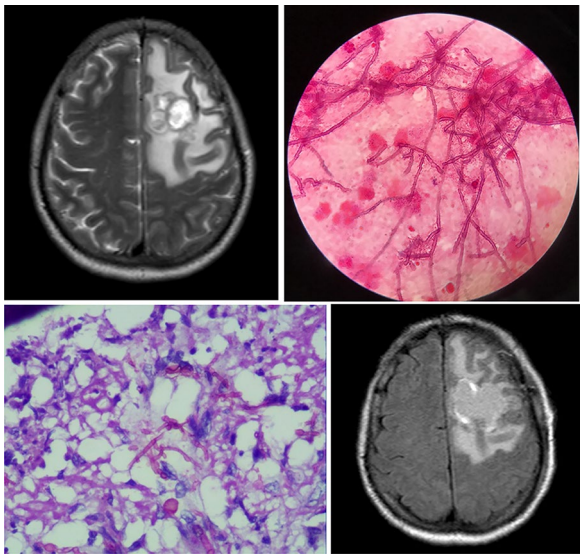
**Introduction:** Fonsecaea monophora is a kind of melanized fungi thatbelongs to Chaetothyriales and occurs mostly in tropicalregions, causing skin abscesses and infection. Fonsecaeamonophora is rarely found in central nervous system (CNS) infections. Cerebral phaeohyphomycosis is a CNS infectioncaused by dematiaceous fungi, and most cases of cerebralphaeohyphomycosis present as a brain abscess. Early identificationof cerebral phaeohyphomycosis is crucial; withoutprompt diagnosis, antifungal therapy is often delayed, whichleads to a high death rate. We report a case of cerebralphaeohyphomycosis caused by F. monophora in China. The patient improved with surgical intervention and voriconazole monotherapy.

**Objectives:** Fonsecaea monophora is a species of Fonsecaea that belongs to Chaetothyriales. It is usually isolated fromtropical and subtropical regions, causing reactive inflammation, skin abscesses, and pain. Cerebral infection caused by F. monophora is rare but often fatal. Diagnosing this disease at an early stage is difficult, and appropriate antifungal therapy isoften delayed as a result.

**Methods:** We report the case of a 53-year-old woman with type 2 diabetes who presented with a headache2months ago and progressive right-sided weakness of 1 month's duration. Magnetic resonance imaging revealed a spaceoccupyinglesion in the left frontal lobe and corpus callosum.

**Results:** The cystic mass was removed by surgical intervention, and theidentification of the sample based on sequencing of the internal transcribed spaced region in BLAST-N search showed thatthe sequences producing most significant alignments were F. monophora or similar (query cover 99%, *E* value 0.0, per ident 99.84).

**Conclusions:** Patient was treated with a 3-month course of twice daily voriconazole, leading to complete recovery. Consent to publish was obtained from the patient.



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2. I would like to express my appreciation of the help from my partners Li Chao and my family members (Sun Pu, Bai zhirui, Bai zhimo)

**Topic:** Infections and prevention

## 000195

## Improving patient care transitions from the Intensive Care Unit to the ward by learning from everyday practice. A multicenter qualitative study on Work-As-Done from the perspective of nurses, patients and relatives

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**Introduction:** The transition from the Intensive Care Unit (ICU) to the ward is an important episode in the patient's healthcare trajectory. Patients and relatives often find this transition difficult, because of the changes in care intensity and the shift of focus from stabilization and recovery to rehabilitation. While numerous procedures have been developed to optimize the transitional care process, little is known about how clinicians deal with the varying circumstances in daily practice and how their actions impact the quality of these transitions (i.e., Safety II).
**Objectives:** To gain better understanding of the everyday practices ('Work-As-Done') that hinder and facilitate patient care transitions from the ICU to the ward.
**Methods:** Multiple qualitative case studies in the ICU and various wards of three Dutch hospitals. Adult patients planned to be transferred were purposively sampled on a variety of characteristics along with their relative (if present), and the ICU and ward nurses who were involved in the transition process. Data were collected by using multiple sources (i.e., observations, semi-structured interviews and a qualitative survey) and then systematically analyzed using the thematic analysis approach until saturation was reached.
**Results:** Twenty-six cases were studied. For each case, the actual transfer was observed. Sixteen patients, five relatives and 36 nurses were interviewed. Two patients completed the survey. Fifteen themes emerged from the data, showing that the quality of transitions is influenced by the extent to which nurses anticipate to patient-specific needs (e.g., providing timely and adequate information, orientation, mental support and aftercare) and to the needs of the counterpart to continue care (e.g., by preparing handovers) besides following standard procedures. Data also shows that procedures sometimes interfere with what works best in practice (e.g., communication via a liaison service instead of direct communication between ICU and ward nurses).
**Conclusions:** Subtle, non-technical nursing skills play an important role in comforting patients and in the coordination of care when patients are transferred from the ICU to the ward. These Work-As-Done findings and their underlying narratives, that are often overlooked when focusing on quality improvement, can be used as material to

reflect on daily practice, and in turn, may stimulate ICU and ward staff in crafting interventions for optimizing the transition process.

**Reference(s)**

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**Topic:** Nursing care and physiotherapy

## 000196

## Major surgery induces CD8 T cell immunometabolic paralysis through stress-induced mitochondrial hyperfusion

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**Introduction:** Major surgery induces a profound immunological dysregulation frequently resulting in post-surgical immunosuppression. This pathological response particularly impairs the function of cytotoxic CD8+T cells (CTLs), which are important for effective clearance of pathogens, putting patients at risk of severe and life-threatening postoperative complications. For instance, almost 10% of patients undergoing elective major surgery develop postoperative nosocomial infections, leading to an increased mortality and additional healthcare costs of 20,000–40,000 US$ per incident [1, 2].
**Objectives:** Previously, we demonstrated that cardiopulmonary surgery leads to the transient generation of myeloid-derived suppressor cells (MDSCs) that induce massive immunoparalysis of human CTL [3], the exact mechanisms of which are currently unknown. Thus, we aimed at examining MDSC-specific immunosuppressive mechanisms and the underlying pathophysiology of postoperative CTL immunoparalysis more in detail.
**Methods:** Blood was obtained at the beginning (T1), the end (T2) of surgery and on the first postoperative day (T3) (Ethics approval: 17-241, LMU Munich). MDSC and CTL were isolated via magnetic cell separation. Cytotoxicity was assessed by Electric Cell-Substrate Impedance Sensing (ECIS). Espression profiles were determined using Next-Generation Sequencing (NGS) and proteomics. Patient serum was analysed by proteomics and metabolomics. Analysis of Reactive Oxygen Species (ROS), mitochondrial membrane potential (ΔΨm), metabolism and structure of CTL was performed using CellROX, JC1, and Seahorse.
**Results:** First, we could show that MDSC-mediated immunosuppression is a general phenomenon after major surgery and is not restricted to cardiopulmonary surgery: We detected newly emerging, acutely occurring MDSC not only after cardiac but also after other types of major surgery. CTL after major surgery (T2-CTL) displayed impaired cytotoxicity (Fig. A, − 14%±3.2%, $p=0.0074$), and IFNγ secretion was almost abrogated (− 91.1±6.5%, $p=0.0039$) compared to preoperatively isolated CTLs of the same patient (T1). As a potential cause NGS and proteomics of MDSC as well as serum proteomics and -metabolomics revealed a strong potential of ROS-production in MDSC and consecutive secretion (Fig. B-D). Mitochondria are especially prone to oxidative stress and mitochondrial fitness is directly linked to cytotoxic effector functions of CTLs. We thus next assessed CTL ROS levels and mitochondrial function in more detail: T2-CTL were shown to take up the produced ROS (Fig. E (left), +21.7%±9%, $p=0.0443$), decreasing antioxidative Glutathione in CTL (Fig. E right). T2 CTL exhibited a declined mitochondrial membrane potential (ΔΨm, Fig. F (left) − 17.4±5.8%, $p=0.0391$) accompanied by impaired mitochondrial oxidative respiration (Fig. F (right), − 58.7±35.7%, $p=0.0312$), and mitochondrial hyperfusion (Fig. G and H, mitochondria/cell: − 31.1±10.2%, $p=0.0069$; mitochondrial length: +620 nm, ±60 nm, $p<0.0001$). In contrast, fission-dependent mitochondrial translocation to the immunological synapse was severely restricted (Fig. I, − 51.6%±5.1%, $p<0.0001$). Importantly, reduction of excessive levels of mitochondrial ROS by Mitotempo, a mitochondria-specific ROS scavenger, improved mitochondrial respiration (Fig. H, +24,4±10.1%, $p=0.0312$), enhanced translocation of mitochondria to the immunological synapse (Fig. I, left +55.9±10%, $p=0.0002$) and improved cytotoxicity of CTLs as measured by ECIS (Fig. I, middle and right, +8.2±6%, $p=0.0256$.)
**Conclusions:** Major surgery induces systemic oxidative stress caused -at least in part- by newly emerging MDSC. This mechanism is responsible for damaging CTL mitochondria, leading to impaired mitochondrial integrity, collapse of the mitochondrial membrane potential and reduced mitochondrial respiration. To compensate for this severe mitochondrial dysfunction and to maintain basal metabolic functionality, mitochondria undergo hyperfusion at the expense of reduced translocation to the immunological synapse. This eventually deteriorates cytotoxic function of CTLs. Importantly, mitigation of excessive mitochondrial ROS partially abrogates mitochondrial damage and improves CTL cytotoxicity. Modulation of postoperative T-cell immunometabolism by reconstitution of mitochondrial fitness might represent a novel therapeutic approach to counteract postoperative immunoparalysis in the future.

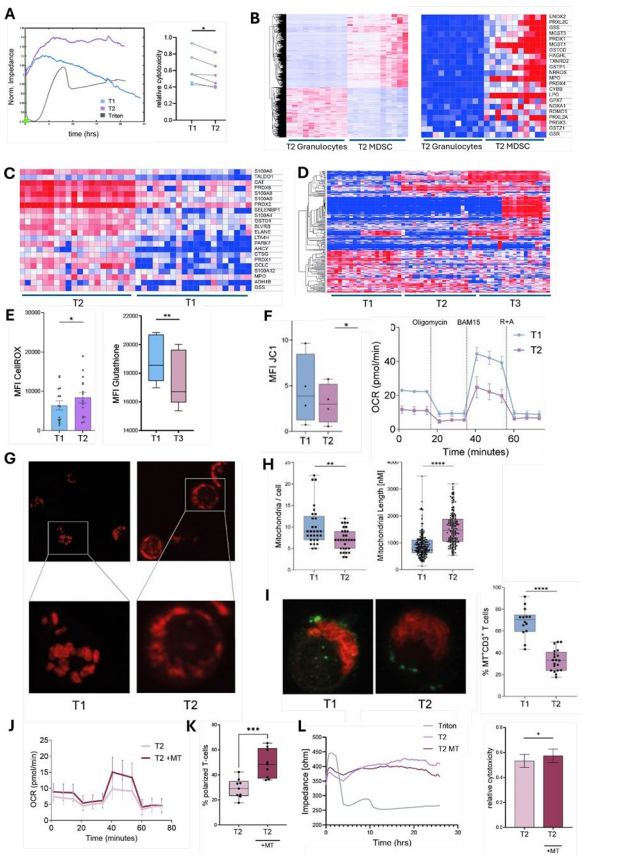


**Fig. (abstract 000196)** A–D: CD8+T cell (CTL) effector and mitochondrial function before (T1) and directly after (T2) major surgery. A) Cell lysis capacity of CTLs as measured by ECIS ($n=5$). B) NGS (left) and proteome (right) heatmap of T2 Granulocytes and MDSC ($n=11$). C+D) T1/T2 Serum proteome (E) and T1/T2/T3 metabolome (F) heatmap ($n=20$). E) CTL ROS content (left, $n=15$), antioxidative capacity (reduced Glutathione (GSH, right), n = 10). F) mitochondrial membrane integrity as measured by JC-1 staining (right, $n=4$) and OXPHOS ($n=6$, one representative example). G+H) Mitochondrial length and size in stimulated CTL. One representative confocal image is shown. I)

Mitochondrial translocation to the immuological synapse. One representative confocal image is shown. J) OXPHOS after incubation with Mitotempo (MT) ($n=6$, one representative experiment is shown). K) Mitochondrial translocation to the immunological synapse (left). L) T2 CTL function as measured by ECIS and cell lysis capacity (middle and right) after MT incubation ($n=9$)

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**Topic:** Translational biology

## 000197

### Changes in Driving Pressure and Arterial Blood Gases After V-V ECMO Initiation and Their Association with Hospital Mortality

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000197

**Introduction:** In patients with severe acute respiratory distress syndrome (ARDS), extracorporeal membrane oxygenation (ECMO) may improve survival [1]. During high flow veno-venous (V-V) ECMO therapy, decarboxylation becomes completely and oxygenation largely independent of ventilation and lung function. This allows intensivists to reduce the intensity of mechanical ventilation while ensuring adequate gas exchange. Therefore, improved gas exchange and reduced intensity of ventilation are likely the paths through which ECMO therapy exerts beneficial effects. However, it remains unknown to what extent improved gas exchange *versus* reduced intensity of mechanical ventilation may contribute to improved survival of patients treated with ECMO. Arterial partial pressures of oxygen ($paO_2$) and carbon dioxide ($paCO_2$) as well as arterial pH are important targets to prevent hypoxia and acidosis in patients with ARDS, while driving pressure ($DP = Pplat - PEEP$) [2] is a key driver of ventilator-induced lung injury (VILI). We hypothesized that decreased intensity of ventilation (reduced driving pressure) as well as improved gas exchange (increased $paO_2$ and pH, and reduced $paCO_2$) after ECMO initiation are associated with improved hospital survival.

**Methods:** Adult patients undergoing V–V ECMO therapy between 2019 and 2023 at Charité Universitätsmedizin Berlin, Berlin, Germany, with available ventilator data were eligible for this retrospective cohort study. Median driving pressure, $paO_2$, and $paCO_2$ during the 12 h before and after ECMO initiation were used to calculate changes during ECMO initiation. Parameters collected during a grace period of $\pm 2$ h around the time of ECMO initiation were excluded from these calculations to account for potential inaccuracies in the manual charting of ECMO initiation times. Multivariable logistic regression, adjusting for a broad range of confounding variables, was used to assess the association of changes in the aforementioned factors and hospital mortality. This study was approved by Charité's Ethics Committee (*EA2/139/20*).

**Results:** 237 patients with complete data for driving pressure and confounding variables were included. At baseline, the median driving pressure was 16cmH2O (13 to 19; interquartile range [IQR]), with a median reduction of – 4 $cmH_2O$ (− 7 to − 1; IQR) after ECMO initiation. Hospital mortality in the overall cohort was 51.9% ($n=123$). In adjusted analysis, higher baseline driving pressure was associated with increased risk of hospital mortality (adjusted odds ratio [aOR] 1.26 per 1 $cmH_2O$ increase, 95% confidence interval [CI] 1.09 to 1.47, $p=0.002$) and decreases in driving pressure after ECMO initiation were independently associated with decreased risk of hospital mortality (aOR 0.90 per 1 $cmH_2O$ decrease, 95%CI 0.81 to 0.99, $p=0.040$; adjusted risk difference [aRD] − 2.2% per 1 $cmH_2O$ decrease, 95%CI − 4.1% to − 0.2%; Fig. 1). Among patients with available arterial blood gas data before and after ECMO initiation ($n=126$), increases in $paO_2$ were associated with decreased hospital mortality (aOR 0.87 per 10 mmHg increase, 95%CI 0.77–0.98, $p=0.021$; aRD − 2.2% per 10mmHg increase, 95%CI − 4.0% to − 0.5%). Changes in paCO2 and pH were not associated with hospital mortality ($p=0.51$ and $p=0.10$, respectively).

**Conclusions:** Reducing driving pressure after ECMO initiation is associated with improved hospital survival of ARDS patients. Improvements in arterial levels of oxygen were further associated with better hospital survival. In our data, changes in arterial levels of carbon dioxide and pH were not associated with hospital survival.

These findings support the hypothesis that a substantial proportion of the beneficial effects of ECMO therapy in ARDS is explained by reduced intensity of mechanical ventilation. Further studies are needed to disentangle the paths through which ECMO exhibits beneficial effects and to identify patients most likely to benefit from this invasive intervention.

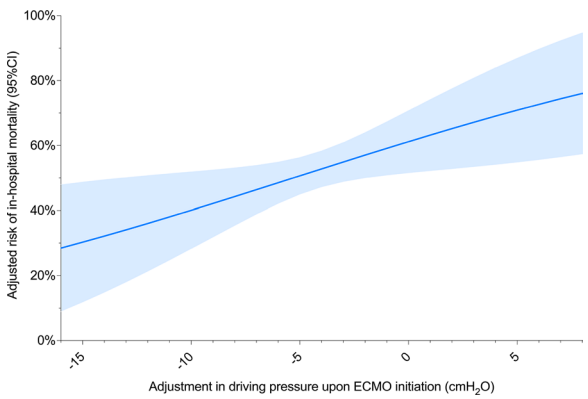


**Fig. 1 (abstract 000197)** Adjusted risk of hospital mortality by adjustments in driving pressure

Presented is the adjusted absolute risk of hospital mortality with 95% confidence intervals (95%CI) by adjustment in driving pressure upon ECMO initiation as obtained from the primary model. The range presented reflects adjustments from the 1st to the 99th percentile in the overall cohort. Hospital mortality in the overall cohort was 51.9%.

Abbreviations: 95 CI, 95 confidence interval.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000199

### CPAx as a predictor of hospital discharge destination in patients admitted to ICU requiring prolonged mechanical ventilation

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):** 000199

**Introduction:** Critical illness is associated with muscle weakness and physical dysfunction that often persists beyond (ICU) (1), necessitating the requirement for rehabilitation post hospital discharge. Early discharge planning can reduce hospital length of stay (LOS) and readmissions, however, the predictive quality of physical assessments on discharge destination performed in ICU is uncertain (2). We aimed to evaluate the predictive accuracy of the Chelsea Critical Care Physical Assessment tool (CPAx) on discharge destination in patients admitted to ICU requiring prolonged mechanical ventilation (MV).
**Methods:** Data for patients admitted to a large, UK, ICU between September 2022–2023 was collected. Patients requiring ≥ 5 days MV without severe neurological or traumatic injury were included. Patient demographics and hospital outcomes were collected retrospectively via electronic patient records. CPAx at first rehabilitation session, defined as MMS ≥ 2 (sitting on edge of the bed), and ICU discharge was collected. Discharge destination was reported as; home; home with rehabilitation (Community or outpatient); and inpatient rehabilitation.
**Results:** 71 patients were included with a median age of 60 (IQR; 44–69), APACHE II score of 17.6 (SD ± 5.6) and Charloson Comorbidity Index of 3 (IQR; 2–5). Sedation days was 10 (IQR; 7–14) and MV days was 21 (IQR;10–32) with 51 (72%) requiring tracheostomies. Time to mobilisation was 12 days (IQR; 9–17) with a median ICU and hospital LOS of 25 (IQR; 17–40) and 40 (IQR; 26–54) days. 33 (46%) were discharged home without rehabilitation, 20 (28%) home with rehabilitation, 6 (8%) required inpatient rehabilitation one patient was transferred to another hospital and 11 (16%) died.
**Discharge destination**: First mobilisation CPAx decreased progressively across the subgroups of patients discharged home with no rehabilitation (16, IQR: 12–25); home with rehabilitation (11; 8–14); and inpatient rehabilitation (9; 8–12) ($p < 0.001$). ICU discharge CPAx mirrored this, with 'no rehabilitation' scoring 40 (IQR; 34–43), home rehabilitation 35 (IQR; 30–39) and inpatient rehabilitation 21 (IQR; 17–28) ($p < 0.001$).

| | Cohort (*N* = 71) | Hospital Discharge Destination | | | | *p*-Value |
|---|---|---|---|---|---|---|
| | | Home No Rehab (*N* = 33) | Home With Rehab (*N* = 20) | Inpatient Rehab (*N* = 6) | Died in Hospital (*N* = 11) | |
| Physical Assessments at First Mobilisation | | | | | | |
| CPAx | 13 (10–18) | 16 (12–25) | 11 (8–14) | 9 (8–12) | 11 (10–14) | **< 0.001** |
| Physical Assessments at ICU Discharge | | | | | | |
| CPAx | 35 (30–41) | 40 (34–43) | 35 (30–39) | 21 (17–28) | 34 (29–37) | **0.001** |

Hospital discharge destinations were further dichotomised into home with no rehabilitation vs. ongoing rehabilitation/death. CPAx score was significantly predictive of discharge destination at first rehabilitation (AUROC of 0.80) and at ICU discharge (AUROC of 0.75). At first mobilisation, an optimal CPAx threshold of 13 was found with 71% of patients with CPAx > 13 was discharged home without rehabilitation compared to 28% of those with CPAx ≤ 13, yielding accuracy of 67% sensitivity and 76% specificity. At ICU discharge, the optimal thresholds were CPAx > 37 yielding a similar accuracy.
**Conclusions:** In patients requiring prolonged MV, CPAx score at first mobilisation and ICU discharge is a good predictor of discharge destination. Early, and accurate identification of discharge destination may reduce hospital LOS, streamline rehabilitation processes, and improve communication within the pathway. Further research comparing the predictive accuracy of the CPAx to other physical assessments is warranted.

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**Topic:** Nursing care and physiotherapy

## 000202

### Evaluating Post-Cardiac Arrest Imaging Protocols at Buckinghamshire Hospitals Trust ICU: A Comprehensive Audit from 2021 to 2023

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):** 000202

**Introduction:** The European Resuscitation Council advocates for CT brain and CT pulmonary angiography (CTPA) post-cardiac arrest to ascertain causality, focusing on pulmonary embolism or intracranial haemorrhage (1). This audit revisits and evaluates the implementation and outcomes of recommended imaging protocols within Buckinghamshire Healthcare NHS Trust's ICU following a preliminary audit in 2020, aiming to enhance post-arrest care pathways (2).
**Objectives:** To assess the adoption and impact of updated post-cardiac arrest imaging pathways in clinical practice, focusing on the diagnostic yield of CT scans in determining the cause of cardiac arrest.

**Methods:** A retrospective review of 104 patients admitted to ICU after in-hospital or out-of-hospital CPR from January 2021 to December 2023 was conducted. Data on CT scan administration, timings, and results were collected from patient records, discharge summaries, post-mortems, and death certificates.
**Results:** The audit of 104 post-cardiac arrest patients admitted from 2021 to 2023 revealed an increasing trend in admissions, with a significant uptick noted each year. Among the patients, 46% of those who underwent in-hospital CPR survived, compared to 34% for out-of-hospital CPR. While 64 patients presented with unclear causes of arrest, 40 had identifiable causes. CT imaging was performed in 97% of cases within 24 h. Despite a reduction in CT head scans from 86% in 2021 to 56% in 2023, the utilisation of CTPA remained stable, underscoring its importance in clinical assessment. Intracerebral haemorrhage ($n=4$) and ischemic stroke ($n=3$) were notable findings from CT head scans, while pneumonia and pulmonary embolism each accounted for 7 cases identified via CTPA. The data highlights the critical role of timely and targeted post-cardiac arrest imaging in enhancing patient outcomes.
**Conclusions:** The audit indicates a substantial diagnostic yield from CT imaging in post-CPR patients, underscoring the importance of adhering to updated imaging protocols. Despite a decrease in CT head scans, the consistent use of CTPA highlights its value in detecting potentially reversible causes of cardiac arrest. The findings advocate for ongoing protocol compliance to enhance patient outcomes post-arrest.

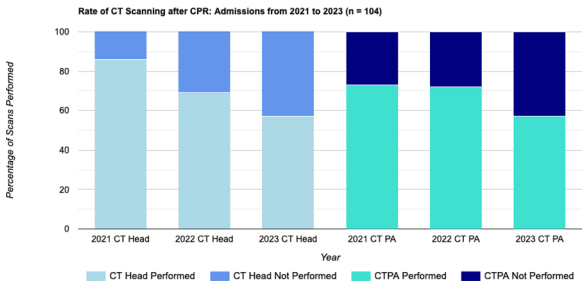


**Fig. (abstract 000202)** Rate of CT Scanning after CPR: Admissions from 2021 to 2023 ($n=104$)

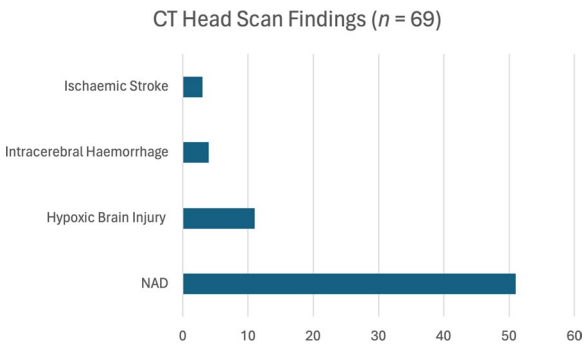


**Fig. (abstract 000202)** CT Head Scan Findings ($n=69$)

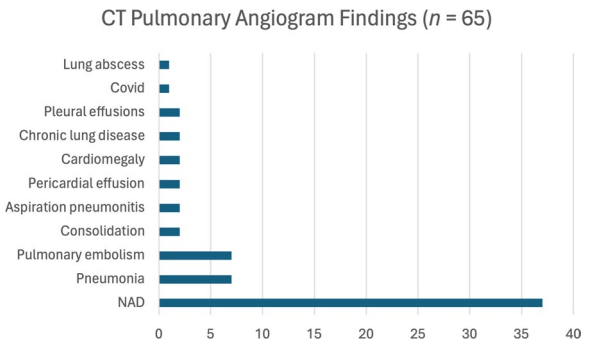


**Fig. (abstract 000202)** CT Pulmonary Angiogram Findings ($n=65$)

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3. None.

**Topic:** Cardiac arrest

## 000204

### An explainable machine-learning model for predicting persistent sepsis associated acute kidney injury: development, validation, and comparison with CCL14

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000204

**Introduction:** Persistent sepsis-associated acute kidney injury (SA-AKI) portends worse clinical outcomes and remains a therapeutic challenge for clinicians. Early identification and prediction of persistent SA-AKI is crucial. The aim of this study was to develop and validate an interpretable machine learning (ML) model that predicts persistent SA-AKI.
**Methods:** Four retrospective cohorts and one prospective cohort were used for model derivation and validation. The derivation cohort utilized the MIMIC-IV database, randomly split into 80% for model construction and 20% for internal validation. External validation is conducted using subsets of the MIMIC-III dataset, the e-ICU dataset, and retrospective cohorts from the ICU of a Northern Jiangsu people`s hospital. Prospective data from the same ICU were used for validation and compared with urinary CCL14 biomarker measurements. AKI was defined based on serum creatinine and urine output, using the kidney disease: Improving Global Outcomes (KDIGO) criteria. Routine clinical data within the first 24 h of ICU admission were collected, and eight ML algorithms were utilized to construct the prediction model. Multiple evaluation metrics, including the area under the receiver operating characteristic curve (AUC), were employed to compare predictive performance. Feature importance was ranked using SHAP, and the final model was explained accordingly.
**Results:** Among eight ML models, the Gradient Boosting Machine (GBM) model demonstrated superior discriminative ability. Following feature importance ranking, a final interpretable GBM model comprising nine features was established. The final model accurately predicted the occurrence of persistent SA-AKI in both internal (AUC = 0.872) and external validation cohorts (MIMIC-III subset: AUC = 0.889, e-ICU dataset: AUC = 0.930, North Jiangsu people`s Hospital retrospective cohort: AUC = 0.942). In the prospective cohort, the GBM model outperformed urinary CCL14 in predicting persistent SA-AKI (GBM AUC = 0.850 vs. CCL14 AUC = 0.821). Additionally, the model has been

transformed into an online clinical tool to facilitate its application in clinical settings.
**Conclusions:** Our interpretable GBM model successfully and accurately predicts the occurrence of persistent SA-AKI, alleviating concerns regarding the "black box" nature of ML techniques through non-direct interpretation.

**Topic:** Acute Kidney Injury and haemofiltration

## 000205

### The impact of temperature on gut microbiota in selective cerebral perfusion in neonatal arch surgery

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000205

**Introduction:** The optimal temperature for selective cerebral perfusion (SCP) during neonatal aortic arch surgery remains undetermined. The primary objective of SCP is to supply oxygenated blood to the brain while temporarily interrupting blood flow to other areas of the body during aortic arch surgery. Nevertheless, the efficacy of lower temperatures during SCP in enhancing organ protection during ischemia remains unknown.
**Objectives:** The gut microbiota undergoes developmental changes from birth and experiences significant maturation within the initial 24 months of life [1]. The impact of ischemia during aortoplasty beyond coarctation site on the integrity of the gut microbiome is poorly understood. Here, we aim to investigate the influence of temperature variation during SCP in neonatal aortic arch surgery and its subsequent impact on the gut microbiota.
**Methods:** We conducted a prospective cohort study to examine the gut microbiota composition in neonates diagnosed with aortic coarctation undergoing aortoplasty utilizing cardiopulmonary bypass (CPB) and SCP techniques. Patients were stratified into two groups based on SCP core temperature: mild hypothermia (30 °C) and moderate hypothermia (25 °C). Three patients who had cardiac surgery under CPB were recruited as control group. Demographic and clinical data were collected alongside stool specimens, which were subsequently analyzed using 16S rDNA and metagenomic sequencing technologies to characterize the fecal microbiome.
**Results:** We compared ten patients under mild hypothermia with four under moderate hypothermia. No mortality or neonatal enterocolitis occurred in our cohort. Although SCP duration was similar between groups, the moderate hypothermia group experienced longer operation, CPB, and cross-clamp durations. Feeding initiation time was consistent, but the mild hypothermia group reported higher gastrointestinal symptoms (4/10) compared to moderate hypothermia (1/3) and control (1/3). Alpha and beta diversity analysis showed similar microbiota composition within the SCP group, distinct from controls. In post-operative infections, mild hypothermia patients showed Staphylococcus species colonization at the CVC site in 9 cases, along with other infections. Moderate hypothermia patients exhibited similar colonization in fewer cases. Controls had only one patient with CVC site colonization.
**Conclusions:** Differences were observed in the gut microbiota composition of neonates who underwent SCP compared to those who solely underwent CPB. Both the mild and moderate hypothermia groups displayed increased bacterial colonization than control group. However, a larger sample size is required to sufficiently discern these differences.

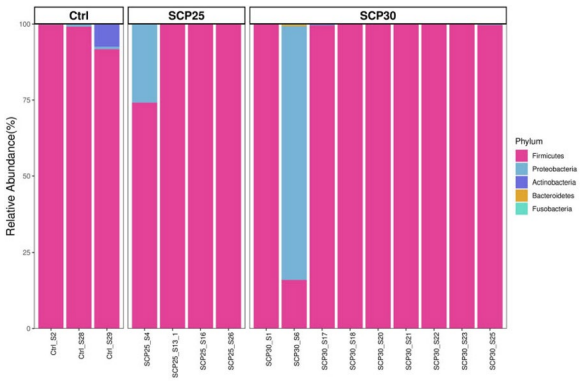


**Fig. (abstract 000205)** Gut microbiota in control group, moderate and mild hypothermia group

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2. This study was funded by a grant from Ministry of Science and Technology in Taiwan (MOST 112–2314-B-002 -180 -)

**Topic:** Infections and prevention

## 000207

### Relationship between strain energy and alveolar overdistension in patients with acute respiratory distress syndrome: a prospective observational study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000207

**Introduction:** Energy produced during mechanical ventilation has been established as a contributor to mortality in acute respiratory distress syndrome (ARDS) patients, elucidated through ventilator-induced lung injury (VILI). However, the potential association between strain energy, an engineering-based concept, and the risk of VILI remains unexplored.
**Objectives:** This study aims to investigate the correlation between strain energy and alveolar overdistension and the relationship between strain energy and single-breath mechanical power (MP) calculated by a simplified formula in patients with ARDS.
**Methods:** Ten sedated and paralyzed ARDS patients underwent decremental positive end-expiratory pressure titration by pressure-controlled ventilation, with simultaneous monitoring of esophageal pressure and electrical impedance tomography (EIT). Strain energy and single-breath MP were calculated using the following formulas from ventilator parameters.

— $\text{Strain energy} = 0.098 \times 1/2 \times (\text{Lung stress})2/12$ (joules).

Where the lung stress was determined as the following; Lung stress = plateau pressure × [1-(E_cw/E_rs)].

— Single breath MP (MPsb) = 0.098 × tidal volume × (PEEP + driving pressure) (Joules).

While EIT provided data on alveolar overdistension percentage (%OD) from EIT using the formula proposed by Costa et al.

**Results:** Enrolled ARDS patients had a mean age of 58.6 ± 22.5 years and $PaO_2/FiO_2$ of 148.3 ± 34.3. Strain energy and single-breath MP measured 1.9 ± 0.7 and 1.2 ± 0.5 J, respectively (Table 1).

In the evaluation of 10 patients, the strain energy demonstrated an elevation corresponding to changes in PEEP levels during the titration process. Across 70 events, a moderate correlation was identified between strain energy and the %OD, denoted by a correlation coefficient of 0.41 and a *p*-value < 0.001. Conversely, there was no discernible pattern in the MPsb observed throughout the PEEP titration. Consequently, no correlation was established between MPsb and %OD, with an r value of 0.10 and a *p*-value of 0.40.

No correlation was identified between strain energy and MPsb ($r = 0.01$, *p*-value 0.93). Furthermore, the values obtained from both parameters differed, as illustrated in Bland-Alman plot (Fig. 1).

According to the ROC analysis, the area under the curve for strain energy and MPsb in assessing potential alveolar overdistension was 0.735 (95% CI 0.617 to 0.853) and 0.569 (95% CI 0.433 to 0.706), respectively.

**Conclusions:** Strain energy demonstrates a stronger correlation with alveolar overdistension. This novel concept presents opportunities for further research aimed at preventing VILI.

**Table 1 (abstract 000207)** Respiratory mechanics during decremental PEEP titration

| Respiratory Mechanics | Overall population (N=10) |
|---|---|
| Optimal PEEP ($cmH_2O$) based on, mean (SD) | |
| RS compliance | 10.4 (3.0) |
| Zero Ptp at end-expiration | 15.1 (2.9) |
| EIT | 11.2 (2.1) |
| Strain Energy (joules), mean (SD) | 1.9 (0.7) |
| Single-Breath MP (joules), mean (SD) | 1.2 (0.5) |

Definition of abbreviations: n = number; SD = standard deviation; PEEP = positive end-expiratory pressure; RS = respiratory system; Ptp = transpulmonary pressure; EIT = electrical impedance tomography; MP = mechanical power

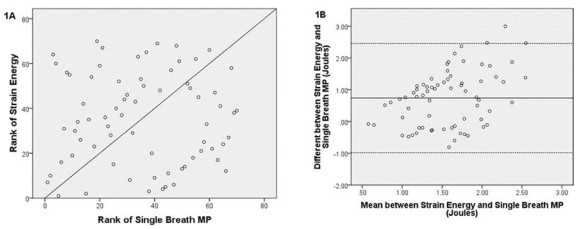


**Fig. 1 (abstract 000207)** A A linear relationship between strain energy and single-breath mechanical power without correlation ($r = 0.01$, *p*-value = 0.93); **1B** mean different values = 0.74 and standard deviation (SD) = 0.88. The limits are − 0.98 to 2.46 (mean 1.96 SD). As the mean of two measurements increases, the difference between the two measurements increases as well

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000210

### Inhibition of xanthine dehydrogenase protects against heatstroke-related acute kidney injury

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000210

**Introduction:** The military often faces extreme weather in combat, in which high temperature can easily lead to heatstroke and threaten the health of soldiers. Heatstroke-related acute kidney injury (HS-AKI) is a core visceral injury caused by heat stroke. Preventing and treating HS-AKI is important to maintain the health of army troops and improve the combat effectiveness of army forces. However, the underlying molecular mechanism of HS-AKI remain unclear and without effective mechanism-mediated treatment strategies.

**Objectives:** To investigate whether inhibition of xanthine dehydrogenase can protects against heatstroke-related acute kidney injury.

**Methods:** C57 male mice were divided into three groups: control group, HS group and febuxostat (Feb, an Xdh-specific inhibitor, 10 mg/kg/day) group. After establishing HS model, gene ontology (GO) was performed to investigated the enriched GO terms and differentially expressed protein. Western blots and RT-qPCR measured protein level and RNA level of differentially expressed protein in vivo and in vitro. Core body temperature was measured by rectal temperature of mice. Survival rate was calculated as percent survival versus time. Serum creatinine and urea were measured by colorimetric detection assay kit. Human kidney proximal tubule epithelial (HK-2) cells were treated with small interfering RNA against differentially expressed protein. Then, inflammation level was detected by western blots. Reactive oxygen species (ROS) Assay Kit measured ROS level.

**Results:** The GO enrichment analysis found that the differentially expressed proteins between the control group and HS group were mainly enriched in biological processes such as stress, inflammation and uric acid metabolic pathway. Xanthine dehydrogenase (Xdh), the key enzyme for uric acid metabolic pathway, protein level was greater in HS group than in control group. In vitro and in vivo validation confirmed that HS caused a significant increase in RNA and protein levels of Xdh. Compared with HS mice, core body temperature rise rate decreased in febuxostat group. Febuxostat ameliorated renal function impairment induced by HS. HS increased oxidative stress (ROS) and inflammation (TNFα, IL-6, IL-β) levels in HK2 cells. Small interfering RNA against xanthine dehydrogenase (siXdh) ameliorated oxidative stress and inflammation leaded by HS in HK2 cells.

**Conclusions:** Xdh promotes oxidative stress and inflammation in HS-AKI. Down-regulation of Xdh may be a promising target for preventing HS-AKI.

**Topic:** Acute Kidney Injury and haemofiltration

## 000211

## Development of a VAV-ECMO Simulator for Optimising Flow Diversion in a Patient with Compromised Cardiopulmonary Failure

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000211

**Introduction:** Veno-arterial-venous extracorporeal membrane oxygenation (VAV-ECMO) improves global oxygen delivery (DO2) while avoiding Harlequin syndrome in patients with cardiopulmonary failure. However, multiple considerations, including cardiac function, pulmonary oxygenation, and venovenous (VV) ECMO recirculation, complicate the optimal flow diversion between VA- and VV-ECMO flows at a fixed total ECMO flow. It is well known that the systemic and pulmonary circulation can be modelled as an electric circuit using a 5-element resistance–capacitance network with four cardiac chambers represented by time-varying elastance. In the model, the addition of a bypass circuit corresponding to the anatomical inlet/outlet sites allows us to simulate VA- or VV-ECMO circulation.
**Objectives:** The aim of this study was to investigate the impact of VAV-ECMO flow diversion with fixed total ECMO flow on haemodynamics and regional oxygen saturation in patients with cardiopulmonary failure by using a VAV-ECMO simulator.
**Methods:** As shown in Fig. 2, VA-ECMO dominant management in VAV-ECMO support significantly increased global DO2 compared with VV-ECMO dominant management (VV-ECMO alone: 123 mL/min vs. VA-ECMO alone: 469 mL/min) in extremely severe cardiopulmonary failure. In severe low pulmonary oxygenation (DL: 0.014 mL/min/mmHg) with preserved LV function, a high VA-ECMO ratio significantly reduced LV SO2 (VV-ECMO alone: 89% vs. VA-ECMO alone: 67%) indicating Harlequin syndrome. In severe LV dysfunction, a high VA-ECMO ratio increased LAP (VV-ECMO alone: 22 mmHg vs. VA-ECMO alone: 26 mmHg). Figure 3 illustrates an example of flow diversion guidance to achieve global DO2 $\geq$ 400 mL/min and LV $SO_2 \geq 80\%$. As shown in the left panel of Fig. 3, lower LV function and pulmonary oxygenation required a higher VA-ECMO ratio to maintain global DO2. However, in extremely low oxygenation with preserved LV function (the right panel of Fig. 3), a high VA-ECMO ratio induced the Harlequin syndrome (blue area).
**Results:** As shown in Fig. 2, VA-ECMO dominant management in VAV-ECMO support significantly increased global DO2 compared with VV-ECMO dominant management (VV-ECMO alone: 123 mL/min vs. VA-ECMO alone: 469 mL/min) in extremely severe cardiopulmonary failure. In severe low pulmonary oxygenation (DL: 0.014 mL/min/mmHg) with preserved LV function, a high VA-ECMO ratio significantly reduced LV SO2 (VV-ECMO alone: 89% vs. VA-ECMO alone: 67%) indicating Harlequin syndrome. In severe LV dysfunction, a high VA-ECMO ratio increased LAP (VV-ECMO alone: 22 mmHg vs. VA-ECMO alone: 26 mmHg). Figure 3 illustrates an example of flow diversion guidance to achieve global DO2 $\geq$ 400 mL/min and LV SO2 $\geq$ 80%. As shown in the left panel of Fig. 3, lower LV function and pulmonary oxygenation required a higher VA-ECMO ratio to maintain global DO2. However, in extremely low oxygenation with preserved LV function (the right panel of Fig. 3), a high VA-ECMO ratio induced the Harlequin syndrome (blue area).
**Conclusions:** Severely compromised pulmonary oxygenation requires the delicate flow adjustment of VA- and VV-ECMO flow balance considering LV function. Our developed VAV-ECMO Simulator can visualise the impact of VAV-ECMO flow diversion on haemodynamics and local oxygen saturation, and provide optimisation of ECMO flow in clinically challenging cases.

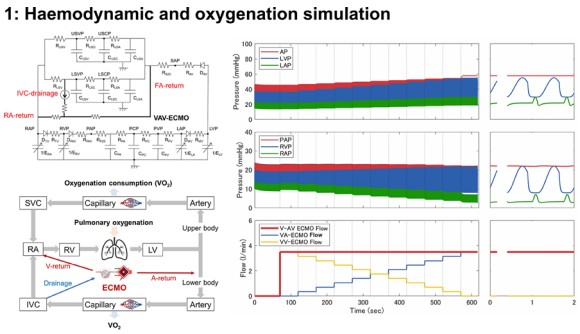


**Fig. 1 (abstract 000211)** Haemodynamic and oxygenation simulation

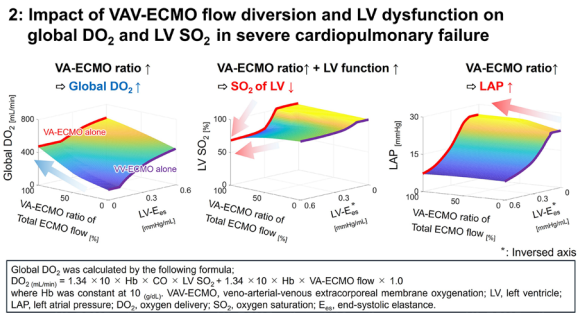


**Fig. 2 (abstract 000211)** Impact of VAV-ECMO flow diversion and LV dysfunction on global DO2 and LV SO2 in severe cardiopulmonary failure

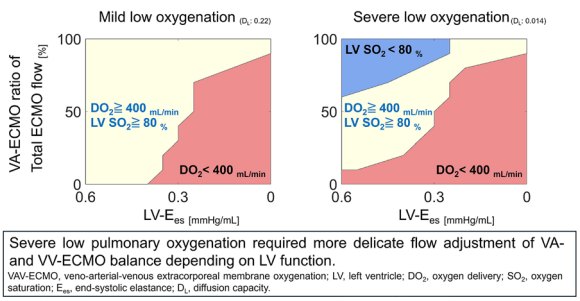


**Fig. 3 (abstract 000211)** VA-ECMO flow ratio to global DO2 $\geq$ 400 mL/min, LV SO2 $\geq$ 80%

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**Topic:** Cardiovascular issues in ICU

## 000213

### Circadian Temperature Rhythms and the Development of Critical Illness Myopathy

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000213

**Introduction:** Circadian rhythms can be disrupted in critically ill patients due to their severe illness and the artificial ICU environment (1). In the skeletal muscle, circadian disruption by Bmal1 knock out resulted in muscle atrophy and insulin resistance in mice (2). Critical Illness Myopathy is likely associated with muscle atrophy, weakness and insulin resistance, as shown by our research group (3–5). It is unclear if circadian disruption is associated with the development of Critical Illness Myopathy.
**Objectives:** To identify differences in circadian temperature rhythms in critically ill patients without Critical Illness Myopathy ("no-CIM") and with Critical Illness Myopathy ("CIM") in comparison to an immobilized healthy cohort.
**Methods:** This post-hoc analysis integrates unique data from an in-depth characterized Critical Illness Myopathy cohort from two prospectively conducted trials, consisting of ICU patients ≥ 18 years of age, SOFA Score ≥ 9, mechanical ventilation. Group categorization to "no-CIM" ($n = 30$) and "CIM" ($n = 32$) was performed by electrophysiological testing. Ethics vote: Charité EA2/061/06, and EA 2/041/10 (3–5). Healthy immobilized subjects from a bed rest study served as controls (6).
In this data-driven approach we compared circadian rhythms between the groups non-invasively, based on the digital biomarker temperature. Data analysis included: Cosinor analysis of high-frequency temperature data to identify amplitude, time of nadir and mesor using a 24-h period (7). Rhythm classification to *loss* (amplitude loss), *change* (phase shift) and *same* with use of the COMPARERHYTHMS library (8). Spearman correlation between temperature amplitude, time of nadir, mesor and myocyte cross-sectional area of Type I, IIa, and IIb fibers from *M.vastus lateralis* biopsies. Individual period estimation by Lomb-Scargle periodogram analysis.
**Results:** The temperature rhythm by cosinor analysis on ICU days 5 and 10, and the day before discharge is visualized in Fig. 1A, for healthy controls in Fig. 1B. Most critically ill patients in both the "no-CIM" and in the "CIM" groups showed either a temperature amplitude loss, phase shift or both, compared to immobilized healthy controls on all days studied. In the "no-CIM" group, the temperature amplitude was lower on the day before ICU discharge compared to the "CIM" group, mean difference [95% CI] 0.21 °C [0.09, 0.34], $p < 0.01$ (Fig. 2). Temperature amplitude was negatively correlated with myocyte cross-sectional area of Type I, IIa, and IIb fibers on the day before ICU discharge (Spearman correlation, Fig. 3A and 3B). Individual period analysis by Lomb-Scargle periodogram revealed a tendency for longer periods than 24 h in critically ill patients compared to healthy controls (Fig. 4).

**Conclusions:** Most critically ill patients without and with Critical Illness Myopathy presented with severely disrupted circadian temperature rhythms compared to immobilized healthy controls. Initially, temperature phase shifts were predominant in both ICU groups. On the day before ICU discharge, patients who did not develop Critical Illness Myopathy were more likely to have reduced temperature amplitudes, while more Critical Illness Myopathy patients remained their amplitude and their shifted temperature rhythms. Consistently, a higher temperature amplitude was associated with a lower myocyte cross-sectional area in muscle fibers. Reducing the amplitude of a phase shifted circadian rhythm may be an adaptive mechanism and protective regarding the development of Critical Illness Myopathy. Future studies are required to address this topic. The analysis of the clock network in the skeletal muscle itself during critical illness may provide further insights.
This analysis is limited by the sample size and the difficulty to control for confounders in the clinical data.

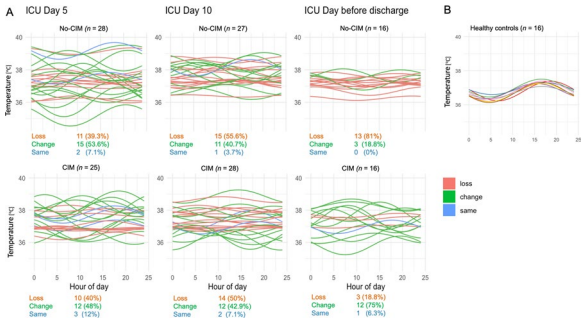


**Fig. 1 (abstract 000213)** **A** Cosinor analysis of temperature and rhythm classification to groups of "no-CIM" and "CIM" patients, ICU day 5, ICU day 10 and the day before ICU discharge. Each line represents one individual per day. Colors indicate the rhythm classification by COMPARERHYTHMS (8), orange = loss (temperature amplitude lower than in healthy controls), green = change (temperature phase shifted compared to healthy controls), blue = same. Amplitude threshold for the loss category based on the amplitude of the healthy cohort, patients below the minimum amplitude were primarily classified to the loss category and not considered for the change category. Fisher exact test for rhythm classification distribution "no-CIM" vs. "CIM", ICU day 5 $p = 0.78$, ICU day 10 $p = 1.0$, day before ICU discharge $p < 0.01$. **B** Cosinor analysis of temperature in immobilized healthy controls, raw data see (6)

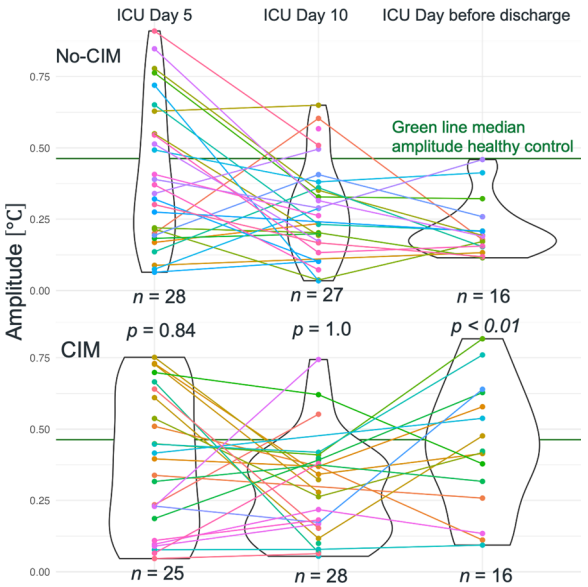


**Fig. 2 (abstract 000213)** Temperature amplitude in groups of "no-CIM" and "CIM" on ICU day 5, ICU day 10 and the day before ICU discharge. Individual trends are indicated by the colored lines. Amplitude determined by Cosinor analysis. Group comparison "no-CIM" vs. "CIM" by Mann–Whitney-U-test

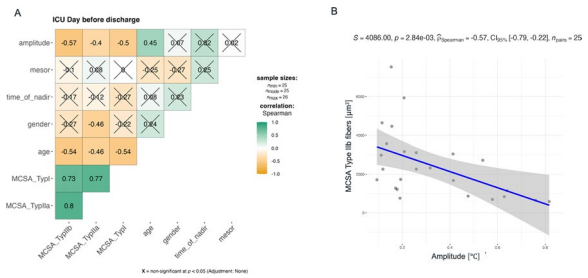


**Fig. 3 (abstract 000213)** **A** Temperature amplitude was negatively correlated with myocyte cross-sectional area (MCSA) of fibers Type I, IIa and IIb on the day before ICU discharge. MCSA by histological analysis of surgical *M.vastus lateralis* biopsies, a low MCSA is an indicator for muscle atrophy. **B** Spearman correlation exemplary shown for Type IIb fibers

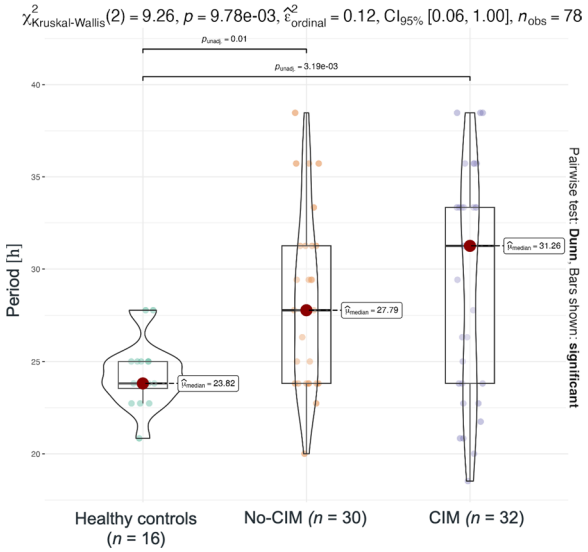


**Fig. 4 (abstract 000213)** Lomb-Scargle periodogram: ICU patients in the "no-CIM" and the "CIM" group presented with a median period above 24 h. Kruskal–Wallis ANOVA with pairwise post-hoc Dunn's test

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9. The two prospective trials were part of partial project 3 (Critical Illness Myopathy and timely electrical muscle stimulation) of Klinische Forschergruppe KFO 192 (Regulation und Fehlregulation von Muskelwachstum), funded by Deutsche Forschungsgemeinschaft (WE4386 1–2, 34181657), and Berlin Institute of Health research twinning grant 3 (S.Weber-Carstens).
10. L.J. Engelhardt is participant in the BIH Charité Junior Digital Clinician Scientist Program funded by the Charité – Universitätsmedizin Berlin, and the Berlin Institute of Health at Charité (BIH). L.J.Engelhardt is funded by the BIH Gender Equality Fund and the Lydia-Rabinowitsch Grant Charité – Universitätsmedizin Berlin


**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000214

### Evaluating the Impact of Glucocorticoids Therapy on 28-day Mortality Among ICU Patients with Severe Fever with Thrombocytopenia Syndrome: A Comprehensive Retrospective Analysis


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000214


**Introduction:** Severe fever with thrombocytopenia syndrome (SFTS) is an emerging tick-borne infectious disease first discovered in China in 2009 [1]. The disease is endemic in several Asian countries [2, 3]. In cases of severe condition, no effective drug or intervention has been shown to reduce mortality. In general, systemic glucocorticoid therapy serves as an adjunct treatment in patients with severe SFTS in clinical settings [4, 5]. However, no studies have specifically addressed the use of glucocorticoids in critically ill patients with SFTS in the intensive care unit (ICU).
**Objectives:** This study aimed to evaluate the potential benefits and risks of corticosteroid therapy in this patient group.
**Methods:** This retrospective observational study was conducted in the ICU of Yantai Qishan Hospital between July 2019 and April 2023. The participants were divided into glucocorticoid (GC) and non-glucocorticoid (non-GC) groups and propensity score matching (PSM) was employed to ensure comparability between the two groups. We used Cox proportional hazard models to examine the mortality risk associated with GC use, Kaplan–Meier survival analyses to assess overall survival, stratified Cox proportional hazard models for subgroup analyses, and likelihood ratio tests to examine the interactions between subgroups.
**Results:** The study of 218 SFTS patients found a median age of 71 years, 49.1% were male. 61.9% required mechanical ventilation, 58.3% received GC treatment, and the 28-day mortality rate was 61.5%. The post propensity score matching (PSM) analysis showed that glucocorticoid treatment improved 28-day mortality rates (Fig. 1), particularly when the Glasgow coma scale (GCS) was below 13 (GCS: 9–12, hazard ratio [HR]: 0.39, 95% confidence interval [CI]: 0.17–0.88, $p=0.024$; GCS: 3–8, HR: 0.09, 95% CI: 0.02–0.35, $p=0.001$), lactate levels exceeded 2 mmol/L (HR: 0.35, 95% CI: 0.15–0.83, $p=0.017$), and norepinephrine was used (HR: 0.26, 95% CI: 0.13–0.49, $p<0.001$). Combining antiviral (HR: 0.41, 95% CI: 0.22–0.78, $p=0.006$) or immunoglobulin therapy (HR: 0.22, 95% CI: 0.1–0.51, $p<0.001$) with GC treatment significantly decreased 28-day mortality rates, in comparison with GC monotherapy (Fig. 2).

**Conclusions:** Patients with severe SFTS in the ICU have a high 28-day mortality rate; however, using GC can reduce it, especially in those with a low GCS score, high lactate levels, and norepinephrine intake and those receiving combined antiviral or immunoglobulin therapy.

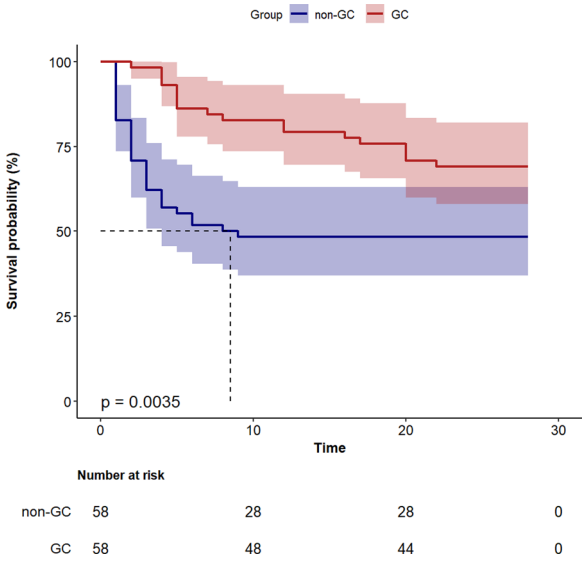


**Fig. 1 (abstract 000214)** Kaplan–Meier survival plots differentiated by the administration of glucocorticoids

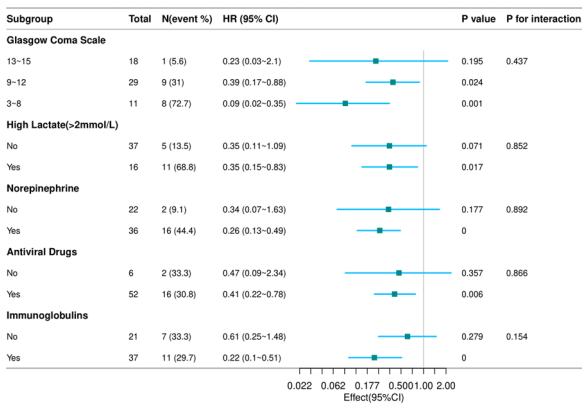


**Fig. 2 (abstract 000214)** Stratified analyses of the associations between GC use and 28-day mortality

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6. We express our appreciation to the laboratories and associated researchers who were instrumental in obtaining the original samples data that were essential to our research in Yantai Qishan Hospital.


**Topic:** Infections and prevention

## 000216

### 24-h in vivo isolated lung perfusion and independent lung ventilation: an innovative model for investigating lung injury propagation in ARDS

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000216

**Introduction:** In the initial phase of acute respiratory distress syndrome (ARDS), activated lung cells initiate an inflammatory process leading to alveolar flooding [1]. While the role of bloodstream-related biotrauma in ARDS is well recognized, the contribution of inflammatory biofluids displaced to unaffected regions through the airways has not been fully investigated [2]. Our group has developed an innovative model that entirely isolates circulation (in vivo isolated lung perfusion—IVLP) and ventilation (independent lung ventilation—ILV) of one lung.
**Objectives:** This study aims to utilize the IVLP + ILV platform to elucidate the complex interplay of biofluid-induced lung injury (BILI) vs bloodstream-related biotrauma in ARDS.
**Methods:** Six initial experiments were conducted to refine study techniques and achieve complete left lung isolation for up to 2 h. The additional experiment, described herein, extends IVLP + ILV up to 24 h. In a 57 kg female pig, a left-sided dual-lumen endotracheal tube was inserted for ILV. Lung protective ventilation was applied in both lungs (Table 1). Endovascular coiling was performed to occlude left bronchial circulation. Subsequently, via left thoracotomy, cannulation of the left pulmonary artery, left superior and inferior pulmonary veins was conducted, followed by isolation of the left lung from systemic circulation using vascular clamps (Fig. 1). IVLP was commenced with a recirculating blood-only extracorporeal circuit at a flow rate

of 550 mL/min. Carbon dioxide and nitrogen were connected to the oxygenator to maintain PaO2/PaCO2 of the left pulmonary artery within 40–45 mmHg. Pressures in the right pulmonary artery and left atrium, as well as pressures downstream the cannulas in the left pulmonary artery and left pulmonary vein (Fig. 1), were monitored. Activated clotting time (ACT) in the left pulmonary circulation was maintained > 200 s.

**Results:** The animal successfully survived 24 h. Respiratory mechanics and function of both the right and left lung remained stable throughout the experiment (Table 1). Similarly, pressures in the pulmonary arteries and veins of the two lungs did not significantly vary over the study duration. The complete isolation of the left lung circulation was confirmed by anticoagulant administration assay (heparin bolus administered in the circuit, and ACT measured in the isolated vs systemic circulation after 30 min—Fig. 2A), oxygenation test (FiO2 sequentially increased from 0.3 to 1 only in the right/left lung, and PaO2 measured in the circuit vs systemic circulation after 30 min—Fig. 2B), and computed tomography angiography conducted at the end of the study (Fig. 3).

**Conclusions:** To the best of our knowledge, this is the first model in which IVLP + ILV are achieved for 24 h. While further experiments are warranted to validate reproducibility, this platform offers an innovative approach to differentiate bloodstream vs airways propagation pathways in ARDS. Future goals involve inducing injury in the isolated lung, followed by controlled dissemination of inflammation.

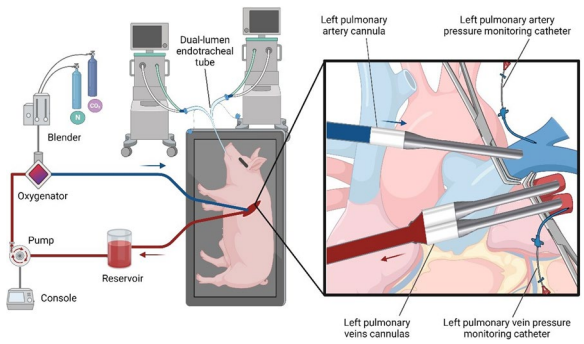


**Fig. 1 (abstract 000216)** Schematic representation of the study setting and in vivo isolated lung perfusion + independent lung ventilation system

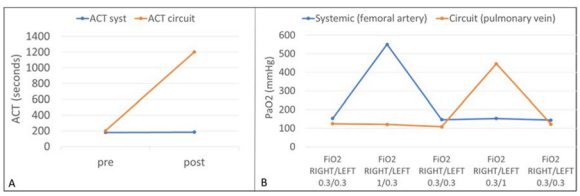


**Fig. 2 (abstract 000216)** Proof of complete isolation of the left lung circulation. Panel A—Anticoagulation Test: Activated clotting time (ACT) was measured in both systemic and extracorporeal circulation before and 30 min after administering a bolus of 2000 IU heparin in the isolated left lung circulation. Panel B—Oxygenation Test: $PaO_2$ was measured in both the systemic and extracorporeal circulation at varying FiO2 levels of the ventilator connected to the right/left lung. 30 min after increasing FiO2 solely in the right (non-isolated) lung, PaO2 increased to > 550mmHg systemically, while remaining unchanged in the circuit. Conversely, 30 min after increasing FiO2 solely in the left (isolated) lung, PaO2 increased to 445mmHg in the circuit but remained unchanged in the systemic circulation

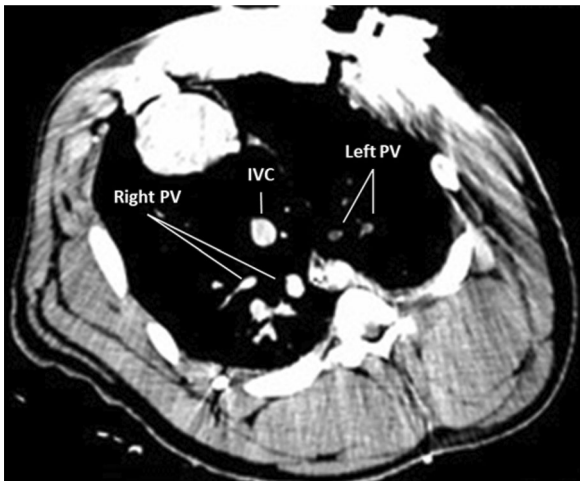


**Fig. 3 (abstract 000216)** Computed tomography angiography. At the conclusion of the experiment, contrast media was injected through the central venous line into the external jugular vein (systemic circulation). The image shows the contrast media in the vessels of the right lung (systemic circulation) after injection, while no contrast can be visualised in the vessels of the left lung (isolated circulation). IVC: inferior vena cava. PV: pulmonary veins

**Table 1 (abstract 000216)** Ventilatory settings, respiratory mechanics, gas exchange and vascular pressures of the right and left lung throughout the 24-h study

| | RIGHT LUNG | | | LEFT LUNG | | |
|---|---|---|---|---|---|---|
| Ventilatory mode | Pressure Regulated Volume controlled | | | Pressure Controlled | | |
| Tidal volume (mL) | 6.5mL/kg | | | 2.5mL/kg | | |
| PEEP ($cmH_2O$) | 8 | | | 5 | | |
| Respiratory rate per minute | 25 | | | 7 | | |
| FiO2 | 0.3 | | | 0.3 | | |
| **Timepoint** | **T0** | **T12** | **T24** | **T0** | **T12** | **T24** |
| Driving pressure ($cmH_2O$) | 11.0 | 11.0 | 12.2 | 9.8 | 13.1 | 11.2 |
| Compliance ($mL/cmH_2O$) | 35.6 | 33.7 | 29.7 | 17.8 | 13.6 | 12.7 |
| $PaO_2/FiO_2$ | 457 | 463 | 490 | 428.6 | 431.4 | 380 |
| Dead space (%) | 10.0 | 14.2 | 7.3 | 38.3 | 24.9 | 28.5 |
| Mean pulmonary artery pressure (mmHg) | 23 | 28 | 23 | 25 | 33 | 25 |
| Pulmonary vein pressure (mmHg) | 5 | 13 | 13 | 13 | 19 | 20 |

**Reference(s)**

1. This study was funded through the Innovation Grant awarded by the Prince Charles Hospital Foundation—The Prince Charles Hospital, Brisbane, Australia.
2. 1. Thompson BT, Chambers RC, Liu KD. Acute Respiratory Distress Syndrome. N Engl J Med 2017;377(19):1904–1905.
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**Topic:** Acute respiratory failure and mechanical ventilation

## 000217

### Using Task Oriented QC Story Tool to Reduce Port-A-Related Bloodstream Infections

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000217

**Introduction:** Cancer patients frequently rely on a Port-A during their cancer treatment. However, Port-A-related bloodstream infections can lead to sepsis, posing a life-threatening risk. We aim to enhance the quality of care for cancer patients and reduce the density of port-A-related bloodstream infections through cooperative interdepartmental teamwork.
**Objectives:** The density of Port-A-related bloodstream infections in our ward was 1.01‰ in 2020, which increased to 2.19‰ in 2021. This rise in Port-A infections also resulted in a higher mortality rate, and cooperative interdepartmental teamwork to take action. Referring to the TCPI (Taiwan Clinical Performance Indicator) index, we established a standard of 1.75‰ for Port-A-related bloodstream infections.

**Methods:** We utilize a task-oriented Quality Control (QC) story tool that includes the following components: 1. Clear definition of topics: We focus on five aspects, including the material of the Port-A, aseptic operation techniques, nursing care for Port-A needles, the procedure of Port-A needle insertion, and post-use handling of the Port-A. We select safe and efficient procedures for Port-A needle insertion, excellent flushing methods, Port-A needle retention time, and Port-A sealing methods as the four control items. 2. Determination of key breakthrough points: We establish standard Port-A needle insertion procedures, universally adopt direct flushing methods, mandate timely replacement of Port-A needles upon expiration, and use high-concentration antibiotics for sealing during hospitalization as the four key improvement points. 3. Strategy formulation: We select four major strategies, including joint development of AI programs with the information department, holding meetings at the nursing station to announce direct flushing methods, promoting timely replacement of Port-A needles through Line group communication, and implementing checks on the Port-A needle insertion procedure.
**Results:** The density of Port-A-related bloodstream infections decreased from 2.19‰ to 1.35‰ after strategy formulation, achieving a target rate of 190.9% and showing a progress rate of 38.35%. Key achievements include 1. Revision of standard procedures. 2. Reduction in the mortality rate of Port-A bloodstream infections from 17.2% to 16.8%.
**Conclusions:** The mortality rate of Port-A-related bloodstream infections decreased by only 0.4%. The primary limitation lies in the patients' poor condition and weakened immune systems. Furthermore, doctors' immediate use of effective antibiotics and timely removal of the Port-A also play a crucial role in reducing mortality rates. These factors contribute to the continued high rates of mortality, which remain uncontrollable.

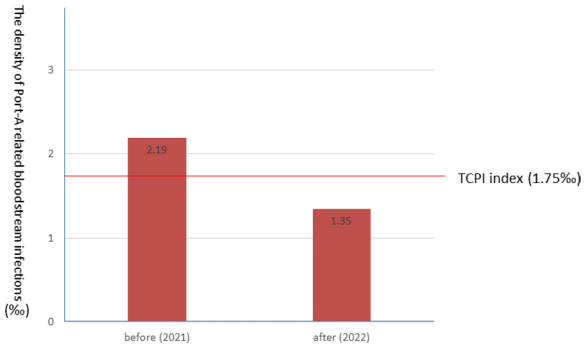


**Fig. 1 (abstract 000217)** Compared the outcomes before and after formulating strategies

**Reference(s)**

1. Velasquez Reyes DC, Bloomer M, Morphet J. Prevention of central venous line associated bloodstream infections in adult intensive care units: A systematic review. Intensive Crit Care Nurs. 2017 Dec;43:12–22. https://doi.org/10.1016/j.iccn.2017.05.006. Epub 2017 Jun 26. PMID: 28663107.
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**Topic:** Infections and prevention

## 000219

### Multitask learning to predict successful weaning in critically ill ventilated patients: a retrospective analysis of the MIMIC-IV database

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000219

**Introduction:** Weaning is an essential issue in critical care. This study explores the efficacy of multitask learning models in predicting successful weaning in critically ill ventilated patients using the Medical Information Mart for Intensive Care (MIMIC) IV database.
**Methods:** We employed a multitask learning framework with a shared bottom network to facilitate common knowledge extraction across all tasks. We explored distinct task combinations of multitask learning. We not only used Shapley additive explanations (SHAP) plot partial

dependence plot (PDP) for model explainability but also conducted error analysis. Area under receiver operating characteristic curve (AUROC), calibration plot and decision curve analysis were used to determine the performance of the model.
**Results:** We found that 78.5% of 7758 critically ill patients were successfully weaned. Multitask learning combined with spontaneous breath trial achieved a higher performance to predict successful weaning compared with multitask learning combined with shock and mortality (area under receiver operating characteristic curve, AUROC, $0.820 \pm 0.002$ vs $0.817 \pm 0.001$, $p < 0.001$). We employed not only calibration curve and decision curve analysis to examine the performance of the model but also the SHAP and PDP plots to interpret the model. The error analysis identified a relatively high error rate among those with low disease severities, including low mean airway pressure and high enteral feeding.
**Conclusions:** We demonstrated that multitask learning increased predictive accuracy for successful weaning through combining weaning relevant tasks. The model explainability and error analysis should enhance trust in AI models.

**Topic:** Acute respiratory failure and mechanical ventilation

## 000220

### Improved prognosis in sepsis patients: exploring the mediating role of platelet count increase in heparin treatment—a retrospective cohort analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000220

**Introduction:** Despite advancements in therapy, sepsis still exhibits high morbidity and mortality rates, and existing therapeutic options are constrained [1]. The role of heparin in sepsis therapy has been debated considerably [2–4]. The controversy regarding heparin's role as an anticoagulant for sepsis may arise from variations in sepsis definitions, study design, drug use timing and dose, maintenance duration, complication, and patient severity.
**Objectives:** This study aimed to determine the best timing and dosage of heparin for sepsis patients, identify those who would benefit most, and find lab indicators to measure heparin's effectiveness.
**Methods:** This retrospective cohort study used the MIMIC-IV dataset to analyze sepsis patients based on sepsis 3.0 criteria. Patients were divided into heparin and non-heparin groups, and PSM was used to evaluate heparin's effectiveness. After that, the heparin group was divided into subgroups based on timing or dose for separate comparisons. To optimize the analysis of heparin treatment, the optimal heparin group was identified based on meeting the criteria for both early initiation and dose of heparin. In contrast, the non-optimal heparin group consisted of individuals who used heparin but did not meet these established criteria. The effectiveness of optimal heparin administration was determined, and a subgroup analysis was conducted to identify patients benefiting from heparin therapy. This analysis was performed using Cox proportional hazards models. Furthermore, causal mediation analysis (CMA) was performed to determine factors mediating the improvement in sepsis prognosis after heparin therapy.
**Results:** In total, 4149 participants were included: 2192 and 1957 in the heparin and non-heparin groups, respectively. After PSM, the effects of heparin therapy on 28-day mortality were better than those of non-heparin treatment (Fig. 1). Figure 2 illustrated the correlations between various heparin treatment regimens and sepsis outcomes. The optimal heparin group was more effective than others, except in cases where patients exhibited low white-blood-cell counts, alkalosis, and reduced platelet counts. Additionally, platelet count mediation analysis showed a mediation proportion of 14% (Fig. 3).
**Conclusions:** Early and sufficient heparin administration can significantly improve the prognosis of sepsis. Platelet count increase may be a potential indicator of heparin therapy effectiveness for sepsis. The findings of this study may help develop strategies for improving sepsis treatment.

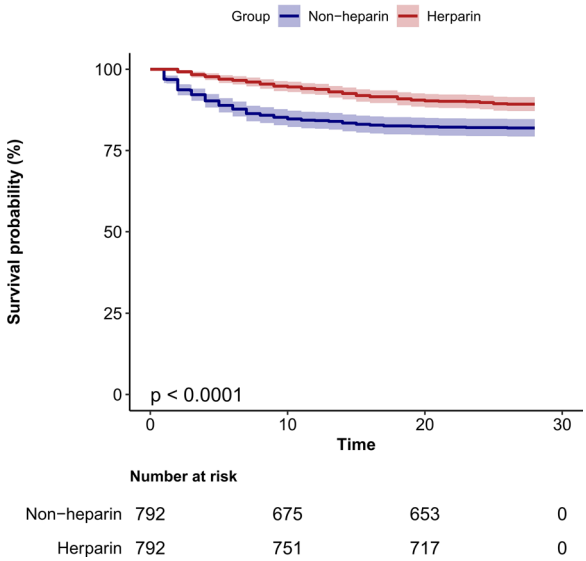


**Fig. 1 (abstract 000220)** Kaplan–Meier survival curves for patients with sepsis between the heparin and non-heparin groups

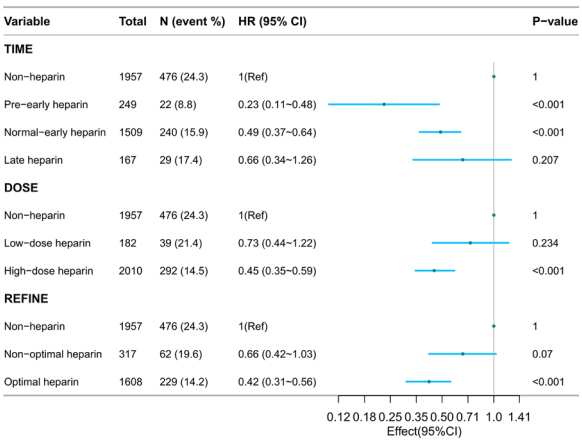


**Fig. 2 (abstract 000220)** Forest plot of 28-day mortality in different initiation times and doses of heparin-treatment groups
Cox proportional hazard model adjusted for different variables. The variables included sex, age, BMI, ethnicity, SOFA score, Elixhauser comorbidity score, hypertension, diabetes, CHD, CKD, COPD, and cancer. BMI, body mass index; CHD, Chronic heart disease; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; HR, Hazard ratio; 95% CI, 95% confidence interval; SOFA, sequential organ failure assessment.

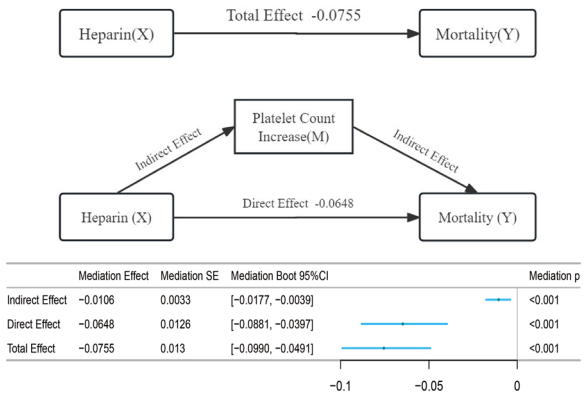


**Fig. 3 (abstract 000220)** Causal mediation analysis for assessment the influence of platelet count increase on the association between heparin administration and 28-day mortality

**Reference(s)**

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2. 1. The author(s) report no conflicts of interest in this work. Lin GL, McGinley JP, Drysdale SB, Pollard AJ. Epidemiology and Immune Pathogenesis of Viral Sepsis. Front Immunol. 2018;9:2147.
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4. 4. Iba T, Saito D, Wada H, Asakura H. Efficacy and bleeding risk of antithrombin supplementation in septic disseminated intravascular coagulation: a prospective multicenter survey. Thromb Res. 2012;130(3):e129–133.
5. We extend our heartfelt gratitude to the research group from BNRist, DCST, RIIT at Tsinghua University for their invaluable assistance in extracting crucial data from the database for our study.

**Topic:** Sepsis

## 000221

### Setting up a Neuro Outreach Service in a Tertiary hospital in Singapore: A pilot study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000221

**Introduction:** Tan Tock Seng Hospital is a tertiary 1000 bed hospital in Singapore, that focuses and specialises in neurocritical services. Due to a high volume of patients from electives, and emergency services needing neuro-related ICU and HDU beds, there was a ICU nurse-led initiatve to see if we could discharge patients in a timely manner without compromising care and safety, with the set up of a Neuro Outreach Service.
**Objectives:** The Neuro Outreach service was first proposed to mitigate the risk of neuro patients deteriorating in the General ward (GW). With a high attrition rate of nurses post COVID, the general ward nurses in non-neuro specialised GWs also have a large proportion of new nurses who are not well versed with managing specific neuro conditions, such as spinal cord injured patients, patients with an in-situ external ventricular drain (EVD), and performiing frequent tracheal toilet for tracheotomised patients following a neurologcal insult.
The objective was to provide a review for such patients within s 24 h window post discharge from ICU. The Neuro Outreach Service would review every patient that was discharged in the preceding 24 h and provide essentail training and assessment of the patient, such as Glasgow Coma Scale assessment, and EVD challenge. If there was any care gaps or practise malalignment that was identified at the bedside, this was highlighted in a non-putatitive way, and provided an opportunity to educate the general ward nurses to specific neurological assessments. The outreach team also provided just-in-time training on the care of such patients in the GW, with emphasis on some key areas, such as potential major complications such as pseudoaneursymal formation from a haematoma, or how to clinically detect cerebral vasospasm from Transcranial Doppler (TCD) Results: A survey of the GW nurses showed that itincreased their confidence and competency in caring for neuro-specific patients.
**Methods:** The Neuro Outreach Service consisted of 8 neuro trained ICU nurses. The would get a list of all patients transferred out of the ICU and HD from the electonic records, and this would allow for timely assessment and review in the GW within 24 h. All reviews and assessments were recorded. Each review consisted of a 30 min consultation with the nurse in charge at the GW bedside. Assessment of the patient was done together, and an opportunity to clarify any doubts was available. Neuro-specific tasks were carried out together e.g. challenging an EVD, and recreating suction to a redivac drain. Bedside GCS was also done together, especially in spinal cord injured patient, to ensure that a drop in power was not missed due to a haematoma formation, or extension of spinal cord injury. Results from 1 May 2022 to 29 Feb 2024 was collected for all patients that the Neuro Outreach Team reviewed in a non-neuro specialised GW.
**Results:** The neuro outreach team reviewed 100 patients from the period 1 May 2022 to 29 feb 2024 in non-neuro specialised GW beds. The outreach team provided just-in-time training on care for neuro = specific conditions. Inaccurate GCS scoring was the key practise gap identified and education was provided to approximately 80 nurses. In addition, a case of breakthrough diabetes insipidus was identified during the review. This resulted in a timely management of a medical condition, and negated the need for readmission to HD/ICU and provided an opportunity for bedside teaching of the biochemical and electrolyte issues encountered. This initiative has empowered ICU nurses to broaden their scope of expertise beyond the ICU, and given confidence to GW nurses to manage neuro-specific patients more confidently. The survey of GW nurses also confirmed that the majority (85%) found the neuro outreach service useful and beneficial for themselves and for their management of the patients under their care.
**Conclusions:** The Neuro Outreach Service is a an effective way to ensure the continuity of care of neuro-specific patients in non-neuro GWs.

**Reference(s)**

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**Topic:** Neurointensive care

## 000222

### Prediction of brain damage after out-of-hospital cardiac arrest: a new model

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000222

**Introduction:** Neurological prognosis in cardiac arrest (CA) is complex and multifactorial but crucial for decision-making and conveying information to the family. This justifies the search for a model to guide us regarding the most likely evolution of each patient.
**Objectives:** To describe a simple and easy-to-use prognostic model in the initial evaluation of neurological damage after out-of-hospital CA.

**Methods:** 195 patients after out-of-hospital CA of cardiac etiology between 2012 and 2023, excluding patients in whom a neurological assessment prior to death could not be performed. Variables present upon hospital admission were included. A multivariable binomial logistic regression was performed after univariable analysis, and the predictive capacity of the model was assessed using the ROC curve. A nomogram (Fig. 1) was constructed for the application of the predictive model. Results are presented as Odds Ratios (OR) and 95% confidence intervals (95% CI). R Studio version 2023.12.1 was used for statistical analysis.

**Results:** Overall hospital mortality was 35.9%, (0.9% vs 84.1%). The Table shows the results of univariable and multivariable analysis. The variables incorporated into the final model were age, time to return of spontaneous circulation (ROSC), CPR delay exceeding 5 min, and the use of AED (p-value < 0.05). The model has an area under the curve of 0.85 (95% CI 0.79–0.91), sensitivity of 65.9%, specificity of 84.1%, positive predictive value (PPV) of 75%, and negative predictive value (NPV) of 77%.

| | | | | Univariate | | | Multivariate | | |
|---|---|---|---|---|---|---|---|---|---|
| | | CPC 1–2 | CPC 3–4-5 | | OR -IC 95% | | | OR- IC 95% | |
| Number of patients | | 113 | 82 | OR | Inf | Sup | OR | Inf | Sup |
| Gender Male | | 101 (89%) | 61 (74%) | 0.345 | 0.159 | 0.751 | | | |
| Diabetes | | 20 (17%) | 26 (31%) | 2.159 | 1.104 | 4.220 | | | |
| Hypertension | | 51 (45%) | 48 (58%) | 1.716 | 0.966 | 3.049 | | | |
| Shockable Rhythm | | 91 (80%) | 54 (65%) | 2.145 | 1.117 | 4.117 | | | |
| STEMI ACS | | 52 (46%) | 42 (51%) | 0.812 | 0.459 | 1.435 | | | |
| CA Location | Location At Home | 51 (45%) | 50 (62%) | 2.67 | 1.209 | 5,911 | | | |
| | Location Street | 32 (28%) | 21 (26%) | 1.790 | 0.740 | 4.320 | | | |
| | Other location | 30 (27%) | 11 (13%) | | | | | | |
| Bystander CPR | | 97(85%) | 51(62%) | 0.271 | 0.136 | 0.542 | | | |
| Age (years) | | 54 [48–66] | 63 [55–73] | 1.031 | 1.010 | 1.052 | 1.045 | 1.017 | 1.071 |
| Time to ROSC(min) | | 17[10–25] | 26.5 [20–37] | 1.054 | 1.029 | 1.080 | 1.055 | 1.028 | 1.084 |
| CPR Delay Exceeding 5 min | | 13 (11%) | 46 (56%) | 9.820 | 4.760 | 20.270 | 8.223 | 3.756 | 18.004 |
| AED* | | 42 (37%) | 15(18%) | 2.642 | 1.342 | 5.202 | 0.447 | 0.192 | 1.042 |

**Conclusions:** This is a model with few explanatory variables, primarily based on age and factors related to the duration of the CA, and therefore easy to calculate. This model allows for initial patient stratification upon hospital admission. It exhibits adequate sensitivity and specificity, with good values of area under the curve.

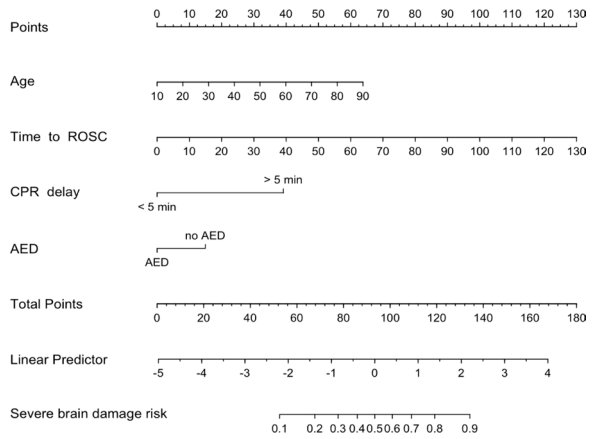


**Fig. 1 (abstract 000222)** Nomogram for the application of the predictive model

**Topic:** Cardiac arrest

## 000225

### Low rates of failed extubations vs. a high rate of failure to extubate: staff perceptions

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000225

**Introduction:** Usual rates of failed extubations in ICUs internationally is 10–20% [1] (failed extubations are defined by re-intubations within 48 h of extubation [2]). We are in a tertiary referral centre with mixed ICUs that include trauma and neurosurgery. We retrospectively collected all intubated patients' electronic charts over 19 months and found a failed extubation rate of only 4%.

**Objectives:** To determine the factors leading to low rates of failed extubation in order to develop appropriate interventions for quality improvement.

**Methods:** We retrospectively looked at data from January 2022 to August 2023 in both mixed ICUs and excluded the cardiothoracic ICU. We analysed the patients that were re-intubated and excluded those that were accidentally extubated, those re-intubated after more than 48 h, and those who needed intubation for a procedure under general anaesthesia. We surveyed our nursing and medical colleagues to assess attitudes and perceptions on failed extubation.

**Results:** Of 676 intubated patients during that period, 26 met inclusion criteria. The most common reason for re-intubation was respiratory failure (46%), followed by severe agitation (23%), coma (12%), post-extubation stridor (11%), aspiration of vomit (4%), and cardiac arrest (4%). The survey revealed that there is awareness we may be too cautious with our decisions, however the majority thought our rates were higher than they actually are. There is a perception that a failed extubation may reflect negatively on them as decision maker.

**Conclusions:** There is no set practice for weaning ventilation and most patients underwent very slow weaning prior to extubation. There are other factors that may have contributed to longer mechanical ventilation including the use of benzodiazepines for sedating neurosurgical patients and the pursuit of the 'perfect' extubation parameters, a rare occurrence in any ICU. Suggestions for improvement include a culture shift and empowering nursing and medical staff for more aggressive weaning plans and updating our protocol to include SBTs, SATs, and cuff leak tests.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000228

### The impact of blood cell salvage on transfusion requirements after decannulation from veno-venous extracorporeal membrane oxygenation: An emulated trial analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000228

**Introduction:** Veno-venous extracorporeal membrane oxygenation (VV-ECMO) is an established supportive therapy for acute respiratory distress syndrome (ARDS) [1,2], however it is associated with blood loss and the need for allogeneic packed red blood cell (PRBC) transfusion, particularly during decannulation [3, 4]. Blood cell salvage (BCS) can reduce the need for blood transfusion, yet it is not consistently used in UK ECMO centres or internationally.
**Objectives:** Our primary outcome was the total number of PRBC units transfused within the two calendar days following ECMO decannulation. Secondary outcomes included (1) changes in pre-specified haematological (i.e., Hb, platelets), inflammatory (i.e., C-reactive protein (CRP), white cell count (WCC)), and coagulation (activated partial thromboplastin time (APTT), international normalised ratio (INR), fibrinogen) laboratory measurements before and after decannulation; and (2) transfusion of other blood products in the same time interval.
**Methods:** We conducted an emulated trial of patients receiving VV-ECMO over 7.5 years (January 2015 to August 2022) in two high volume ECMO centres, comparing BCS to non-blood cell salvage (n-BCS) during decannulation. We estimated the average treatment effect of BCS on Hb and blood product transfusion within two calendar days of decannulation.
**Results:** We included 841 patients who underwent VV-ECMO decannulation. The mean number of packed red blood cells (PRBC) transfused with BCS was 0.23 (95%CI: 0.20, 0.27) units compared to 0.47 (95%CI: 0.42, 0.53) units with n-BCS; an average treatment effect for BCS of − 0.24 (95%CI: − 0.34, − 0.15) units. BCS reduced the risk of receiving any PRBC transfusion following decannulation by -11.3% (95%CI: − 17.6%, − 5.5%). BCS also resulted in a mean Hb increase of 1.4 (95%CI: 0.8, 2.0) g/L contrasting with a mean Hb decrease of 4.1 (95%CI: 3.6, 4.8) g/L with n-BCS. We found no effect of decannulation, or BCS compared to n-BCS on platelet levels. Fibrinogen levels overall decreased by clinically insignificant amount following decannulation (− 0.3; 95%CI: − 0.1, − 0.5 g/L) but no effect of BCS usage was observed. There was a small difference in mean white cell counts (WCC) (14.0; 95%CI: 13.2, 14.8 × 109/L versus 16.4; 95%CI: 15.8, 17.1 × 109/L) between treatment groups before decannulation, but no effects of decannulation or BCS use were observed. There was a decrease in CRP levels by 8.4 (95%CI: 5.0, 11.8) mg/L following decannulation, irrespective of BCS usage.

**Table 1 (abstract 000228)** PRBCs transfused with estimated population averaged mean PRBC counts

| | Non- Blood Cell Salvage (n = 446) | Blood Cell Salvage (n = 395) |
|---|---|---|
| Any PRBC Transfusion | 141 (32%) | 82 (21%) |
| PRBC Units transfused: | | |
| 0 | 305 (68%) | 313 (79%) |
| 1 | 89 (20%) | 70 (18%) |
| 2 | 41 (9.2%) | 12 (3.0%) |
| 3 | 4 (0.9%) | 0 (0%) |
| 4 | 6 (1.3%) | 0 (0%) |
| 5 | 1 (0.2%) | 0 (0%) |
| ITT mean count | 0.47 (95%CI: 0.42, 0.53) | 0.23 (95%CI: 0.2, 0.27) |
| PP mean count | 0.47 (95%CI: 0.42, 0.53) | 0.21 (95%CI: 0.18, 0.25) |

*n* (%); (95%CI)—95% Confidence Interval; ITT—Intention To Treat; PP—Per Protocol; PRBC—Packed Red Blood Cells

**Conclusions:** These findings suggest BCS should be considered particularly for specific patient populations or in scenarios where the availability of PRBC is scarce. Future research is required to refine our understanding of the cost-effectiveness of BCS.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000229

### Assessment of microcirculatory dysfunction by optical coherence tomography angiography in septic shock—a preliminary report

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**Introduction:** Sepsis is a life-threatening organ dysfunction caused by a dysregulated host response to infection [1]. Microcirculatory dysfunction is common in septic shock (SS), and has prognostic implications associated with increased organ failure and mortality [2–4]. *Optical coherence tomography angiography* (OCTA) is a relatively novel imaging technique that enables investigation of retinal microcirculation in a non-invasive and reproducible manner, providing high-resolution images within seconds [5]. The interpretation of OCTA findings can be fully automated [6]. Additionally, the retinal microcirculation may serve as a surrogate for changes in more critical vascular beds, such as the brain, compared to the sublingual region. We aim to

demonstrate the feasibility of OCTA in improving the assessment of microcirculatory dysfunction during SS.
**Objectives:** To characterize alterations in retinal microcirculation in SS.
**Methods:** We are conducting an ongoing prospective cross-sectional case–control study at the Intensive Care Department of Hospital da Luz Lisboa. Adult patients (≥ 18 years-old) with SS (defined according to Sepsis-3 criteria1 plus a SOFA score5 with ≥ 3 points in the cardiovascular system, despite adequate volume resuscitation) are being enrolled. Patients with pre-existing retinal pathology are excluded. Healthy voluntary controls are recruited from hospital staff and matched by age (± 5 years) and gender. An OCTA of both eyes is performed within 24 h of SS diagnosis. OCTA microcirculatory metrics are compared between groups using paired Wilcoxon signed-rank test.
**Results:** To date, we have enrolled 8 patients and 8 controls, representing 27% of intended sample size. Fifty percent of participants were females. The median age of patients was 46 years (Interquartile Range [IQR]: 34–55) and 44 years (IQR: 35–55) for controls. The most promising variables thus far are the foveal avascular zone (FAZ) area and FAZ perimeter of both eyes. Median values of these variables were lower in SS patients compared to controls (Table 1).

**Table 1 (abstract 000229)** Foveolar avascular zone differences between septic shock patients and controls

| | Right eye | | | Left eye | | |
|---|---|---|---|---|---|---|
| | **Patients** | **Controls** | ***p*-value** | **Patients** | **Controls** | ***p*-value** |
| FAZ area (mm2) | 0.20 | 0.30 | 0.01 | 0.17 | 0.31 | 0.02 |
| FAZ perimeter (mm) | 1.80 | 2.36 | 0.01 | 1.75 | 2.27 | 0.04 |

**Conclusions:** Our findings support the hypothesis that retinal microcirculatory changes occur during SS and demonstrate that OCTA is a feasible bedside tool for their assessment. OCTA shows potential in overcoming the limitations associated with the hand-held vital microscopes currently used for microcirculatory assessment. Future steps will involve longitudinally profiling these microcirculatory changes during the course of SS.

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**Topic:** Sepsis

## 000230

### The effect of cipepofol on breathing patterns, respiratory drive, and inspiratory effort in mechanically ventilated patients

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**Introduction:** Analgosedation is crucial for alleviating pain and agitation in the intensive care unit (ICU) [1], while adverse effects including respiratory depression [2] limit its clinical use. Consequently, there is a significant interest in measuring the respiratory effects of these drugs, especially for new agents. Cipepofol, a novel 2,6-disubstituted phenol derivative and a structural analog of propofol, is a highly selective gamma-aminobutyric acid A receptor potentiator [3], with a non-inferior sedation profile to propofol for ICU sedation [4]. However, as a new sedative drug, further research is required, particularly detailed studies on its adverse effects, especially its respiratory effects used for ICU sedation.
**Objectives:** The present study aimed to investigate the effects of cipepofol on breathing patterns, respiratory drive, and inspiratory effort in mechanically ventilated patients.
**Methods:** The study was designed as a single-center, one-arm, physiological trial. We included intubated patients receiving invasive mechanical ventilation in partial pressure support mode. When the patients' baseline sedation level had reached a Richmond Agitation Sedation Scale (RASS) score ≥ − 2, cipepofol was initiated at 0.3 mg/kg/h and increased by 0.1 mg/kg/h every 30 min until the maximal dose of 0.8 mg/kg/h. The infusion of cipepofol would be discontinued if the RASS score was ≤ − 4, or respiratory rare < 8 breaths/min [5], or pulse oxygen saturation (SpO2) < 90% [6] before reaching the maximal dose. The reason for discontinuation and the final infusion rate for each patient were recorded. At baseline and 30 ± 5 min after each increase in the infusion rate, respiratory variables including RR, tidal volume (VT), minute ventilation (Vmin)), airway occlusion pressure after 100 ms (P0.1) [7], pressure muscle index (PMI) [8], and expiratory occlusion pressure (Pocc) [9] were recorded. The primary outcome was the change from baseline in respiratory variables to 30 min after the initiation of cipepofol at 0.3 mg/kg/h. The secondary outcomes were the changes in respiratory variables, cardiovascular variables (systolic blood pressure, diastolic blood pressure, mean arterial pressure, heart rate, SpO2, end-tidal carbon dioxide), and RASS score at different infusion rates of cipepofol.
**Results:** The infusion rate at 0.3 mg/kg/h of cipepofol was completed in all 20 patients, and all patients achieved the RASS score − 2 to + 1. For the main respiratory variables (Table 1), common features were: a significant reduction in VT ($P = 0.002$), while the change in RR ($P = 0.465$) and Vmin ($P = 0.154$) were not significant. The reductions in P0.1 ($P = 0.020$), PMI ($P = 0.019$) and Pocc ($P = 0.007$) were significant. The number of patients decreased as the cipepofol infusion rate increased, and the leading cause for discontinuation was oversedation (RASS ≤ − 4). A linear mixed-effects model was used to analyze the effect of different doses of cipepofol (Fig. 1). With the increase in cipepofol dose, there was a significant decrease in RASS score ($P < 0.001$), the increase in RR ($P < 0.001$) and decrease in VT ($P = 0.002$) was significant, while Vmin ($P = 0.430$) did not change significantly.

**Table 1 (abstract 000230)** The differences in respiratory variables from baseline to 30 min after cipepofol was infused at a rate of 0.3 mg/kg/h

| Variable | At baseline | 30 min after infusion of cipepofol | *P* value |
|---|---|---|---|
| RR, mean ± SD | 16.2 ± 3.4 | 16.7 ± 2.7 | 0.465 |
| VT, median [IQR] | 451.6 [393.5–565.9] | 390.9 [356.6–511.0] | 0.002 |
| Vmin, mean ± SD | 7.5 ± 1.9 | 7.2 ± 1.8 | 0.154 |
| P0.1, (median [IQR]) | 1.7 [1.0–3.1] | 1.4 [1.0–2.7] | 0.020 |
| PMI, (median [IQR]) | 2.1 [1.7–4.3] | 2.1 [1.3–2.7] | 0.019 |
| Pocc, (median [IQR]) | 9.4 [6.4–12.9] | 7.2 [6.1–10.6] | 0.007 |

RR, respiratory rate; SD, standard deviation; VT tidal volume; IQR, interquartile range; Vmin minute ventilation; P0.1, airway occlusion pressure after 100 ms; PMI, pressure muscle index; Pocc, expiratory occlusion pressure

**Conclusions:** Cipepofol demonstrates the capability to achieve a satisfactory sedation level of RASS -2 to + 1 in mechanically ventilated adult patients. The primary effects of cipepofol on respiratory patterns, respiratory drive, and inspiratory effort include a decrease in VT, P0.1, PMI, and Pocc, while the changes in RR and Vmin were insignificant.

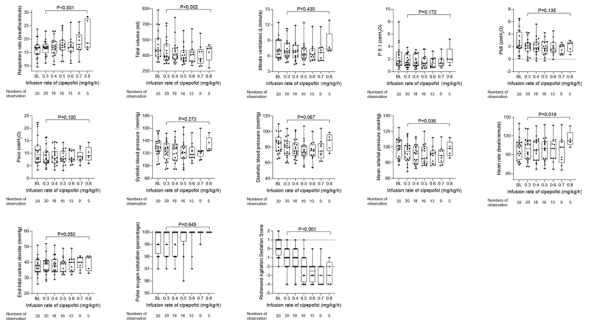

**Fig. 1 (abstract 000230)** Respiratory variables, cardiovascular variables and RASS score during cipepofol infusion at different rates. Overlaid Box-and-whisker and scatter plot. Boxes represent the median with an interquartile range; Whiskers extend the minimum and maximum values; Circles indicate individual observations; BL baseline. P0.1 airway occlusion pressure after 100 ms; PMI pressure muscle index; Pocc the expiratory occlusion pressure

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**Topic:** Sedation, analgesia and delirium

## 000234

### Risk Factors for Postoperative Hyperbilirubinemia in Living Donors Undergoing Living Donor Liver Transplantation


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**Introduction:** Postoperative liver failure is a critical concern for donors undergoing living donor liver transplantation. Previous research has established a significant association between elevated peak total bilirubin (TB) levels after hepatic resection and postoperative liver failure. In this study, our objective was to indirectly identify risk factors associated with postoperative hyperbilirubinemia in living donors.

**Methods:** We retrospectively reviewed data from 1075 living donors who underwent liver transplantation at Seoul National University Hospital from January 4, 2013, to April 29, 2023. After excluding 14 cases with missing data and 58 cases with left hemihepatectomy, we analyzed a total of 1003 cases. Univariate and multivariate analyses were conducted to identify statistically significant differences between groups with high and low peak TB levels postoperatively. Hyperbilirubinemia was defined as peak TB > 7 mg/dL post-operatively.

**Results:** The rate of complications higher than Grade III was 3%. Sixty-one donors (6.08%) showed hyperbiliruminemia. However, there was no case of liver failure and no difference in complication rate between hyperbilirubinemia and non-hyperbilirubinemia groups. The male donors [Hazard Ratio(HR) 8.89 (2.72–29.05)], smaller remnant volumes [HR 1.14 (1.05–1.25)], preoperative TB [HR 14.54 (6.08–34.78)] were identified as the risk factors of hyperbilirubinemia. To establish a possible threshold indicating higher peak TB values after surgery, subgroup analysis was performed for preoperative TB and remnant volume. Statistically significant associations were found for preoperative TB levels of 1.6 or higher, indicating an increased risk of higher peak TB values postoperatively. Also, in terms of remnant volume, statistically significant higher peak TB levels were observed when the remnant volume was below 32.7%.

**Conclusions:** Although no cases of postoperative liver failure were observed in the analyzed donor population, maintaining awareness of the potential for such complications remains essential. Efforts to mitigate risks by excluding preoperative risk factors are crucial.

| peak TB | | Lower | Higher | p-value |
|---|---|---|---|---|
| n | | 942 | 61 | |
| Sex (%) | F | 410 (43.5) | 3 ( 4.9) | <0.001 |
| | M | 532 (56.5) | 58 ( 95.1) | |
| Age (mean (SD)) | | 34.78 (11.50) | 31.07 (11.43) | 0.015 |
| BMI (mean (SD)) | | 23.58 (3.33) | 24.59 (3.02) | 0.022 |
| Blood_type (%) | A- | 3 ( 0.3) | 0 ( 0.0) | 0.884 |
| | A+ | 326 (34.6) | 17 ( 27.9) | |
| | B- | 1 ( 0.1) | 0 ( 0.0) | |
| | B+ | 250 (26.5) | 17 ( 27.9) | |
| | O- | 3 ( 0.3) | 0 ( 0.0) | |
| | O+ | 286 (30.4) | 20 ( 32.8) | |
| | AB+ | 73 ( 7.7) | 7 ( 11.5) | |
| DM (%) | (-) | 932 (98.9) | 61 (100.0) | 0.886 |
| | (+) | 10 ( 1.1) | 0 ( 0.0) | |
| HTN (%) | (-) | 904 (96.0) | 60 ( 98.4) | 0.551 |
| | (+) | 38 ( 4.0) | 1 ( 1.6) | |
| Operator (%) | S | 655 (69.5) | 43 ( 70.5) | 0.804 |
| | L | 272 (28.9) | 18 ( 29.5) | |
| | Y | 1 ( 0.1) | 0 ( 0.0) | |
| | C | 14 ( 1.5) | 0 ( 0.0) | |
| Incision (%) | Open | 268 (28.5) | 12 ( 19.7) | 0.182 |
| | Lapa | 674 (71.5) | 49 ( 80.3) | |
| Graft (%) | RHH | 887 (94.2) | 60 ( 98.4) | 0.273 |
| | ERHH | 55 ( 5.8) | 1 ( 1.6) | |
| Remnant_percent (mean (SD)) | | 35.22 (3.89) | 33.21 (3.38) | <0.001 |
| Op_time (mean (SD)) | | 262.78 (63.08) | 265.16 (57.52) | 0.774 |
| Blood_loss (mean (SD)) | | 290.13(208.84) | 299.29 (160.72) | 0.737 |
| Bx_macro (%) | <1 | 377 (40.0) | 18 ( 29.5) | 0.234 |
| | <10 | 535 (56.8) | 40 ( 65.6) | |
| | <50 | 30 ( 3.2) | 3 ( 4.9) | |
| Bx_micro (%) | <1 | 499 (53.0) | 35 ( 57.4) | 0.002 |
| | <10 | 426 (45.2) | 21 ( 34.4) | |
| | <50 | 17 ( 1.8) | 5 ( 8.2) | |
| HBcAb (%) | (n-c) | 10 ( 1.1) | 1 ( 1.6) | 0.889 |
| | (-) | 781 (82.9) | 51 ( 83.6) | |
| | (+) | 151 (16.0) | 9 ( 14.8) | |
| CMVIgG (%) | (n-c) | 16 ( 1.7) | 2 ( 3.3) | 0.497 |
| | (-) | 110 (11.7) | 9 ( 14.8) | |
| | (+) | 816 (86.6) | 50 ( 82.0) | |
| HBV_DNA (%) | (n-c) | 9 ( 1.0) | 1 ( 1.6) | 1 |

TB; Total Bilirubin, BMI; Body Mass Index, DM; Diabetes Mellitus, HTN; Hypertension, S; Dr. Suh, L; Dr. Lee, Y; Dr. Yi, C; Dr. Choi, RHH; Right Hemihepatectomy, ERHH; Extended Right Hemihepatectomy

| | HR | Lower CI | Upper CI | p-value |
|---|---|---|---|---|
| pre TB | 14.54 | 6.08 | 34.78 | < 0.01 |
| Male | 8.89 | 2.72 | 29.05 | < 0.01 |
| Smaller remnant volume | 1.14 | 1.05 | 1.25 | < 0.01 |
| Laparoscopic surgery | 2 | 1 | 4 | 0.05 |

TB; Total Bilirubin, HR; Hazard Ratio, CI; Confidence Interval

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**Topic:** Brain death, organ donation and transplantation

## 000235

### Heat acclimation attenuates ferroptosis and prevents heat stress-induced acute kidney injury by enhancing mitophagy

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**Introduction:** Exposure to a intense heat stress environment can lead to impaired renal function and even induce acute kidney injury (AKI), while heat acclimation(HA) can improves heat endurance, and prevents the kidney against ischemic injury induced by intense heat stress. However, the mechanism underlying of the nephroprotective effect of HA remains unclear.Ferroptosis is a programmed cell death form characterized by excessive accumulation of lipid peroxide and iron, which is involved in the development and development of multiple AKI.However, the role of ferroptosis in the HS-AKI mechanism remains elusive.Furthermore, it has been reported that mitophagy can exert protective effects on AKI through clearance of damaged mitochondria, inhibition of apoptosis, alleviation of oxidative stress and the inflammatory response.Several studies have suggested that mitophagy may influence the development of AKI through regulating intracellular iron metabolism, but it has not been reported in heat stress-induced AKI.
**Objectives:** To investigate whether heat acclimation alleviates ferroptosis to prevent heat stress-induced acute kidney injury by enhancing mitophagy.
**Methods:** 6–8-week-old C57BL / 6 mice were divided into control group (CON), heat acclimation group (HA), heat stroke group (HS), heat stroke + heat acclimation group (HS + HA), and heat stroke + heat acclimation + 3-MA group (HS + HA + 3-MA).Among them, the mice in the HS group were kept at room temperature for 30 days and then subjected to high-temperature and high-humidity environmental stress with a temperature of 39 ± 0.5 °C and a humidity of 60 ± 0.5% to establish the HS model.The mice in the HS + HA group were kept in an environment with a temperature of 34 ± 0.5 °C and a humidity of 50 ± 0.5% for 30 days to establish the HA model, followed by exposure to high-temperature and high-humidity environmental stress.Mice in the HS + HA + 3-MA group were subjected to high heat and humidity environmental stress after consecutive intraperitoneal injection

of the mitophagy inhibitor 3-MA (20 mg/kg/day) for the last 7 days of the constructed HA model.When the HS model was successfully established, the proteomic assay was applied and differential protein expression was analyzed using GO enrichment. Subsequently, the levels of thermal endurance, renal function, pathological changes, inflammation, oxidative stress, apoptosis, mitophagy and ferroptosis were assessed in each group of mice.
**Results:** The GO enrichment analysis found that the differentially expressed proteins between the CON and HS groups were mainly enriched in biological processes such as stress, inflammation and ferroptosis pathways.Transferrin is a key protein in the ferroptosis pathway, and its protein expression level was significantly higher in the HS group than in the CON group. In vivo experiments confirmed that heat acclimation significantly improved renal function, enhanced thermal endurance, and improved the survival rate of mice under HS conditions. Moreover, heat acclimation significantly enhanced mitophagy and alleviated HS-induced ferroptosis, inflammation, apoptosis and oxidative stress. In contrast, the mitophagy inhibitor 3-MA inhibited ferroptosis and reversed the renoprotective effect of the heat acclimation.
**Conclusions:** Heat acclimation may prevent heat stress-induced acute kidney injury by alleviating ferroptosis through enhanced mitophagy.

**Topic:** Acute Kidney Injury and haemofiltration

## 000236

### Efficacy and Safety of Ilaprazole for stress ulcer—associated upper gastrointestinal bleeding prophylaxis in Critically Ill Patients: A Randomized, Double-Blind, non-inferiority Phase 3 Trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000236

**Introduction:** Proton pump inhibitors (PPIs) have been shown to reduce clinically important upper gastrointestinal (UGI) bleeding around 40% among critically ill patients. However, there have been no clinical trials investigating the use of ilaprazole, a newer generation benzimidazole PPIs, specifically in critically ill patients with stress ulcers.
**Objectives:** To evaluate the non-inferiority of Ilaprazole to esomeprazole in preventing clinically significant UGI bleeding in critically ill patients.
**Methods:** In this Randomized, Double-Blind, non-inferiority Phase 3 trial, patients with high risk for stress ulcer bleeding and requiring invasive mechanical ventilation at 70 clinical centres in China were enrolled. Eligible patients were randomly assigned in a 1:1 ratio to receive either ilaprazole for injection (10 mg once daily, first dose doubled) or esomeprazole for injection (40 mg twice daily). The primary endpoint was absence of clinically significant UGI bleeding, in the Per-Protocol Set (PPS) with a non-inferiority margin of 5%. The trial is registered with ClinicalTrials.gov, NCT05841394 and is completed.
**Results:** From July 16, 2021, to April 28, 2022, 441 patients (mean age, 59.00 years old; 150 [34.01%] female) were enrolled: 220 patients were allocated to receive ilaprazole treatment, while 221 patients were allocated to esomeprazole treatment. The primary endpoint occurred in 189 (96.92%) patients in the ilaprazole arm and 189 (96.92%) patients in the esomeprazole arm (Absolute Risk Difference: 0, 95% CI: − 3.85 to 3.85, $p = 1.000$). Secondary outcomes demonstrated comparable incidences of clinically insignificant upper gastrointestinal (UGI) bleeding, any gastrointestinal bleeding, as well as similar 28-day mortality, ICU mortality, and pneumonitis between the two treatment arms. The incidence of study-drug-related adverse events was observed in 17 (7.7%) patients in the ilaprazole arm and 22 (10.0%) patients in the esomeprazole arm, respectively ($p = 0.526$). The ilaprazole arm had a significantly lower incidence of hepatobiliary disorders (0.9%) compared to the esomeprazole arm (5%) ($p = 0.012$).
**Conclusions:** Among critically ill patients with high-risk of stress ulcer, Ilaprazole demonstrated non-inferiority to esomeprazole in the prevention of upper gastrointestinal (UGI) bleeding, exhibited a comparable incidence of overall adverse events, and showed a lower occurrence of hepatobiliary disorders.

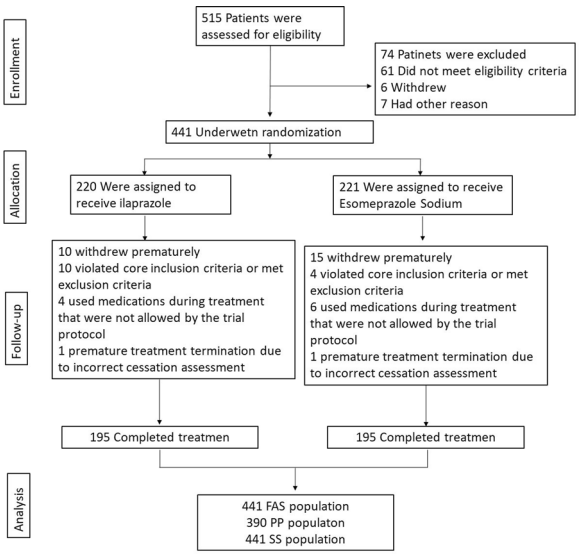


**Fig. (abstract 000236)** Randomization, treatment assignments, and follow-up

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10. We are indebted to the clinical research center leaders who played pivotal roles in patient enrollment and ensuring the successful implementation of the research protocol. Special thanks are due to: Dr. Meitao from Changde First People's Hospital, Dr. Chentao from Guiyang Medical University Affiliated Hospital, Dr. Xiangpeng from Changsha Central Hospital, Dr. Daiyonghong from Jiangjin District Central Hospital of Chongqing, Dr. Wanghuaxue from The First Affiliated Hospital of Bengbu Medical College, Dr. Panjingye from The First Affiliated Hospital of Wenzhou Medical University, Dr. Gaochunming from Linfen Central Hospital, Dr. Sunrenhua from Zhejiang Provincial People's Hospital, Dr. Dingxinmin from Shanxi Bethune Hospital (Shanxi Academy of Medical Sciences), Dr. Chengyadong from Changzhi City People's Hospital, Dr. Chengyuan from The Second Affiliated Hospital of Chongqing Medical University, Dr. Qinbingyu from Henan Provincial People's Hospital, Dr. Zhanglina from Xiangya Hospital of Central South University, Dr. Quhongtao from The First Affiliated Hospital of Nanhua University, Dr. Weishutian from Jinzhong City First People's Hospital, Dr. Kangyan from West China Hospital of Sichuan University, Dr. Yuanyuan from Gansu Provincial People's Hospital, Dr. Pengzhiyong from Zhongnan Hospital of Wuhan University, Dr. Yujianquan from Subei People's Hospital, Dr. Jiangfan from Deyang City People's Hospital, Dr. Wangqiuhui from Wuxi City People's Hospital, Dr. Wangfeng from The Seventh People's Hospital of Shanghai, Dr. Yuli from Wuhan Central Hospital, Dr. Zhangtiantuo from The Third Affiliated Hospital of Sun Yat-sen University, Dr. Caiguolong from Zhejiang Hospital, Dr. Hebin from Shanghai Chest Hospital, Dr. Yuzhanbiao from Hebei University Affiliated Hospital, Dr. Laijunhua from Liuzhou Workers Hospital, Dr. Zhangrumin from Zibo Central Hospital, Dr. Yangmingshi from Xiangya Third Hospital of Central South University, Dr. Yangyi from Southeast University Affiliated Zhongda Hospital, Dr. Wangsheng from The Tenth People's Hospital of Shanghai, Dr. Shangyou from Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Dr. Jihongming from Shanxi Provincial People's Hospital, Dr. Linronghai from Taizhou Municipal Hospital, Dr. Zouxu from Guangdong Provincial Hospital of Traditional Chinese Medicine, Dr. Fengyongwen from The Second People's Hospital of Shenzhen, Dr. Liukexi from Lianyungang City First People's Hospital, Dr. Huanglinxi from The First Affiliated Hospital of Shantou University Medical College, Dr. Huzhenjie from The Fourth Hospital of Hebei Medical University, Dr. Mayuan from The Western Theater General Hospital of Chinese PLA, Dr. Zhuying from Hangzhou First People's Hospital. We are also indebted to all the intensivists who helped us conduct the study and collect the medical data.

**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000239

### Discussing expected long-term outcomes in the ICU: effect on experiences and outcomes of patients, family, and clinicians; a multicenter randomized clinical trial

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**Introduction:** ICU survivors and their families are often unaware of the physical, mental and cognitive symptoms that can persist for months, or even years, after ICU discharge, consequently underestimating the long-term impact of critical illness. Unfortunately, these unrealistic expectations can result in a reduced quality of life (QoL), as QoL depends partly on the degree to which expectations are met. Moreover, many health care facilities aspire to increase patient and family participation in decision making. However, without adequate information on expected patient-relevant outcomes, such as long-term QoL, there is little room for patient involvement. Therefore, we developed an intervention to support conversations about expected long-term QoL during family meetings, based on a prediction model, and supported by a web-based application visualizing the personalized predictions and a comprehensive information leaflet about recovery after critical illness.
**Objectives:** To evaluate the effectiveness of the developed intervention on patient and family reported experiences and outcomes, and on experiences of ICU clinicians.
**Methods:** We conducted a randomized clinical trial in the ICUs of two Dutch hospitals. Patients $\geq$ 16 years old, admitted for at least 24 h to the ICU between March 2021 and September 2023, were included after providing informed consent, and randomly assigned to receive either the intervention or usual care. The intervention consisted of a family meeting in which physicians discussed the expected long-term outcomes with patients and/or their family, based on the predicted change in QoL one year after ICU admission using a previously validated prediction model, supplemented with extensive information on recovery after critical illness. Primary outcome was patients' and family members' experience with the shared decision-making process during a family meeting, measured with the 3-item CollaboRATE questionnaire (range 0–27). Secondary outcomes were ICU professionals' experiences with the shared decision-making process (determined using the 35-item Ethical Decision-Making Climate Questionnaire [EDMCQ] and the Collaboration and Satisfaction about Care Decisions [CSACD] questionnaire), symptoms of anxiety and depression (assessed with the Hospital Anxiety and Depression Scale [HADS]) among patients and family members 3 months and 1 year post-ICU, and patients' QoL (measured with the EuroQol five-dimensional [EQ-5D-5L] questionnaire) 3 months and 1 year post-ICU.
**Results:** In total, 160 patients were included (mean age 60 years [SD 15]; 97 men [61%]). 13 patients (8.1%) died before assessment of the primary outcome, resulting in an intervention group of 73 patients and a usual care group of 74 patients. No significant differences were seen in patients' and family members' experiences of the shared decision-making process during a family meeting, with a median CollaboRATE score of 24 (IQR 23–27) in the intervention arm, compared to 25 (IQR 23–27) in usual care ($p = 0.6$). Moreover, the outcomes of patients and family at 3 months did not significantly differ between the intervention and usual care group (Table 1). Regarding the ICU professionals' experiences, an improvement in CSACD score was observed after the intervention period (median 40 [IQR 34–45] vs median 37 [IQR 32–43], $p = 0.01$), while no significant change in the ethical decision-making climate was found.
**Conclusions:** This multicenter randomized clinical trial, evaluating the incorporation of personalized predictions of long-term QoL in family meetings, showed no difference between patients' and family members' experiences, and outcomes of patients and family 3 months post-ICU. However, after the intervention period, ICU clinicians reported better collaboration about care decisions. The 1 year outcomes of patients and family, will be available in September 2024 and presented at the conference.

**Table 1 (abstract 000239)** Patients' and family members' experiences and 3 months post-ICU outcomes

| | *Intervention (n = 73)* | *Usual care (n = 74)* | *p-value* |
|---|---|---|---|
| CollaboRATE score (range 0 – 27), *median (IQR)* | 24 (23 – 27) | 25 (23 – 27) | 0.6 |
| Patients' change in QoL (EQ-5D-5L), *mean (SD)* | -0.13 (0.30) | -0.06 (0.31) | 0.3 |
| Patients' change in anxiety (HADS-A), *mean (SD)* | -0.8 (4.4) | 0.8 (4.2) | 0.2 |
| Patients' change in depression (HADS-D), *mean (SD)* | 0.6 (4.9) | 0.5 (4.1) | >0.9 |
| Family members' change in anxiety (HADS-A), *mean (SD)* | 0.9 (5.7) | 1.8 (4.4) | 0.4 |
| Family members' change in depression (HADS-D), *mean (SD)* | 0.7 (4.6) | 2.1 (4.2) | 0.2 |

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**Topic:** Health Services Research and Outcome

## 000241

### Comparing the characteristics and outcomes of patients requiring rapid response team activation in the weekdays, weeknights and weekends at King Abdulaziz Medical City in Riyadh

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000241

**Introduction:** Higher mortality rates have been observed among patients admitted to the hospital during the weekends and weeknights in several, but not all, studies. These observations were attributed to suboptimal hospital staffing and resource allocation during weekends and after-hours. Rapid Response Teams are activated for patients experiencing deterioration in the ward, yet the impact of the timing of activations on patient outcomes remains unclear.
**Objectives:** We aimed to investigate the association between the timing of rapid response team activation and patient outcomes.
**Methods:** We conducted a retrospective cross-sectional study of patients in the ward who had activation of the Critical Care Response Team (CCRT) of King Abdulaziz Medical City, Riyadh from January 1 to December 31, 2019. We compared the characteristics and outcomes of patients who had CRRT activation on weekends (Friday and Saturday) vs. weekdays (Sunday to Thursday) and during afterhours (1600 to 0759) vs. daytime (0800-1559).
**Results:** During the study period, there were 836 CCRT activations with 212 (25.4%) occurring during the weekend. There were no significant differences in the demographics, baseline comorbidities, admission category (medcial, surgical and trauma), and reasons for CCRT activation (Systolic BP < 90 mmHg: 34/212 [16.0%] vs. 120/624 [19.2%], $p = 0.30$; heart rate > 130/min: 44/212 [20.8%] vs. 162/624 [26.0%], $p = 0.13$; respiratory rate > 30/min: 55/212 [25.9%] vs. 175/624 [28.0%], $p = 0.55$; drop in Glasgow Coma Scale score by ≥ 2: 58/212 [27.4%] vs. 140/624 [22.4%], $p = 0.15$). Sepsis was more suspected in the weekend activations (112/212 [52.8%] vs. 276/624 [44.3%], $p = 0.03$). The rate of ICU admission was 77/212 [36.3%] vs. 185/624 [29.6%], $p = 0.07$), with no significant differences in intubation and vasopressor therapy. Patients with CCRT activations on the weekend had higher hospital mortality (69/212 [32.5%] vs. 148/624 [23.7%], $p = 0.01$). No significant differences were observed between CCRT activations during afterhours and daytime with respect to demographics, reasons for CCRT activation, ICU admission, ICU interventions and hospital mortality (110/447 [24.6%] vs. 80/338 [23.7%], $p = 0.76$). However, patients with CCRT activation during weekend afterhours had higher mortality compared with weekday afterhours (42/116 [36.2%] vs. 68/331 [20.5%], $p = 0.001$).
**Conclusions:** Patients who had CCRT activation during the weekend had higher hospital mortality, despite no major differences in clinical characteristics. This possible "weekend effect" needs further assessment, which may include collecting additional data and evaluating the hospital's operational dynamics and staffing during weekends.

**Topic:** Health Services Research and Outcome

## 000242

### LA Reservoir Strain as a Predictor for LV Filling Pressure: Evidence from LV Catheterization

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**Introduction:** Understanding of left atrial (LA) strain as a factor in predicting left ventricular (LV) filling pressure remains limited. This study aimed to predict LV filling pressure non-invasively through assessment of LA strain with existing parameters.
**Objectives:** We prospectively collected data, including pre-atrial contraction (pre-A) and LV end-systolic pressure (LVEDP) measurements, from patients who underwent coronary artery angiography and LV catheterization. Transthoracic echocardiography was conducted to assess LA strain within 24 h of LV catheterization. Patients with supraventricular tachycardia, atrial fibrillation, or acute coronary syndrome were excluded. Biomarkers, including NT-proBNP, functional, and morphological echocardiographic parameters were also collected.
**Methods:** We prospectively collected data, including pre-atrial contraction (pre-A) and LV end-systolic pressure (LVEDP) measurements, from patients who underwent coronary artery angiography and LV catheterization. Transthoracic echocardiography was conducted to assess LA strain within 24 h of LV catheterization. Patients with supraventricular tachycardia, atrial fibrillation, or acute coronary syndrome were excluded. Biomarkers, including NT-proBNP, functional, and morphological echocardiographic parameters were also collected.
**Results:** From June 2021 to September 2022, 365 participants ($61.7 \pm 11.5$ years, 25.5% female) were enrolled. The mean LA reservoir strain (LASr) was $28.7 \pm 7.4$. In c-statistics, the cutoff for LASr predicting an LVEDP of > 16 mmHg was 0.54 (0.50–0.57) at 18%, and 0.62 (0.57–0.67) at 24%. For predicting a pre-A pressure of > 12 mmHg, the c-statistics at LASr cutoffs of 18 and 24% were 0.58 (0.52–0.64) and 0.70 (0.63–0.77), respectively ($p$ for difference < 0.001). Logistic regression analysis revealed that, after covariate adjustment, the predictive power of LASr for elevated LV filling pressure was not significant at a cutoff of 18% but was an independent predictor at 24% (adjusted odds ratio [OR] 3.22 [95% confidence interval {CI} 1.77–5.88] for LVEDP ≥ 16 mmHg; adjusted OR 3.11 [95% CI 1.86–5.20] for LV pre-A ≥ 12 mmHg). As a continuous variable, LASr predicted LV pre-A pressure (c-statistics 0.79 [0.71–0.86]) better than LVEDP (c-statistics 0.71 [0.66–0.77]) in models including traditional parameters.
**Conclusions:** The LASr is an independent predictor of LV filling pressure when used with established factors.

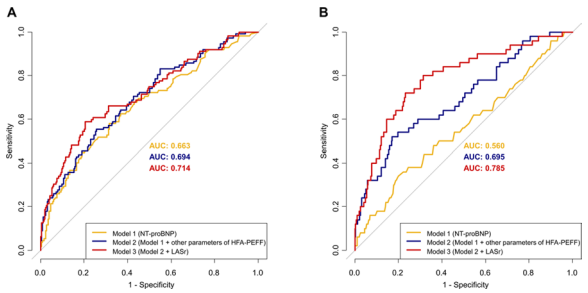
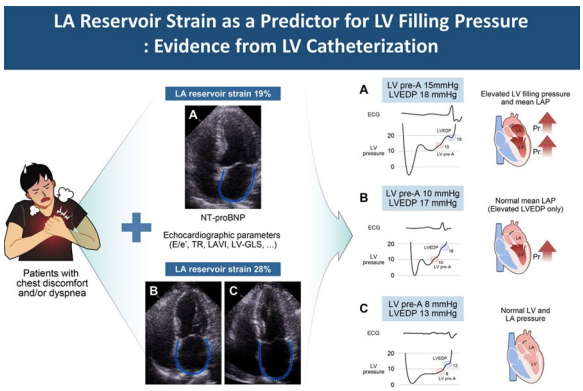



**Fig. (abstract 000242)** C-statistics of several models to predict elevated LV filling pressure of (A) LVEDP ≥ 16mmHg and (B) LV pre-A pressure ≥ 12mmHg




**Graphical Abstract (abstract 000242)**

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3. None.

**Topic:** Imaging in intensive care

## 000243

### Mechanical left ventricular unloading in cardiogenic shock treated with venoarterial extracorporeal membrane oxygenation: a systematic review and meta-analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000243

**Introduction:** Mechanical left ventricular unloading can prevent increased left ventricular afterload induced by venoarterial extracorporeal membrane oxygenation (VA-ECMO), thereby potentially improving clinical outcomes. A previous meta-analysis of observational studies found an association between the use of mechanical left ventricular unloading and improved survival among patients with cardiogenic shock undergoing VA-ECMO treatment. However, this result can be biased due to inherent limitations of observational studies. The recent publications of randomized controlled trials (RCTs) and propensity score-matched studies allowed for an updated meta-analysis by overcoming challenges of the previous study.
**Objectives:** This systematic review and meta-analysis focusing on RCTs and propensity score-matched studies aimed to evaluate if mechanical left ventricular unloading could reduce mortality in patients with cardiogenic shock undergoing VA-ECMO.
**Methods:** This study was registered on PROSPERO International prospective register of systematic review on January 15, 2024 (CRD42024498665). We searched MEDLINE, Embase, and the Cochrane Library for RCTs and propensity score-matched studies published from inception until December 20, 2023. The primary outcome was mortality at the longest follow-up, and the secondary outcomes included successful weaning from VA-ECMO, major bleeding, hemolysis, stroke, renal replacement therapy, limb ischemia, and bridge to heart transplantation or durable ventricular assist device. We used a *Mantel–Haenszel* random effects meta-analysis and reported the pooled results with a risk ratio (RR) and 95% confidence interval (CI).
**Results:** We identified two RCTs and eleven propensity-matched studies totaling 9858 patients. Mechanical left ventricular unloading was significantly associated with reduced mortality at the longest follow-up (RR, 0.89; 95% CI, 0.84 to 0.94; $P=0.0001$; moderate certainty of evidence). Among secondary outcomes, successful VA-ECMO weaning was more frequent with mechanical LV unloading (RR, 1.15; 95% CI, 1.02 to 1.29; $P=0.02$; low certainty of evidence), while major bleeding (RR, 1.27; 95% CI, 1.02 to 1.59; $P=0.03$; low certainty of evidence) and hemolysis (RR, 1.49; 95% CI, 1.10 to 2.02; $P=0.01$; moderate certainty of evidence) were increased. Other secondary outcomes were not significantly different.
**Conclusions:** Among adult patients with cardiogenic shock treated with VA-ECMO, mechanical left ventricular unloading was significantly associated with reduced mortality.

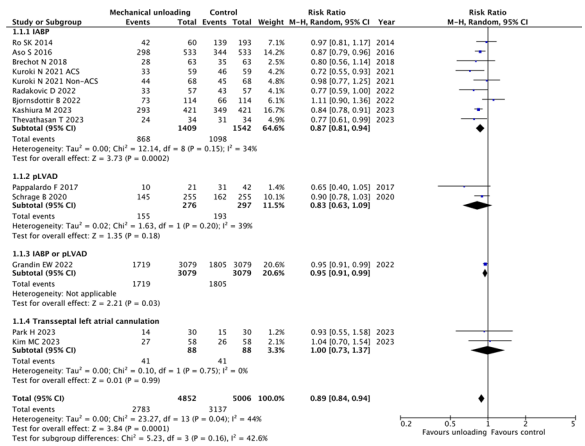


**Fig. (abstract 000243)** Forest plot for mortality at the longest follow-up available

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**Topic:** Cardiovascular issues in ICU

## 000244

### Hallucinations in the Critically Ill; Prevalence and Association with Disturbed Behaviour

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000244

**Introduction:** Hallucinations in the critically ill are difficult to study and their prevalence and association with disturbed behaviour is unknown. These difficulties are, in part, a consequence of the challenges of reporting an intermittent and unpredictable phenomenon combined with the absence of standardised contemporaneous reporting tools. However, we hypothesised that bedside care givers would record observations regarding the presence of hallucinations and disturbed behaviour in the bedside clinical progress notes of critically ill patients. We further hypothesised that Natural Language Processing (NLP) could be used to scan these notes for words describing hallucinations and disturbed behaviour thereby enabling the identification of patients who experienced such phenomena during their intensive care stay.
**Objectives:** To evaluate the prevalence of hallucinations and the association with disturbed behaviour in critically ill patients.
**Methods:** We obtained electronic progress notes, demographics, medications, and outcomes of a cohort of critically ill patients. Using a previously validated methodology, we applied NLP to search bedside clinical progress notes for key words indicating a patient may have experienced hallucinations and / or disturbed behaviour.
**Results:** We studied 7525 patients. We found 625 (8.31%) were screened positive by NLP as having experienced hallucinations and 6900 (91.69%) were found not to have experienced hallucinations. Patients screened positive for hallucinations were younger (61.4 years vs 64 years, $p<0.001$), had higher APACHE III scores (55.0 vs 47.0, $p<0.001$), were significantly more likely to be diagnosed with renal failure (7.6% vs 2.5%, $p<0.001$) and were more likely to be diagnosed with cirrhosis (13.4% vs 6.9%, $p<0.001$). Further, we found that of patients screened positive for hallucinations, 623 (99.7%) were also screened positive for NLP diagnosed behavioural disturbance (NLP-Dx-BD) and possible delirium. However, of patients screened negative for hallucinations only 3274 (47.4%) were screened positive NLP-Dx-BD. Finally, in a sub-group analysis, we found that 25% of patients screened positive for hallucinations also received antipsychotic medication. Contrastingly, only 6.2% of patients screened negative for hallucinations received antipsychotics.
**Conclusions:** Hallucinations in critically ill patients are common. Further, critically ill patients who are screened positive for hallucinations are also likely to be screened positive for NLP-Dx-BD and, thus, likely delirium. These findings suggest that hallucinations may be a manifestation of a similar neurocognitive disfunction as delirium.

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**Topic:** Information systems and Data Science

## 000246

### Reducing administrative burden by implementing a coreset of quality indicators in the ICU: a multicenter longitudinal intervention study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000246

**Introduction:** Quality indicators are used in intensive care units (ICUs) as standards to measure, compare and improve quality of care. However, the number of quality indicators for which ICU clinicians need to record data increases and for many indicators there are concerns about their added value. This frustrates clinicians, and may divert time from providing and improving actual patient care.
**Objectives:** To determine whether working with only a core set of quality indicators in the ICU reduces registration time and administrative burden of ICU clinicians, and if this is associated with more joy in work without impacting the quality of ICU care.
**Methods:** Between May 2021 and June 2023, ICU clinicians of seven hospitals in the Netherlands were instructed to only register information on a consensus-based core set of quality indicators. Throughout this period, they were also empowered to resolve quality issues proactively. An implementation plan was developed and several

implementation tools were used to facilitate this process. Data on registration time, administrative burden and joy in work were collected at three time points with validated questionnaires. Longitudinal data on quality of care, expressed in standardized mortality rates (SMR) and ICU readmission rates, were gathered from the Dutch National Intensive Care (NICE) registry. Longitudinal effects and differences in outcomes between ICUs and between nurses and physicians were statistically tested.
**Results:** A total of 390 (60%), 291 (47%) and 236 (40%) questionnaires were returned at T0 (i.e., before the intervention was implemented), T1 (1-year follow-up) and T2 (2-year follow-up). At T2 the overall median registration time per day was halved by 30 min ($p < 0.01$) and median scores were lower for both physicians and nurses ($p < 0.01$). The decrease in registration time is longitudinally associated with respondents being a physician or a nurse ($p = 0.02$) and with the ICU where respondents work ($p < 0.01$). Respondents also experienced fewer unnecessary and unreasonable registration tasks at T1 ($p < 0.01$) and at T2 ($p < 0.01$). Both decreases are longitudinally associated with the ICU where respondents work ($p < 0.01$). No statistically significant changes over time were found in joy in work, SMR and ICU readmission.
**Conclusions:** Implementing a core set of quality indicators reduces registration time and the administrative burden without harming patient care. The valuable time saved as a result of this intervention can be invested in bedside patient care and in aspects that enhance joy in work in the ICU (e.g., teambuilding, professional development and breaks to socialize and recuperate from work).

**Reference(s)**
1. This work was supported by the Netherlands Federation of University Medical Centers (NFU).

**Topic:** Health Services Research and Outcome

## 000247

### Predictors of Postoperative Oliguria in Patients Going Through Major Abdominal Surgery: A Single Center Prospective Observational Study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):** 000247

**Introduction:** Postoperative oliguria is common in patients going through major abdominal surgery. Among clinicians, oliguria is often considered a sign of hypovolemia and a risk factor for acute kidney injury (AKI), and therefore often rapidly treated with an increase in fluid administration. Alternatively, postoperative oliguria is attributed to post-surgical anti diuretic hormone (ADH) release and left untreated.
**Objectives:** The aim of our study was to investigate the predictors of urine output postoperatively, focusing on ADH levels, fluid administration, hemodynamics and patient factors.
**Methods:** In this single center prospective observational study adult patients planned for major abdominal surgery were followed with regard to the occurrence of oliguria during the first 12 h of their stay in the post-anesthesia unit (PACU). Samples were collected pre- and postoperatively for ADH and serum osmolality and blood pressure and fluid administration rates were registered.
**Results:** 54 patients were included in the study. Preoperative ADH levels were low but increased markedly postoperatively (1.5 (1.2–2.2) to 17.9 (12.0–29) pg/mL, $p < 0.001$) and correlated to serum osmolality (rho = 0.45). ADH adjusted for osmolality was not a predictor of postoperative oliguria, but higher ADH levels and increased fluid administration were associated with normalization of urine output after an oliguric episode. Oliguria was only seen in patients with hypotension relative to their blood pressure prior to anesthesia or those with mean arterial pressure (MAP) < 65 mmHg. Preoperative renal function and increased postoperative fluid administration were associated with oliguria.
**Conclusions:** ADH levels postoperatively did not predict postoperative urine output or oliguria in patients going through major abdominal surgery.

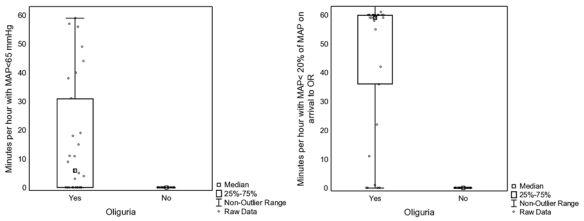


**Fig. (abstract 000247)** Minutes per hour with MAP < 65mmHg and MAP < 20% of MAP on arrival to operating room (OR) in patients with and without oliguria during the first 12 h in the in the post-anesthesia unit (PACU)

**Topic:** Perioperative care

## 000248

### Does the use of focused echocardiography affect the management impact of pulmonary embolism in the intensive care setting?

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):** 000248

**Introduction:** The use of echocardiography in the intensive care setting is becoming a more utilised imaging modality. It provides information to guide therapeutic interventions and prognosticate pulmonary embolism (PE) allowing consideration of specialist referral for cardiac/surgical intervention [1].
**Objectives:** This literature review analyses primary research and explores the impact echocardiography has when assessing and treating the critically unwell patient. It aims to explore the PICO question 'Does the use of focused echocardiography affect the management impact of pulmonary embolism in the intensive care setting?'.
**Methods:** Systemic searches of the electronic database PubMed were conducted in July 2022, where articles were manually screened by the author according to the selection criteria. Main reasons for exclusion were the extensive use of transoesophageal echocardiography or the use of echocardiography in cardiology which were not included as part of this review. Assessment of the included studies were stratified against a critical appraisal checklist. From a total of 47 identified articles, 15 were included. All the studies included data that was statistically significant for the parameters (PE and haemodynamic instability). However, it must be noted that the follow up duration on some studies was limited and there were some confounding factors that might have altered the results included.
**Results:** The use of echocardiography in the haemodynamically stable patient cannot directly exclude the diagnosis of PE alone, it is used however to risk stratify PE patients to moderate or high risk groups depending on the presence or absence of right ventricular dysfunction [2]. In patients with a high clinical suspicion of PE, studies have shown a consistently high specificity (approx. 90%) and low sensitivity (56–70%) for echocardiography making it a useful rule-in test [3]. In high-risk patients with massive PE, echocardiography is widely embraced and confirms aetiology of haemodynamic compromise

however in low-risk patients echocardiography rarely yields findings and does not change prognostication. 4 New pathways have now been developed to synchronise management of acute PE utilising the advantages of echocardiography.
**Conclusions:** With the current evidence, the use of echocardiography can be favoured (when used alongside other modalities) in the diagnosis and management of PE in the intensive care environment. However, further high-quality randomised control trials with a longer follow up time are needed to make this suggestion more substantial. It is highlighted that the focused echocardiogram performed in the intensive care setting does not replace a comprehensive exam and its use is primarily around point of care ultrasound to identify life threatening PE. There is no doubt that with little complication rate the use of echocardiography to aid diagnosis and management in the intensive care setting is a rapidly evolving field and using it alongside other imaging modalities in the assessment of a patient is likely to lead to a gold-standard approach.

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**Topic:** Imaging in intensive care

## 000249

### The comparison between oral modafinil and placebo to accelerate the rate of improvement in the level of consciousness in adult patients with moderate to severe acute traumatic brain injury admitted in intensive care units

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000249

**Introduction:** Traumatic Brain Injury (TBI) is one of the most common causes of hospitalization and disability in young and middle-aged people. Modafinil is a new central nervous system stimulant with low side effects, which is recently used off-label to increase the level of consciousness in TBI patients. In this triple-blind randomized clinical trial, our aim is to compare oral modafinil with placebo in increasing the rate of recovery of consciousness in patients with moderate to severe TBI hospitalized in the intensive care units (ICUs).
**Methods:** All patients admitted to the ICUs of Shahid Rajaei level one trauma center, Shiraz, Iran between April 2021, and April 2023, who met the inclusion criteria were included in the study. A total of 97 patients aged 18 to 70 with moderate or severe TBI, who had not received intravenous sedatives continuously within 24 h prior to screening, and whose Glasgow Coma Motor score was 4 or 5 and did not increase during this period, were included and randomized in either the modafinil (M) or placebo (P) group. Patients in the M group received 200 mg of modafinil daily for 7 days, and patients in the P group received placebo for 7 days. Their motor GCS and total GCS scores were recorded three times a day. Other data such as the length of stay in the ICU and hospital, the need for mechanical ventilation, the time to remove the tracheal tube, and the need for tracheostomy insertion were recorded.
**Results:** There was no significant difference between M and P groups in the duration from starting the intervention until 2 points increase in GCS (4 vs. 3 days—*P*-value = 0.251) or 1 point increase in motor GCS (3.5 vs. 3 days—*P*-value = 0.310) Also, there was no significant difference between the two groups in the mean value of total GCS (*P*-value = 0.533) and motor GCS (*P*-value = 0.167). The only significant difference between the groups was in the percentage of patients with an increase in total GCS by 2 points (54% in M group vs. 32% in P group—P-value = 0.042) and an increase in motor GCS by 1 point (56% in M group vs. 34% in P group—P-value = 0.042); these percentages were significantly higher in M group. In other outcomes, including the length of stay in the ICU (17 vs. 18 days—*P*-value = 0.896) and hospital (24 vs. 28 days—*P*-value = 0.136), mechanical ventilation days (11 vs. 11 days—*P*-value = 0.915), and the need for tracheostomy (26 vs 24 patients—*P*-value = 0.568), there was no significant difference between M and P groups.
**Conclusions:** Oral modafinil seems to be beneficial for more rapid increase in level of consciousnesses in selected patients with severe TBI in the acute phase in ICU. Further randomized and multicenter clinical trials with larger sample size are needed.

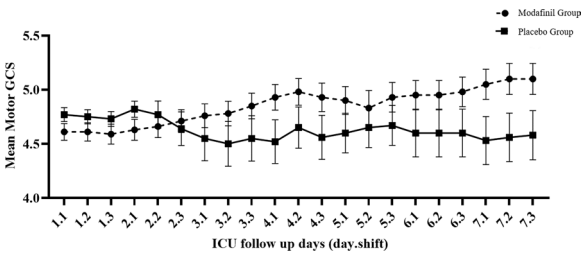


**Fig. 1 (abstract 000249)** The increase in mean motor GCS number during follow-up ICU days in modafinil (square) and placebo (circle) groups

**Topic:** Neurointensive care

## 000250

### A retrospective analysis and comparison of Neuron-Specific Enolase (NSE) and MIRACLE2 scores in predicting outcome following out-of-hospital cardiac arrests

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000250

**Introduction:** Predicting poor outcomes following cardiac arrests is a complex task, with multiple models existing to help achieve this. Neuron-specific enolase (NSE) is a blood serum enzyme released in response to hypoxic neurological injury [1], with Resuscitation Council UK guidelines stating a NSE > 60 µg/L (mcg/L) at 48–72 h post-cardiac arrest being an indicator of poor outcome [2]. The purpose of this study was to compare the NSE biomarker with the MIRACLE2 score, a tool used to predict poor outcomes following out-of-hospital cardiac arrests [3].
**Methods:** A retrospective study was conducted at Southend hospital in the United Kingdom, where all NSE serum samples were collected over a 2-year period. Patient identifiers for each NSE test were then used to retrospectively analyse each clinical scenario, looking specifically at those involved in out-of-hospital cardiac arrests. Exclusion criteria included in-hospital cardiac arrests, duplicate entries, and

cases of inappropriate NSE testing, such as when cardiac arrest did not occur. Within each case identified, patient notes were scrutinised to manually calculate their MIRACLE2 score. Comparison was then made between the NSE and MIRACLE2 score for each patient, along with their ultimate outcome being survival or death following their out-of-hospital cardiac arrest.

**Results:** Between January 2022 and February 2024 a total of 37 NSE blood tests were analysed. Following exclusion criteria, 23 were valid for inclusion in this study. A value of greater than 16.3 (mcg/L) was deemed as being abnormally high. 19 patients were then identified as having abnormally high NSE values. In patients who did not survive, their NSE values ranged from 11.3 to 800 (mcg/L), with a mean of 190.3 (mcg/L) and median of 128.8 (mcg/L). The corresponding MIRACLE2 score for patients with abnormally high NSE values was on average 5, representing a > 80% predicted chance of poor neurological outcome at 6 months based on their MIRACLE2 score alone. Subsequent analysis then revealed that indeed 87% of those identified did not survive to discharge and had poor outcomes.

In those who survived an out-of-hospital cardiac arrest, their average MIRACLE2 score was 3, with the lowest NSE being 3.4 and the highest value being 54 (mcg/L), with a mean of 25.7 (mcg/L) and a median of 21.7 (mcg/L). Comparison between those who survived and those who died can be seen in Fig. 1. Showing overlap between the two groups suggests that relying on a single NSE value by itself does not always aid in predicting survivability.

Pearson's correlation was then applied to both the surviving and non-surviving groups, revealing a coefficient *r* value of 0.30 in the survivor dataset and a *r* value of 0.36 in the non-survivor dataset, suggesting weak-to-moderate correlation between the NSE biomarker and MIRACLE2 score.

**Conclusions:** Predicting poor outcomes following out-of-hospital cardiac arrests is a complex task. This study has shown there exists a relationship between NSE values and the corresponding MIRACLE2 score when used together to aid in prognostication of out-of-hospital cardiac arrests. Due to the small sample size, additional study in a larger population group is warranted to explore this relationship further.

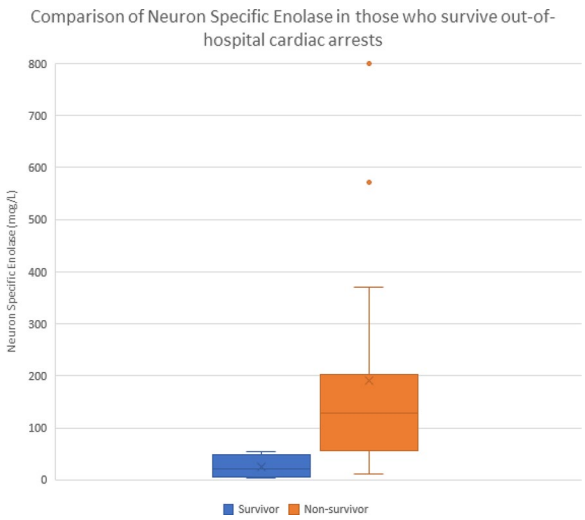


**Fig. 1 (abstract 000250)** Comparison of Neuron Specific Enolase (NSE) values in those who survive out-of-hospital cardiac arrests

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**Topic:** Cardiac arrest

## 000251

### Physical and functional outcomes of WIND 3b patients under the care of a specialist critical care physiotherapy rehabilitation team (CCPRT)

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000251

**Introduction:** Muscle wasting occurs rapidly following initiation of mechanical ventilation (MV), and prolonged MV instigates a higher degree of muscle atrophy (1). This phenomenon leads to prolonged ICU stay, higher mortality and prolonged physical dysfunction following hospital discharge (2). Early and enhanced rehabilitation has been shown to counteract muscle wasting, reduce LOS and improve outcomes (3). We aimed to assess the physical and functional outcomes in WIND group 3b i.e. tracheostomy requirement for prolonged respiratory weaning, under the care of a CCPRT.

**Methods:** WIND 3b patients admitted to a large, UK ICU, without significant neurological or traumatic injury, between November 2021–2023 under the CCPRT were included. The CCPRT provide weekday enhanced rehabilitation to NICE CG83 guidelines. Patient demographics and hospital outcomes were collected retrospectively via electronic patient records. Physical function at ICU and hospital discharge was assessed using the Manchester Mobility Scale (MMS). Occurrence of ICU acquired weakness (ICU-AW) was assessed using the Medical Research Council Sum-Score (MRC-SS) at first rehabilitation session & ICU discharge.

**Results:** 157 patients were included with mean age of 57.6 ± 14.8 years and APACHE II of 16 (IQR: 7–31) on admission. 23 (15%) died in the ICU and 14 (9%) on the ward. Duration of MV was 29 days (IQR: 19–38) with an ICU LOS of 34 days (IQR: 24–46). 100% of patients had ICU-AW at first rehabilitation session (MRC < 48). 64/117 (55%) patients demonstrated ICU-AW at ICU discharge, of which 38 was significant (MRC-SS < 48) and 26 severe (MRC-SS < 36). 88% ($n = 115$) of patients were able to stand or better (MMS ≥ 4) and 57% ($n = 75$) able to mobilise (MMS ≥ 6) at ICU discharge. Hospital LOS was 50 days (IQR 38–74) with 89% ($n = 100$) of patients being able to mobilise (MMS ≥ 6) at hospital discharge. 81% ($n = 92$) of patients were discharged to their home environment.

| Outcomes | *N* | |
|---|---|---|
| Time from admission to tracheostomy | 117 | 11 (8–15.75) |
| Time from admission to mobilisation (MMS ≥ 2) | 117 | 12 (9–17) |
| MRC at ICU Discharge | 117 | 46 (36–50) |
| *No ICU-AW* | | 53 (45%) |
| *Significant ICU-AW* | | 38 (32%) |
| *Severe ICU-AW* | | 26 (22%) |
| MMS at ICU Discharge | 131 | |
| *3* | | 16 (12%) |
| *4* | | 31 (24%) |
| *5* | | 9 (7%) |
| *6* | | 39 (30%) |

| Outcomes | N | |
|---|---|---|
| *7* | | 36 (27%) |
| MMS at Hospital Discharge | 113 | |
| *3* | | 5 (4%) |
| *4* | | 6 (5%) |
| *5* | | 2 (2%) |
| *6* | | 26 (23%) |
| *7* | | 74 (66%) |
| Discharge Destination | 113 | |
| *Home (No Rehabilitation)* | | 51 (45%) |
| *Home (With Rehabilitation)* | | 41 (36%) |
| *Inpatient Rehabilitation* | | 21 (19%) |

**Conclusions:** ICU-AW was highly prevelant in WIND 3b patients at ICU discharge, despite enhanced rehabilitation. However, a specialised CCPRT achieved resolution of ICU-AW in 45% of WIND 3b patients and a high level of physical function at ICU/hospital discharge, with 81% of patients discharged to their home environment. With ever increasing survivorship, further research looking at the long-term functional outcomes in this cohort is essential.

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**Topic:** Nursing care and physiotherapy

## 000252

### Can early tracheostomy cuff deflation with voice restoration reduce psychological morbidity in patients requiring prolonged mechanical ventilation? An observational study


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000252


**Introduction:** Tracheostomy placement is often required in critically ill patients who require prolonged mechanical ventilation (MV) (1) and is associated with increased Intensive Care Unit (ICU) length of stay (LOS), mortality (2) and psychological morbidity (3). Timing of tracheostomy placement and tracheostomy practice i.e. cuff deflation and voice restoration, varies between centres and regions (4). We aimed to evaluate the effect of the timing of tracheostomy cuff deflation and voice restoration on psychological morbidity in patients requiring prolonged MV.

**Methods:** Patients admitted to a large, UK ICU between November 2021–2023, requiring MV > 5 days and a tracheostomy for ventilator weaning were included. Those with significant neurological injury were excluded. Patient demographics and outcomes were collected retrospectively via electronic patient records. Patients were categorised into Early (0–5 days), intermediary (6–10 days) and delayed (> 10 days) tracheostomy cuff deflation. The incidence of psychological morbidity was collected at ICU discharge using the Hospital Anxiety & Depression Score (HADS) & Intensive Care Psychological Assessment Tool (IPAT).

**Results:** 157 patients were included. 23 (15%) died in ICU and 14 (9%) on the ward. 58 (37%) had 'early' cuff deflation, 54 (34%) 'intermediary' and 45 (29%) 'delayed'. No significant difference in patient demographics, sedation days, time to tracheostomy insertion and incidence of delirium was observed between groups. Delayed cuff deflation was associated with significantly higher levels of anxiety (HADS-A, $p = 0.040$) and psychological distress (IPAT, $p = 0.046$) at ICU discharge, with a higher prevalence of moderate and severe anxiety in the delayed cuff deflation group (47% vs 31% vs 12%). A trend towards a higher prevalence of moderate and severe depression was also observed in the delayed cuff deflation group (41% vs 28% vs 20%; p.056).

| Tracheostomy to cuff deflation | N | Whole Cohort | 0–5 Days 'early' | 6–10 Days 'intermediary' | > 10 Days 'delayed' | |
|---|---|---|---|---|---|---|
| *Psychological outcomes* | | | | | | |
| HADS-A at ICU Discharge | 89 | 8 (4–11) | 7 (3–9) | 8 (6–12) | 8 (4–14) | **0.040** |
| *Normal (0 – 7)* | | 42 (47%) | 20 (56%) | 15 (42%) | 7 (41%) | |
| *Mild Anxiety (8–10)* | | 24 (27%) | 12 (33%) | 10 (28%) | 2 (12%) | |
| *Moderate Anxiety (11–15)* | | 17 (19%) | 2 (6%) | 10 (28%) | 5 (29%) | |
| *Severe Anxiety (16–21)* | | 6 (7%) | 2 (6%) | 1 (3%) | 3 (18%) | |
| HADS-D at ICU Discharge | 89 | 8 (4–12) | 6 (3–10) | 8 (5–12) | 10 (4–15) | 0.056 |
| *Normal (0–7)* | | 43 (48%) | 21 (58%) | 15 (42%) | 7 (41%) | |
| *Mild Depression (8–10)* | | 22 (25%) | 8 (22%) | 11 (31%) | 3 (18%) | |
| *Moderate Depression (11–15)* | | 15 (17%) | 5 (14%) | 5 (14%) | 5 (29%) | |
| *Severe Depression (16–21)* | | 9 (10%) | 2 (6%) | 5 (14%) | 2 (12%) | |
| IPAT at ICU Discharge | 89 | 8 (6–12) | 8 (4–11) | 9 (7–12) | 12 (6–15) | **0.046** |
| *Psychological Distress ≥ 7* | | 60 (67%) | 21 (58%) | 27 (75%) | 12 (71%) | |

**Conclusions:** Presence of psychological morbidity within patients requiring prolonged MV and a tracheostomy is high. Our observational data suggests that earlier tracheostomy cuff deflation and voice restoration, may be protective against severe psychological morbidity.

Future trials of early tracheostomy cuff deflation to assess its efficacy in preventing psychological distress is warranted, as well as possible benefits on weaning outcomes and delirium management.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000253

### Service evaluation of tracheostomy practice and management in patients requiring prolonged mechanical ventilation within a large, UK mixed speciality Intensive Care Unit

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**Introduction:** Tracheostomy insertion is commonly performed to help liberate patients from mechanical ventilation (MV) in the ICU (1). TracMan investigated early (< 4 days of admission) vs late (≥ day 10) tracheostomy insertion finding no additional benefit on mortality or weaning outcomes (2). Percutaneous tracheostomies were more frequent than surgical (89.2% vs 10.8%) and the utilisation of sedative medication > 24 h after insertion was high in both the early (approx. 40%) and late (approx. 30%) groups. Regional differences remain in tracheostomy practice (3). In our service, tracheostomy insertion is dictated by clinical decision, and is not protocolised. To investigate our practice, we evaluated tracheostomy management for patients requiring prolonged MV.
**Methods:** We included consecutive patients who were admitted to a large mixed speciality ICU within the UK between November 2021–2023 who required a tracheostomy and > 5 days of MV. Patients where the tracheostomy was not solely required for ventilation weaning e.g. those with significant neurological injury, were excluded. Patient demographics, ventilation and hospital outcomes were retrospectively collected via electronic patient records.
**Results:** 157 patients were included. Mortality within the ICU was 15% ($n = 23$). Age at admission was 57.6 ± 14.8 years with 67% being male. Median duration of MV was 29 days (IQR: 19–38) with ICU length of stay 34 days (IQR: 24–46). Their median Charlson Comorbidity Index at admission was 3 (IQR: 2–5) and APACHE II score 16 (IQR: 7–31). Percutaneous tracheostomy insertion was performed in 118 (75%) patients with 39 (25%) being surgical. The median time to tracheostomy from admission was 11 days (IQR; 8–15.75). Sedation was stopped < 1 day (IQR; 0–2) after tracheostomy and 74% had sedation terminally ceased within 24 h. 77% ($n = 121$) of patients were on a spontaneous mode of ventilation within 24 h of insertion. Patients were liberated from MV on average, 14 days (IQR; 8–25) post insertion and it took 21 days (IQR; 11–31) to achieve successful decannulation.

| Tracheostomy outcomes | *N* | |
|---|---|---|
| Tracheostomy Type | 157 | |
| *Percutaneous* | | 118 (75%) |
| *Surgical* | | 39 (25%) |
| Time to tracheostomy insertion (days) | 157 | 11 (8–15.75) |
| Died in ICU | 157 | 23 (15%) |
| Duration of MV (Days) | 152 | 29 (19–38) |
| ICU Length of Stay (Days) | 132 | 34 (24–46) |
| Sedation Stopped | 157 | 155 (99%) |
| *Days from Tracheostomy* | 155 | 0 (0–2) |
| *Pre-Tracheostomy* | | 23 (15%) |
| *Same Day as Tracheostomy* | | 61 (39%) |
| *Next Day* | | 31 (20%) |
| *> 1 Day* | | 40 (26%) |
| Reached 24 Hours of TM | 144 | 139 (97%) |
| *Days from Tracheostomy* | 139 | 14 (8–25) |
| Decannulated | 157 | 128 (82%) |
| *Days from Tracheostomy* | 128 | 21 (11–31) |

**Conclusions:** Our service evaluation showed a higher incidence of surgical tracheostomies than preceding literature. Time to tracheostomy was consistent with previous studies and current evidence-based practice. We were able to achieve sedation cessation and spontaneous breathing in a higher proportion of patients < 24 h after tracheostomy than previous studies which may lead to earlier engagement in rehabilitation. This, combined with a low mortality rate, may indicate appropriate patient selection and procedure timing within our ICU. Further local evaluation of the high incidence of surgical tracheostomies may be beneficial.

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3. 1. Mohammad Waheed El-Anwar,1 Ahmad Abdel-Fattah Nofal,1 Mohammad A. El Shawadfy,1 Ahmed Maaty,2 and Alaa Omar Khazbak1 Tracheostomy in the Intensive Care Unit: a University Hospital in a Developing Country Study

**Topic:** Acute respiratory failure and mechanical ventilation

## 000254

### The effect of design and implementation of a "Daily Sedation Interruption" protocol on major ICU outcomes in a resource-limited teaching hospital; A parallel design, quasi-experimental clinical trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000254

**Introduction:** Daily sedation interruption (DSI) has been considered as the state-of-the-art of care in intensive care unit (ICU) based mainly on the studies with before-after design, conducted in well-staffed ICU settings. The goal of this study was to design and implement a protocol for daily withdrawal of sedatives and to investigate its effect on major patient-centered outcomes in an ICU in a big teaching hospital, south of Iran.
**Methods:** In this non-randomized clinical trial, two mixed medical-surgical ICU's with similar bed numbers and nurses staffing and managed by the same intensivist-driven medical team were selected. A protocol for DSI was designed and approved after a comprehensive literature review. During a 6-month period, all adult patients who were under mechanical ventilation more than 24 h in these two ICU's who did not meet exclusion criteria were recruited. In the intervention ICU, the nursing staff were trained and encouraged to use DSI protocol on a daily basis. Protocol commitment was supervised by the investigation team, strictly. No intervention was conducted in the control ICU, where sedation regimens were according to daily physicians "as needed" orders and the nurses' decision. Two ICU's were compared for significant patient-centered outcomes during the study period.
**Results:** Sixty-three patients in P-ICU and fifty-three patients in C-ICU were eligible for recruitment during the study period with similar demographic characteristics and medical diagnoses. Mean Glasgow Coma Scale Score and mean Richmond Agitation Sedation Score of patients were significantly higher in P-ICU ($P=0.001$ and $p=0.036$, respectively). There was no significant difference between the ICU's regarding ICU and hospital length of stay and hospital mortality, however, median for ventilator free days (4 vs. 3 days, $p=0.027$) was higher and ICU mortality (19 vs. 36 percent, $p=0.043$) was lower significantly in P-ICU. Moreover, re-intubation rate (6.3 vs 20.8 percent, $p=0.021$) and readmission to ICU rate (zero vs. 7.5 percent, $p=0.041$) were significantly lower in P-ICU patients during the study period. There was no significant difference between these ICU's regarding total midazolam equivalent dosage for sedation, accidental removal of connections, intra vascular accesses and tubes or fall from bed.
**Conclusions:** Despite some limitations, this study well underscores that the implementation of the DSI protocol is a safe and useful method to improve significant ICU outcomes in mechanically ventilated patients admitted to ICU's in a variety of care model settings.

**Reference(s)**
Some of the data were recruited from Iran Intensive Care Unit Registry (IICUR). This is a Persian ICU-based registry which is launched in 2018 at Nemazee hospital affiliated with Shiraz University of Medical sciences. This registry was developed based on the COMET (CORE Outcome Measurement and Evaluation Tool) program, following the approval of the Australian and New Zealand Intensive Care Society. IICUR was approved by Ethics Committee of Shiraz University of Medical Sciences in 2018 (IR.SUMS.REC.1397.559) and recognized by Iran Ministry of Health as the first and single registry of adult ICU in Iran

**Topic:** Sedation, analgesia and delirium

## 000255

## What can we learn from the morbidity and mortality process? Introducing an electronic system to capture M&M cases in the intensive care unit to promote organisational memory

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**Introduction:** The morbidity and mortality process (M&M) is an essential component of clinical governance. A well conducted M&M will allow multi-disciplinary team (MDT) learning, identification of risk and potential system failures, and allow targeted QI interventions. We describe our experience in a large critical care unit in a tertiary hospital, of using an electronic real-time submission tool (M&M Datix) to capture, triage and publicise M&M cases. Each case report was submitted contemporaneously by a clinician involved in the case, and following discussion at departmental M&M meetings, feedback notes collated and distributed.
**Objectives:** To quantify the number and categories of cases captured via our electronic M&M submission portal.
- Describe common themes of cases that trigger an M&M review.
**Methods:** M&M Datix was used to generate "meeting outcome" notes for all M&M cases between 2017 and 2023. We reviewed all meeting outcome notes and assigned learning categories to each case. We describe an overview of the number of cases submitted via M&M Datix and quantify the common categories which lead to M&M submission.
**Results:** Since 2017 there have been 98 submissions in total via M&M Datix, with 79 cases included in analysis and broadly categorised as:
- 28 mortality cases.
- 17 morbidity cases.
- 34 educational cases.
All these cases have been discussed at a monthly departmental team-based quality review meeting. Each analysed case was allocated to a minimum of one learning category.

**Table 1 (abstract 000255)** Key themes identified during analysis of M&M Datix submissions

| Common learning categories: | Number of cases: |
|---|---|
| Team working | 58 |
| Communication | 50 |
| Education | 42 |
| Death | 28 |
| Diagnostic uncertainty | 19 |
| Others | 69 |

The positive contribution of MDT communication and planning for complex cases was emphasised commonly. Central venous catheters, although commonly used, were featured in several M&M cases including contrast extravasation, malposition, and perceived delayed insertion. The need for simulation drills for predictable critical incidents was a common recommendation.
**Conclusions:** M&M Datix has allowed the generation of post-meeting learning notes and clinical governance newsletters to bolster organisational memory. We encourage all new staff to read these to ensure they are orientated to potential risk. Furthermore, we have ensured that both our QI strategy and our MDT educational programme targets areas of learning from our M&M process. It is not surprising that team-working and communication feature heavily in critical incident analysis. It is fundamental that these important non-clinical attributes feature in all healthcare professional training and education.

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**Topic:** Information systems and Data Science

## 000257

### Volatile sedation in intensive care units: a systematic review and *meta*-analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000257

**Introduction:** The use of volatile anesthetic agents has increased in the intensive care unit (ICU) during mechanical ventilation. Compared to intravenous sedation, volatile sedation may have several advantages including suppression of lung injury and inflammatory responses, thereby potentially improving clinical outcomes in critically ill patients. Previous meta-analyses showed a shorter duration to liberation from mechanical ventilation with the use of volatile sedation. The recent publications of large-scale randomized controlled trials (RCTs) and propensity score-matched studies justified updating a comprehensive evaluation on the efficacy and safety of volatile sedation in this setting.
**Objectives:** We aimed to test the hypothesis that volatile sedation, compared to intravenous sedation, would improve clinically relevant outcomes among critically ill adult patients undergoing mechanical ventilation.
**Methods:** This study was registered in the PROSPERO International prospective register of systematic reviews (CRD42023458064) on September 10, 2023. We searched MEDLINE, Embase, and Cochrane Library until October 2, 2023 for RCTs and propensity score-matched studies comparing volatile anesthetics with intravenous agents in critically ill adults receiving invasive mechanical ventilation in the ICU. The primary outcome was the time from termination of sedative administration to extubation. The secondary outcomes included delirium, in-hospital mortality, length of stay in the ICU and hospital, and acute kidney injury. We assessed these outcomes with a random-effects Mantel–Haenszel model.
**Results:** We included eighteen RCTs and three propensity score-matched studies, totaling 2054 patients. Volatile sedation was significantly associated with a shorter time to extubation than intravenous sedation (mean difference, − 87 min; 95% confidence interval (CI), − 125 to −49; $p < 0.001$; $I^2 = 91\%$). Among the secondary outcomes, delirium was less frequent (37/405 [9.1%] vs. 62/406 [15.3%]; risk ratio, 0.60; 95% CI, 0.41 to 0.89; $p = 0.01$; $I^2 = 0\%$) and the length of hospital stay was shorter (mean difference, − 0.92 days; 95% CI, − 1.79 to − 0.04; $p = 0.04$; $I^2 = 53\%$) in the volatile sedation group. No significant difference was detected in other outcomes.
**Conclusions:** Compared to intravenous sedation, volatile sedation was significantly associated with a reduced time to extubation, a lower incidence of delirium, and a decreased length of hospital stay among critically ill patients on mechanical ventilation.

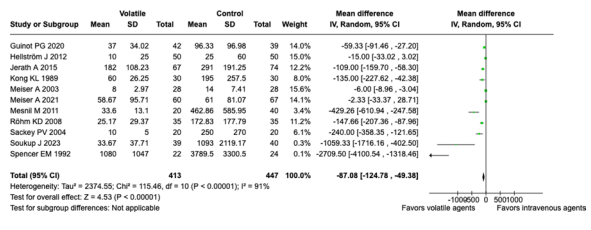


**Fig. (abstract 000257)** Forest plot for time to extubation

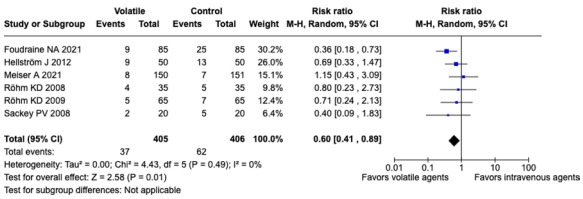


**Fig. (abstract 000257)** Forest plot for incidence of delirium

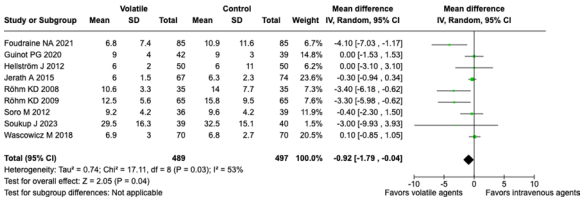


**Fig. (abstract 000257)** Forest plot for hospital length of stay

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**Topic:** Sedation, analgesia and delirium

## 000258

### Activation Pattern of Dendritic Cell Necroptosis during the Acute Phase of *Sepsis* and Its Impact on Immune Function and Organ Damage

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**Introduction:** Sepsis, a life-threatening organ dysfunction caused by a dysregulated host response to infection, remains a principal cause of mortality among critically ill patients worldwide. Studies have indicated that the early stages of sepsis can lead to a reduction in dendritic cell (DC) numbers and functional impairment. Clinical investigations have also identified a close correlation between the extent of DC depletion and fatal outcomes in patients with sepsis. Necroptosis, a form of cell death dependent on RIPK1/RIPK3 signaling, plays a pivotal role in the pathogenesis of sepsis. However, the extent and impact of DC necroptosis during sepsis have not been previously reported.

**Objectives:** To delineate the pattern of DC necroptosis during sepsis and explore its effects on the immune function and organ damage in mice with sepsis.
**Methods:** A sepsis model was established in wild-type male C57BL/6J mice using the CLP method. Splenic DCs were isolated at 0 h, 6 h, 12 h, and 24 h post-model establishment. The level of DC necroptosis was assessed through Western Blot, flow cytometry, confocal imaging, and ELISA. Additionally, a sepsis model was established in Cd11ccreMlklfl/fl mice, and immune function was evaluated 24 h post-model establishment via flow cytometry and ELISA, while serum biochemical indicators and H&E staining of vital organs (heart, liver, lungs, kidneys) were used to assess organ damage.
**Results:** In the early stages of sepsis (within 24 h), a significant necroptosis of splenic DCs was observed, correlating positively with disease progression. Sepsis induced a significant increase in the phosphorylation levels of MLKL, RIPK3, and RIPK1 in DCs, with a marked increase in the proportion of DCs undergoing necroptosis (Annexin V + 7-AAD +). The intracellular levels of p-RIPK3 and p-MLKL were significantly elevated, along with notable upregulation of necroptosis-associated factors (HMGB1, IL-1α, IL-33, LDH, and TNF-α). Knockout of the Mlkl gene in mouse DCs inhibited necroptosis, significantly increased the proportion of CD3 + T cells and CD4 + T cells in peripheral blood, decreased the proportion of Tregs, and significantly reduced the levels of pro-inflammatory (e.g., IFN-γ) and anti-inflammatory (e.g., IL-10) cytokines. Furthermore, conditional knockout of the Mlkl gene in mice resulted in a significant reduction in organ damage markers (ALT, AST, CREA, and CK) post-CLP modeling, with corresponding improvements in tissue damage in the heart, liver, lungs, and kidneys.
**Conclusions:** Sepsis induces necroptosis in splenic DCs, correlating positively with disease progression. Inhibiting DC necroptosis significantly ameliorates sepsis-related immune dysfunction and organ damage, suggesting its critical role in the pathogenesis of sepsis.

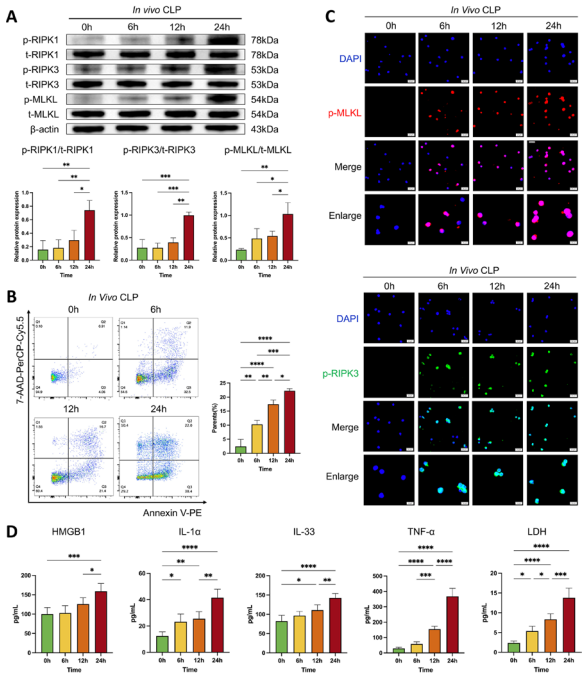


**Fig. 1 (abstract 000258)** Necroptosis of Splenic Dendritic Cells Induced by Sepsis. A: Levels of necroptosis-related proteins in DCs 24 h post-CLP modeling assessed by Western Blot; B: Proportion of necroptotic DCs 24 h post-CLP modeling detected by flow cytometry; C: Expression levels of p-MLKL and p-RIPK3 in DCs 24 h post-CLP modeling observed via confocal microscopy; D: Levels of necroptosis-related cytokines in mouse serum 24 h post-CLP modeling measured by ELISA. *: $P < 0.05$, **: $P < 0.01$, ***: $P < 0.001$, ****: $P < 0.0001$

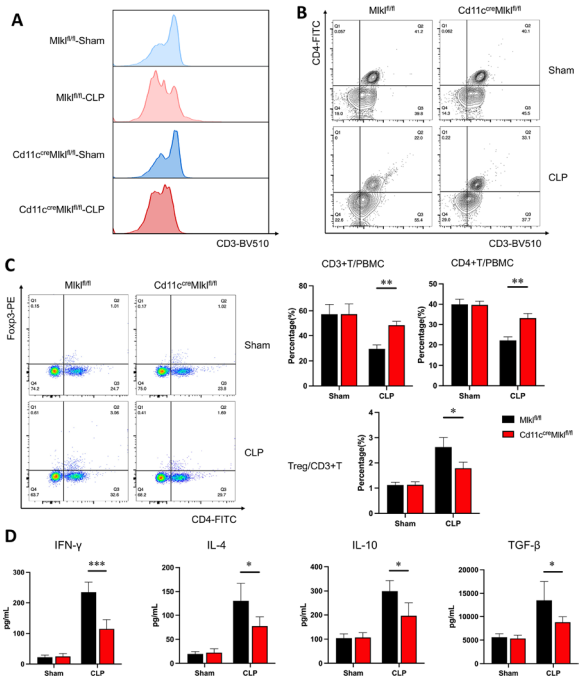


**Fig. 2 (abstract 000258)** Impact of Conditional Knockout of Mlkl Gene on Immune Function in Mice with Sepsis. A: Proportion of CD3+T cells in PBMCs of different groups of mice measured by flow cytometry; B: Proportion of CD4 + T cells in PBMCs of different groups of mice measured by flow cytometry; C: Proportion of Tregs in CD3+T cells of peripheral blood in different groups of mice measured by flow cytometry; D: Levels of inflammatory cytokines in peripheral blood of different groups of mice measured by ELISA. *: $P < 0.05$, **: $P < 0.01$, ***: $P < 0.001$

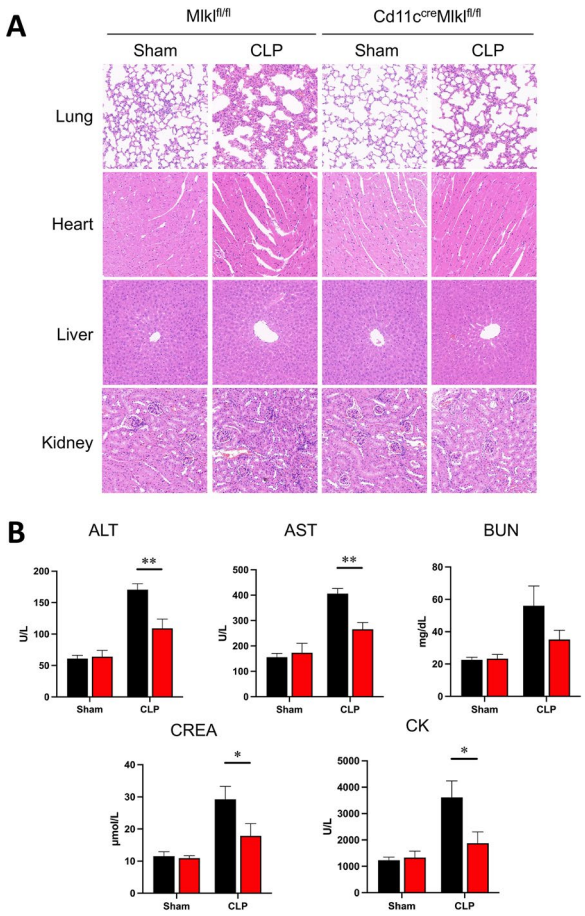


**Fig. 3 (abstract 000258)** Impact of Conditional Knockout of Mlkl Gene on Organ Damage in Mice with Sepsis. A: Assessment of tissue damage in the lungs, heart, liver, and kidneys of different groups of mice by H&E staining; B: Evaluation of organ damage markers in different groups of mice by biochemical tests. *: $P < 0.05$, **: $P < 0.01$

**Reference(s)**


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**Topic:** Sepsis

## 000259 Human umbilical cord mesenchymal stem cell-derived small extracellular vesicles ameliorate sepsis-associated acute kidney injury by suppressing inflammatory responses and glycolysis through the let-7a-5p/TLR4/NF-kB axis


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**Introduction:** Sepsis is a fatal disease with high morbidity and mortality, and acute kidney injury is a common complication. Recent evidence suggests that inflammation, metabolic reprogramming and microcirculation dysfunction are the three basic mechanisms underlying the development of sepsis-associated acute kidney injury (SA-AKI)[1]. Human umbilical cord mesenchymal stem cell-derived small extracellular vesicles (hucMSC-sEVs) have the capacity for intercellular signaling communication, making them a novel therapeutic strategy for various diseases[2]. Our previous study found that hucMSC-sEVs ameliorated ischemia–reperfusion-induced AKI[3], whereas engineered red blood cell-derived extracellular vesicles significantly enhanced the ability to specifically target damaged kidneys[4]. However, the use of hucMSC-EVs in SA-KI has been rarely reported.
**Objectives:** To investigate the role and molecular mechanisms of hucMSC-sEVs in SA-AKI.
**Methods:** hucMSC-sEVs were obtained through ultracentrifugation combined with size exclusion chromatography, and characterized by transmission electron microscopy, nanoparticle tracking analysis, and western blotting. SA-AKI was induced by cecal ligation and puncture (CLP) in mice and lipopolysaccharide (LPS)-induced HK2 cell model, followed by intervention with hucMSC-sEVs. The biodistribution of hucMSC-sEVs in the SA-AKI mouse model was imaged using the IVIS spectrum imaging system. Serum creatinine, urea nitrogen and cystatin C were measured to evaluate kidney function. Histopathological changes of kidney tissues in mice were detected by H&E staining. The mRNA levels of renal injury molecules, inflammatory cytokines and key enzymes of glycolysis in kidney tissues of mice and HK-2 cells were determined by qPCR. The miRNA expression profile of hucMSC-sEVs was analyzed through small RNA sequencing.
**Results:** We found that hucMSC-sEVs exhibited significant improvements in SA-AKI both in vitro and in vivo. In vitro, hucMSC-sEVs inhibited inflammation and glycolysis in LPS-stimulated HK-2 cells. In vivo, administration of the hucMSC-sEVs improved the extent of weight loss, enhanced survival rate, reduced serum levels of creatinine, urea nitrogen, and cystatin C, ameliorated the pathological injury of kidney tissues in mice, and decreased mRNA expression levels of KIM-1, NGAL as well as IL-1β, IL-6, TNF-α, MCP-1, HK2, PKM2, LDHA, PDK1, and showing dose-dependent protective. Mechanistically, exosomal small RNA sequencing and qPCR analysis demonstrated that let-7a-5p, which is highly enriched in hucMSC-sEVs, has the ability to reduce inflammation and glycolysis by targeting TLR4/NF-κB pathway. Conversely, downregulation of let-7a-5p in hucMSCs attenuated the protective effects of hucMSC-sEVs on SA-AKI in mice.
**Conclusions:** We have unveiled a novel potential therapeutic mechanism whereby let-7a-5p in hucMSC-sEVs may ameliorate SA-AKI by modulating TLR4/NF-κB pathway to reduce inflammation and glycolysis, which may benefit patients with SA-AKI in future clinical applications.

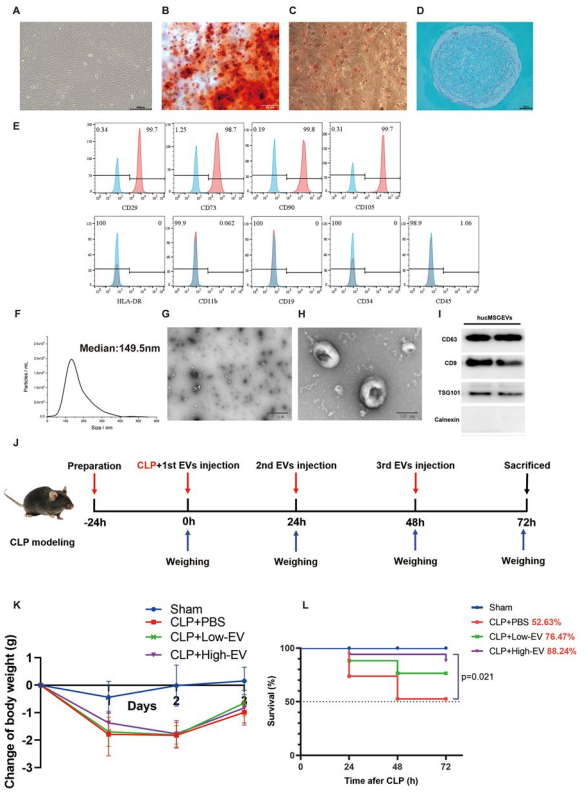


**Fig. 1 (abstract 000259)** Characterization of MSC-EVs and intervention in septic mice. (A) Growth morphology of MSC cells under light microscope. (B) MSC osteogenic differentiation map. (C) MSC adipogenic differentiation map. (D) MSC differentiation into cartilage. (E) MSC marker identification. (F) Nanoparticle tracing results for MSC-EVs. (G–H) Transmission electron microscope results of MSC-EVs. (I) Western blot analysis of MSC-EVs marker protein. (J) Experimental protocol of MSC-EVs intervention in sepsis mouse model established by CLP. (K) Daily weight changes of animals in each group. (L) Survival curves of animals in each group

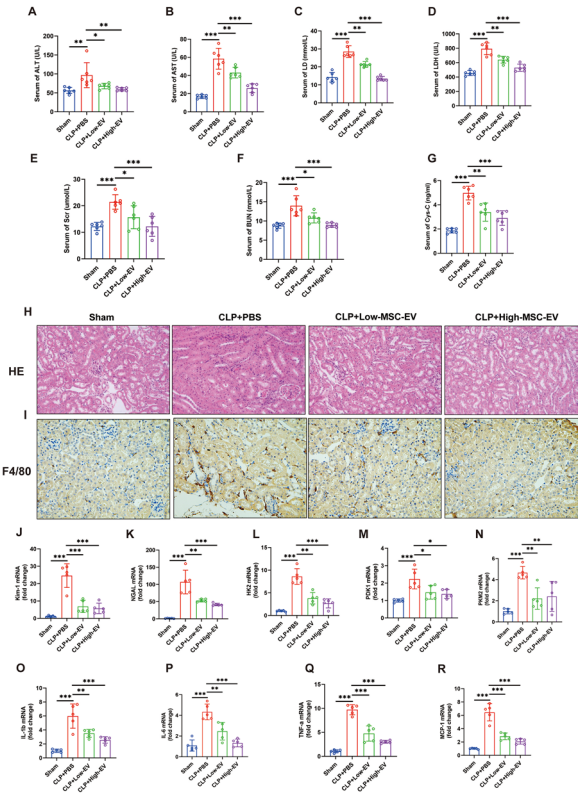


**Fig. 2 (abstract 000259)** Evaluation of the protective effects of MSC-EVs on septic mice. (A) Serum ALT levels of mice in each group. (B) Serum AST levels of mice in each group. (C) The level of LD in serum of mice in each group. (D) LDH level in serum of mice in each group. (E) The level of serum Scr in mice of each group. (F) Serum BUN levels of mice in each group. (G) Serum Cys-C levels of mice in each group. (H) Representative image of HE staining of kidney tissue. (I) Representative image of F4/80 immunohistochemical staining of kidney tissue. (J-R) qRT-PCR was used to detect the mRNA expression of renal injury markers (Kim-1, NGAL), key glycolytic enzymes (HK-2, PDK-1, PKM-2) and inflammatory cytokines (IL-1b, IL-6, TNF-a, MCP-1) in renal tissue. Data are presented as mean ± SD, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, one-way ANOVA

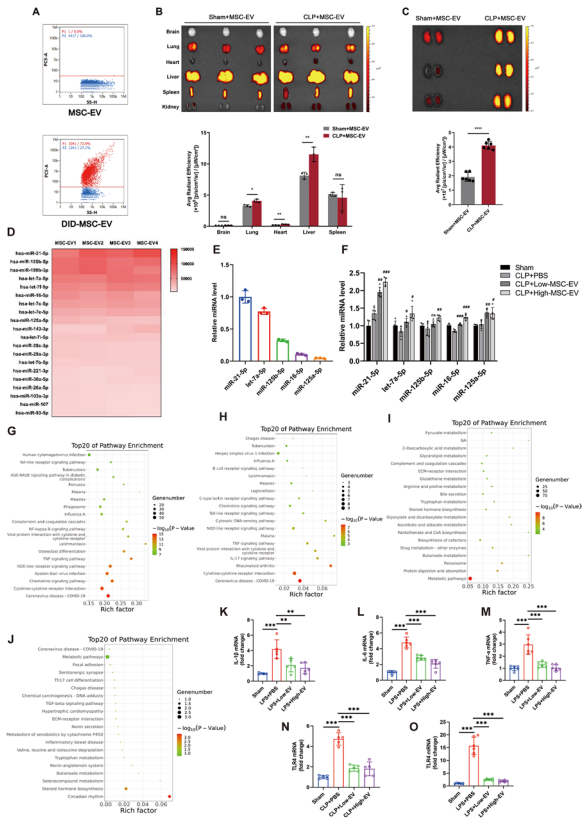

**Fig. 3 (abstract 000259)** The mechanism of MSC-EVs in septic mice. (A) Positive rates of EVs and DID-EVs assessed by nanoflow. (B) Organ distribution of DID-EVs. (C) Renal distribution of DID-EVs. (D) Top 20 miRNA sequencing in MSC-EVs cargo. (E) qRT-PCR detection of miRNAs in MSC-EVs content. (F) qRT-PCR was used to detect miRNA levels in kidney tissues of each group. (G) Pathway enrichment results for upregulated differential genes in the CLP group versus the Top 20 in the Sham group. (H) Pathway enrichment results of down-regulated differential genes in MSC-EVs group compared with CLP group Top 20. (I) Pathway enrichment results of down-regulated differential genes in CLP group versus Sham group Top 20. (J) Pathway enrichment results of upregulated differential genes in MSC-EVs group versus CLP group Top 20. (K–O) qRT-PCR was used to verify the mRNA expression levels of inflammatory factors and TLR4 in renal tissues and in vitro models. Data are presented as mean ± SD, $*p<0.05$, $**p<0.01$, $***p<0.001$, one-way ANOVA

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**Topic:** Sepsis

## 000260

### Ventilator-associated pneumonia in ICU patients with or without *Candida* airway colonization

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**Introduction:** In critically ill patients with ventilator-associated pneumonia (VAP), the relationship between *Candida* species airway colonization, adverse clinical outcomes, and antifungal treatment's impact is not entirely known. We compared these variables between VAP patients with or without *Candida* isolation from the respiratory tract.

**Methods:** In this cohort study, data were retrospectively collected from three medical and surgical adult ICUs of Namazi hospital between the 1st of March 2016 and the 29th of March 2023. We assessed 426 consecutive immunocompetent patients with VAP and compared them according to the presence or absence of *Candida* spp. in their lower respiratory tract samples.

**Results:***Candida* spp. were isolated from the respiratory tract of 93 (21.8%) VAP patients. Multivariate analysis revealed that having a feeding tube (OR: 8.43, 95% CI [4.54–15.66]) and the use of proton pump inhibitors (OR: 4.04, 95% CI [1.85–8.76]) independently predicted the isolation of *Candida*. The length of mechanical ventilation and the in-hospital mortality rate were similar in both groups, while the intensive care unit (ICU) mortality rate was greater among patients with *Candida* respiratory colonization ($P \leq 0.001$). Antifungal therapy was more frequently prescribed in patients with *Candida* colonization but did not influence the outcomes. Among VAP patients with *Candida* colonization, the ICU stay in patients with antifungal therapy was longer than in those without antifungal therapy (37 vs. 26 days, $P<0.01$).

**Conclusions:** Our findings indicate that *Candida* airway colonization is associated with higher ICU mortality in patients with VAP. However, antifungal treatment did not affect mortality or clinical outcomes in VAP patients with *Candida* airway colonization.

**Reference(s)**

Some of the data were recruited from Iran Intensive Care Unit Registry (IICUR). This is a Persian ICU-based registry which is launched in 2018 at Nemazee hospital affiliated with Shiraz University of Medical sciences. This registry was developed based on the COMET (CORE Outcome Measurement and Evaluation Tool) program, following the approval of the Australian and New Zealand Intensive Care Society. IICUR was approved by Ethics Committee of Shiraz University of Medical Sciences in 2018 (IR.SUMS.REC.1397.559) and recognized by Iran Ministry of Health as the first and single registry of adult ICU in Iran.

**Topic:** Infections and prevention

## 000261

### Umbilical cord mesenchymal stem cell-derived small extracellular vesicles modulate IL-6/NF-κb/NLRP3/GSDMD axis via IL-6st to alleviate pyroptosis in sepsis acute lung injury

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**Introduction:** Sepsis is a fatal disease in which acute lung injury is the earliest and most serious complication. Excessive inflammatory response is an important mechanism in the development of sepsis-induced acute lung injury (S-ALI)[1]. Aberrant activation of the interleukin 6 (IL-6) signaling pathway plays an important role in the inflammatory cascade response in sepsis, thereby promoting SALI[2]. Our previous studies demonstrated that small extracellular vesicles derived from human umbilical cord mesenchymal stem cells (hucMSC-sEVs) have anti-inflammatory and pro-repair effects, and that engineering sEVs can also enhance their targeting to specific organs[3], [4]. However, the role of hucMSC-sEV on S-ALI and the mechanisms remain to be thoroughly explored.
**Objectives:** To investigate the protective effects and mechanisms of hucMSC-sEV against S-ALI.
**Methods:** hucMSC-sEV was obtained by differential ultracentvation combined with size exclusion chromatography and characterized. S-ALI model was established by cecal ligation and puncture (CLP) and LPS. First, the biological distribution of sEV was observed by IVIS spectroscopic imaging system and confocal microscopy, and cellular uptake was quantified by flow cytometry. ELISA was used to detect the levels of serum inflammatory factors, LD and LDH. HE staining was used to detect the pathological changes of lung tissue. Functional molecules of sEV and differentially expressed genes were analyzed by proteomics and RNA sequencing. qRT-PCR, Western blot and immunohistochemical/fluorescence were applied to assess the transcriptional and translational levels of the indicators. Inhibition assay were validated by cell transfection.
**Results:** hucMSC-sEV significantly ameliorated sepsis acute lung injury in vitro and in vivo. In vivo, the number of sEV distributed in lung increased significantly after CLP. In the sEV intervention group, mice showed less body weight loss, higher survival rate, and less pathological lung tissue damage; lower serum LD, LDH, IL-1β, IL-6, TNF-a, and IL-18 levels. In vitro, increased uptake of hucMSC-sEV by LPS-stimulated BEAS-2B cells, and the inflammatory response was suppressed. Mechanistically, RNA sequencing revealed that CLP-induced upregulated genes were mainly associated with inflammatory response, and the signal pathway was enriched in NLRs-like receptor signaling pathway, which was significantly inhibited after sEV intervention. Combined with exosomal proteomics sequencing analysis and qRT-PCR validation, it was confirmed that IL-6st was highly enriched in sEV, which could regulate the NF-κb/NLRP3/GSDMD signaling pathway by competitive binding to IL-6, thereby inhibiting pyroptosis and ameliorating lung injury. In contrast, after knocking down IL-6st in hucMSC, the protective effect of hucMSC-sEV against S-ALI was reduced.
**Conclusions:** hucMSC-sEV carries IL-6st to competitively bind IL-6, thereby inhibiting NF-κb/NLRP3/GSDMD signaling pathway-induced pyroptosis and alleviating S-ALI.

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5. None

**Topic:** Sepsis

## 000264

### Trends and complications in intra-aortic balloon pump use compared to SHOCK-II trial

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**Introduction:** The intra-aortic balloon pump (IABP) was considered a device that improved outcomes in myocardial infarction complicated by cardiogenic shock. However, the IABP-SHOCK-II [1] trial found no survival benefit.
**Objectives:** We aimed to analyse the use of IABP in a critical care setting of a major tertiary cardiac centre in the UK in patients following cardiac surgery.
The primary outcome was the trend in IABP use over time. The secondary outcomes were the length of stay in Intensive Care, number of blood products used and status at ICU discharge. Tertiary outcomes included morbidity. mortality and complications suffered in this patient group.
**Methods:** We used a retrospective review of medical notes to determine the pathway of admission to Intensive Care, the date of insertion of IABP and the subsequent date of removal. Type of surgery, status at discharge, blood products used and complications suffered due to IABP and post-IABP removal were all recorded.
**Results:** Despite previous findings of SHOCK-II [2], 265 patients received IABP therapy in a major cardiothoracic centre in the UK. 69 female (26%), 196 male (74%). Average age: 66.93 years. Pathway for admission to critical care included: post-ACS: 122/265 (46%), post-cardiac surgery 106/265 (40%) and decompensated heart failure 37/265 (14%). The median length of stay was 5 days (IQR 7, Q1 3 Q3 10). The mean length of stay was 9.1 days (Range: 1–113). 54 people died during their admission in this study (20%). We found 142/265 (54%) had complications with IABP in situ and 54/265 (20%) had complications after removal. Mean number of red blood cells transfused was 1.66 (Range: 0–24) per patient. 140 patients received no blood at all. The mean units of platelets was 0.64 (Range: 0–11), with 194 receiving no platelets at all.
**Conclusions:** IABP therapy is still being used in a major cardiac centre in the UK. In light of the findings of SHOCK-II, guidelines may require change to see an impact on clinical practice. If IABP use is to continue, then research should be conducted to compare the outcomes of patients who receive IABP therapy vs those who do not.

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**Topic:** Cardiovascular issues in ICU

## 000266

### Ards in patients with mechanical ventilation in high altitude ICUS: in search of a phenotype and its prognostic impact

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**Introduction:** The syndromic definition of Acute Respiratory Distress Syndrome (ARDS) encompasses a range of pulmonary physiological abnormalities and chest radiographic findings, alongside variations in biological pathways of injury, as evidenced by plasma protein biomarkers and gene expression profiles. Compared to residing in low-altitude regions, long-term habitation in high-altitude, hypobaric, and hypoxic environments gives rise to disparities in the pathophysiology and clinical presentations of ARDS.

**Objectives:** Analyze demographic, clinical, and paraclinical data of patients diagnosed with severe acute respiratory failure under mechanical ventilation from cities situated at 2500 m above sea level, admitted to respective intensive care units, and identify characteristic phenotypes that may facilitate a more effective therapeutic approach and improve mortality outcomes.

**Methods:** An Multicenter ambispective cohort study was carried out in patients admitted to intensive care units with a diagnosis of Acute Respiratory Distress Syndrome (ARDS) in third-level hospitals located in Colombia and Bolivia: Hospitals San José and San Jose Childrens, Cafam Clinics Of Bogotá and Hospital Agramont from El Alto city in Bolivia. Data collection spanned retrospectively from April 2022 to April 2023 and prospectively from April to June 2023, extracted from electronic medical records covering the hospitalization period. An initial descriptive analysis summarized the qualitative variables using frequencies and percentages, while the quantitative data were presented as means and interquartile ranges. Differences between survivor and deceased patients were initially explored by univariate statistical analyses. Qualitative variables were compared using chi-square tests and quantitative variables using the Student's t-tests adjusted for non-homogeneous variance when needed. These analyses were performed in IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp. A multivariate logistic regression of the first 10 principal components (PC) was performed to evaluate the effect of each of these PCs on the probability of decease using the model: Probability of decease ~ Intercept + PC1 + PC2 + PC3 + PC4 + PC5 + PC6 + PC7 + PC8 + PC9 + PC10. The classification cutoff was set to 0.5. PCA and logistic regression analyses were performed in GraphPad Prism version 10.0.0 for Windows, GraphPad Software, Boston, Massachusetts USA.

**Results:** 70 patients with mechanical ventilations and ARDS are included. Univariate analyses revealed differences between survivors and deceased patients in eight out of fifty-nine studied variables. Comparatively, deceased individuals showed significantly higher values of APACHE II score, CRP, total count of leucocytes, and total count and percentage of neutrophils, while the total count and percentage of lymphocytes, and the percentage of basophils were significantly lower. We were interested in surveying whether a specific combination of clinical parameters and their values which could characterize those patients who deceased from those who survived exists. Thus, we selected the variables measured as numeric continuous values (35 variables) and performed a principal component analysis (PCA). We calculated a total of 35 principal components.Thus, compared to survivors, deceased patients in our sample were characterized by elevated values of neutrophils (total count and %), leucocytes (total count), and PCR, were older, heavier, and showed decreased values of lymphocytes (total count and %), monocytes (%), basophils (%), hemoglobin, EPO, and RDW. Finally, we were interested in identifying which of the clinical variables included in PCs 2 and 4 are the best predictors of death in these patients. Logistic regression analyses revealed that basophils (%), leucocytes, lymphocytes (total count and %), neutrophils (%) and PCR significantly affect the probability of decease. However, CRP (AUC = 0.82) and % neutrophils (AUC = 0.71) are the most reliable predictors.

**Conclusions:** In ICU patients residing of High altitudes a phenotype with Inflammatory and hematological parameters demonstrated a strong association with the probability of survival or mortality.

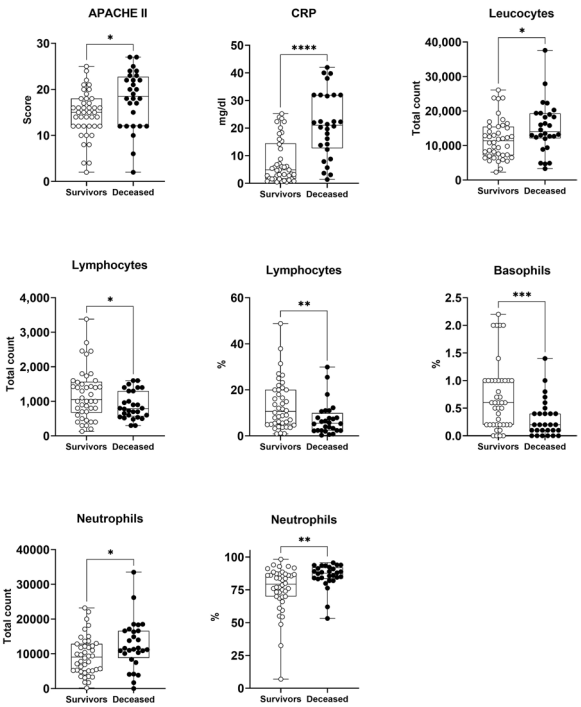


**Fig. (abstract 000266)** Survivors and deceased patients showed differences in 8 out of 59 studied variables. All these nine parameters were markers of inflammation. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; ****$p < 0.0001$. nsurvivors = 42; ndeceased = 28

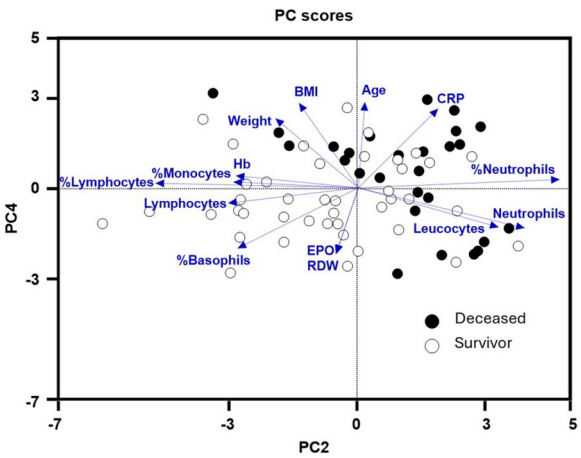


**Fig. (abstract 000266)** Deceased (black dots) and survivor (white dots) high-altitude patients with subacute respiratory failure differentiate from one another in values of hematological parameters and inflammatory markers

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000267

### The impact of age on the outcome of traumatic brain injury: a retrospective study

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**Introduction:** Approximately 30% of trauma-related deaths result from traumatic brain injury (TBI) [1], in younger adults and elderly patients [2]. Management strategies may vary across age groups, potentially influencing short-term neurological outcomes [3].
**Objectives:** To investigate age-related disparities in treatment approaches and 3-month neurological outcomes among TBI patients.
**Methods:** We conducted a retrospective study of TBI patients requiring Intensive Care Unit (ICU) admission from January 1, 2015, to June 30, 2020 in a tertiary University hospital. Patient demographics, major comorbidities, ICU admission parameters, interventions, and complications were collected. A favorable neurological outcome (FO) was defined as a Glasgow Outcome Scale (GOS) score of 4–5 at 3 months. A multivariable logistic regression model was used to assess the association of age with neurological outcome.
**Results:** We enrolled 462 TBI patients, of which 290 (62.8%) had a FO. The highest prevalence of FO was found in the patients aged 35–49 (71/101, 70.3%), followed by the group aged 13–34 (60/93; 64.5%) and the group aged 50–79, 121/191 (63.4%; $p = 0.03$). Older patients (age 80 years) received significantly less invasive intracranial pressure monitoring (ICP) and less aggressive treatment for raised ICP, including osmotic therapy, decompressive craniectomy and barbiturates. Logistic regression adjusted for initial Glasgow Coma Scale (GCS), hypotension and hypoxemia on admission, pupillary reactivity on admission, glucose on admission, the presence of traumatic subarachnoid hemorrhage or epidural hematoma on CT-scan, any episode of intracranial hypertension, seizures and shock, showed that, compared to the reference group of age 17–34, the age group 35–49 had the highest (OR: 2.88; CI:1.17–7.08; *p*-value: 0.02) and the age group 80 the lowest (OR: 0.29; CI: 0.12–0.70; *p*-value: 0.006) probability of FO.
**Conclusions:** In this cohort of TBI patients, those aged 35–49 had the best neurological outcome, while patients aged 80 and older had the worst neurological outcome and received less invasive monitoring and treatment for intracranial hypertension.

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**Topic:** Neurointensive care

## 000268

### Clinical features and outcomes of Guillain–Barré syndrome in the ICU of a tertiary center in Portugal

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**Introduction:** Guillain-Barré syndrome (GBS) is the most common cause of acute flaccid paralysis worldwide.1 Data on the clinical features of GBS are limited. We aimed to describe the clinical, laboratory characteristics and outcomes of a cohort of patients with GBS in the ICU of a tertiary center.
**Methods:** This is a retrospective observational cohort study of patients admitted with GBS between January 2020 and December 2023 to the ICU of a tertiary center in Portugal. Descriptive statistics were used.
**Results:** A total of 15 patients were enrolled of which 10 (66.7%) were male and the mean age was 59,3 $3 \pm 12.9$ years. Their comorbidities were arterial hypertension (60.0%), diabetes mellitus (33.3%), dyslipidemia (53.3%), obesity (26.7%), heart failure (13.3%) and multiple sclerosis (6.7%). The most frequent trigger was respiratory infections in 26,7% followed by other viral infections in 20% and recent surgery in 13.3%. All patients presented with weakness at admission. Other clinical features are desribed in Table 1. Cerebrospinal fluid examination revealed a mean protein level of 51, $9 \pm 41.5$ g/dL and cytoalbuminological dissociation in 50%. Electrophysiologic study was performed in 14 patients from which 5 revealed a sensorimotor polyneuropathy, 3 were normal, 3 axonal demyelination, 2 Miller-Fisher and 1 acute motor sensory axonal neuropathy (AMSAN). Mean ICU length of stay was $29.9 \pm 26.4$ days with 13 (86.7%) patients requiring invasive mechanical ventilation (IMV) for a mean of $16.1 \pm 11.1$ days. Intravenous Immunoglobulin (IVIG) was used in 14 (93.3%) patients and plasma exchange in 5 (33.3%) patients, 4 (80.0%) of them after IVIG. 38.5% patients reported full recovery at 1-year follow-up. Hospital mortality was 6.7% and 1-year mortality was 13.3%.

**Table 1 (abstract 000268)** Clinical features on admission

| Clinical features at admission | N (%) |
|---|---|
| Sensory involvement | 9 (60%) |
| Bulbar symptoms | 15 (100%) |
| Ophthalmoplegia | 2 (13.3) |
| Dyspnea | 13 (86.7) |
| Ataxia | 6 (40%) |
| Areflexia | 12 (80%) |
| Autonomic dysfunction | 11 (73.3) |

**Conclusions:** The results of this review are in accordance with the literature, regarding demographic data and clinical behavior. IVIG is the preferred immunomodulatory treatment. Retreatment is controversial, however we considered it for for non-responsive patients.

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**Topic:** Neurointensive care

## 000269

### Effects of $FiO_2$ Adjustment on the Hyperoxia Biomarkers and Postoperative Complications Using Oxygen Reserve Index on One Lung Ventilation

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**Introduction:** One-lung ventilation (OLV) is a technique used in thoracic surgeries with the aim ofenhancing the surgical field of view and preventing the transmission of unilateral pathologiesto the contralateral lung through the respiratory pathways. Ceasing ventilation of the lung onthe operated side leads to its collapse, which significantly impacts respiratory and circulatoryphysiology. Close monitoring of oxygenation and circulation is of paramount importance inthese patients. Particularly, anesthesiologists might need to administer high concentrations ofoxygen to patients due to compromised oxygenation. However, in this scenario, the harmfuleffects of hyperoxia can emerge as a result of increased oxygen exposure.In patients undergoing one-lung ventilation (OLV), alongside the use of basic pulseoximetry for oxygenation monitoring, arterial blood gas analysis is employed. While pulseoximetry serves as a satisfactory monitoring tool for detecting hypoxemia, it falls short inindicating hyperoxia. Arterial blood gas analysis, on the other hand, serves as the gold standardfor representing the oxygenation state at a specific moment, yet its feasibility for continuousmeasurement is limited. The Oxygen Reserve Index (ORi) is a noninvasive and continuous toolused to display mild hyperoxic blood oxygen values in patients. Apart from its function as anearly warning system by detecting a decrease in ORi values before hypoxemia occurs, it alsofacilitates the avoidance of hyperoxia. Its clinical utilization is present in the operating roomand intensive care unit settings.
**Objectives:** The primary objective of our study is to demonstrate whetherORi monitoring during OLV provides effective oxygenation with lower FiO2 levels; thesecondary objective is to investigate whether there are differences in biomarker levels relatedto hyperoxia in blood and tracheal aspirate, postoperative pulmonary complications, andsurgical site infections between groups with and without ORi monitoring.
**Methods:** After obtaining ethical approval from Başkent University Clinical Research EthicsCommittee and written consent from patients, a total of 60 elective thoracic surgery patientspatients undergoing one-lung ventilation (OLV) were included in the study. The patients weredivided into two groups: one group underwent ORi monitoring with FiO2 adjustments, whilethe other group had fixed FiO2 values during OLV (0.6) and dual-lung ventilation (0.5) ifhypoxemia did not occur. Blood samples were collected at anesthesia induction, postoperative 12 and 24 h. Tracheal aspirate sampling was done before extubation at the end of thesurgery. Patients were followed for pulmonary complications and surgical site infections untildischarge.
**Results:** The patients included in the study exhibited similar demographic characteristics.Comparable mechanical ventilator pressures were observed during the intraoperative period.While significant hypoxemia was not observed in either group, the intraoperative FiO2 levelswere significantly lower in the group with ORi monitoring compared to the non-monitoredgroup (0.4(0.4–0.5) vs 0.5(0.5–0.6) $p < 0.001$). However, there was no significant differencebetween the two groups in terms of IL-6, SOD, and MDA levels in both blood and trachealaspirate samples (for each biomarker $p > 0.05$). There was no statistically significant differencein the development of postoperative pulmonary complications between the two groups. Surgicalsite infection was not observed in either group.
**Conclusions:** In conclusion, ORi monitoring can be considered as an effective and safe tool inpreventing the development of hyperoxia in patients undergoing one lung ventilation. However, in clinical practice, to demonstrate its potential to reduce complications and morbidity, moreextensive and comprehensive studies are needed, particularly when high SpO2 targets are notconsidered.

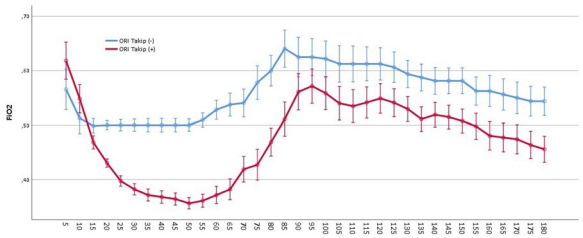


**Fig. (abstract 000269)** X axis = Time (minutes) Y axis = $FiO_2$ Blue line = Patients without ORi monitoring Red line = Patients with ORi monitoring

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**Topic:** Perioperative care

## 000270

### Antibiotic associated thrombocytopenia in ICU for treatment of gram positive micro-organisms

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**Introduction:** Thrombocytopenia is the most common coagulation problem in ICU patients and is an independent predictor of death among critically ill patients. When starting antibiotic therapy in septic patient, drug-induced thrombocytopenia maybe considered as a possible game player. We aimed to compare risk factors and major outcomes associated with usual antibiotics used for coverage of gram-positive bacteria in our ICU's.
**Methods:** We conducted a retrospective study of prospectively collected data of all patients admitted to the three mixed medica-surgical ICUs between 2018 and 2023 from Iran Intensive Care Unit Registry. Every patient with equal or more than 18-year old and thrombocytopenia at least five days after start of intravenous vancomycin, linezolid or teicoplanin (V, L, and T groups, respectively) was included in the study. Any possible risk factor and major patient-centered outcomes were examined.

**Results:** From a total number of 6560 admitted patients during the study period, 678 patients received one of the target medications and 100 patients experienced thrombocytopenia. There was no significant difference between the patients who received one of the studied antibiotics, regarding demographic data except for age (younger in V group; $p < 0.001$), median duration of hospitalization before ICU admission (longer for L group; $p < 0.048$) and median platelet count at ICU admission (higher for V group; $p < 0.001$). Baseline serum creatinine was also higher and concomitant cardiovascular disease was more frequent in L group ($p < 0.001$ and $p < 0.003$, respectively). There was no significant difference between the groups regarding incidence of thrombocytopenia, ICU and hospital length of stay and ICU and hospital mortality.
**Conclusions:** Choice of antibiotic selection for definite or empirical treatment of gram-positive bacteria in septic ICU patients should be based on the clinical background and possible causative bacteria. Risk of thrombocytopenia may not be a major consideration for antibiotic selection in ICU.

**Reference(s)**

1. 1. The major source of the data was Iran Intensive Care Unit Registry (IICUR). This is a Persian ICU-based registry which is launched in 2018 at Nemazee hospital affiliated with Shiraz University of Medical sciences. This registry was developed based on the COMET (CORE Outcome Measurement and Evaluation Tool) program, following the approval of the Australian and New Zealand Intensive Care Society. IICUR was approved by Ethics Committee of Shiraz University of Medical Sciences in 2018 (IR.SUMS.REC.1397.559) and recognized by Iran Ministry of Health as the first and single registry of adult ICU in Iran.

**Topic:** Haematologic-oncologic issues in the ICU

## 000271

### Impact of board-certified intensive care training facility on choice of adjunctive therapies and prognosis for severe respiratory failure: a nationwide cohort study

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**Introduction:** Severe respiratory failure has high mortality and presents various treatment options, necessitating intensive care expertise for decision-making [1]. However, the effect of intensivists on treatment and outcomes in severe respiratory failure is still unknown. Severe respiratory failure has high mortality and presents various treatment options, necessitating intensive care expertise for decision-making. However, the effect of intensivists on treatment and outcomes in severe respiratory failure is still unknown.
**Objectives:** The primary goal is to compare patient outcomes at board-certified intensive care facilities to those at non-certified facilities. The secondary goal is to describe treatment differences between board-certified and non-certified intensive care facilities.
**Methods:** This retrospective cohort study, using Japan's nationwide inpatient administrative database from 2016 to 2019, enrolled patients with severe respiratory failure who underwent mechanical ventilation (MV) for over four days. The following information was collected: demographics, treatment after hospital admission, and patient outcomes. Propensity score matching compared hospital mortality as a primary outcome between patients in board-certified and non-certified intensive care facilities in Japan.
**Results:** Of 66,905 in this study (64% men; median age, 76 years), 30,588 were treated at board-certified facilities and 36,317 did not. After hospital admission, the following interventions were more common at board-certified facilities than at non-certified ones: Propofol (35% vs. 18%), dexmedetomidine (37% vs. 19%), fentanyl (50% vs. 20%), rocuronium (8.5% vs. 2.6%), vecuronium (1.9% vs. 0.6%), noradrenaline (35% vs. 19%), arginine vasopressin (8.1% vs. 2.0%), adrenaline (2.3% vs. 1.0%), dobutamine (8.7% vs. 4.8%), PDE inhibitors (1.0% vs. 0.3%), early enteral nutrition (29% vs. 14%), early rehabilitation (34% vs. 30%), RRT (15% vs. 6.7%), ECMO (1.6% vs. 0.3%), and critical care unit admission (74% vs. 30%). The following interventions were equally or less often at board-certified than at non-certified facilities: dopamine (9.0% vs. 15%), sivelestat (4.1% vs. 7.0%), high-dose corticosteroids (13% vs. 15%), and low-dose corticosteroids (18% vs. 18%). After one-to-one propensity score matching, 26,673 were included in each group. Patients in board-certified group had lower hospital mortality (31% vs. 38%, $p < 0.001$) and shorter MV duration (median 9 days vs.10 days, $p < 0.001$) compared to those in non-certified group. Sensitivity analyses for hospital mortality, using multivariable regression and inverse probability of treatment weighting, confirmed the propensity score-matched analysis results.
**Conclusions:** Patients with severe respiratory failure treated at board-certified facilities underwent more selected interventions and had lower hospital mortality compared to those at non-certified facilities. These findings highlight the need for more intensivists.

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**Topic:** Health Services Research and Outcome

## 000274

### Family satisfaction in the intensive care unit: a questionnaire survey in the medical city, Iraq

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**Introduction:** Family satisfaction is an important goal of care since they play a crucial role in decision-making in critically ill patients. However, the studies on family satisfaction in intensive care unit are limited in Iraq.
**Objectives:** The purpose of this study is to assess the level of family satisfaction and identify parameters correlated with family satisfaction.
**Methods:** The Iraq Medical City and Soonchunhyang University Medical Center has conducted a cross-sectional survey in two ICUs in the medical city, Iraq supported by Korea International Cooperation Agency using verified family satisfaction questionnaire. Demographic characteristics and clinical outcomes of the patient were also collected to analysis correlation patient characteristics that affect satisfaction.
**Results:** A total of 103 family members were surveyed. The mean score of family satisfaction was $80.10 \pm 13.5$ (mean $\pm$ SD; maximal score, 100). Family members reported the greatest satisfaction with "Consistency of information" ($83.17 \pm 15.85$) and "management of pain" ($83.01 \pm 16.12$). They were least satisfied with "atmosphere in the waiting room" ($64.73 \pm 33.97$). Patient death and higher severity (APACHE II $\geq 30$) were associated with lower family satisfaction ($p = 0.007$ and 0.04, respectively).
**Conclusions:** Family members were generally satisfied, but improvements are needed in some aspect. In cases of patient death and higher severity, satisfaction was lower and statistically significant. It is expected that satisfaction level will increase through the opening of the new Critical Care Specialty Hospital and strengthening the capacity of medical staffs.

**Table 2 (abstract 000274)** Demographic characteristics of family members

| | Total(n=103) |
|---|---|
| Age (mean±SD ) | 37.79 ± 12.49 |
| Sex (male, n(%)) | 64 (62.14%) |
| ICU experience (yes, n(%)) | 23 (22.33%) |
| Live with patient? (yes, n(%)) | 61 (59.22%) |
| How many time you see the patient? (n(%)) | |
| - more than weekly | 18 (17.48%) |
| - weekly | 17 (16.05%) |
| - monthly | 7 (6.80%) |
| - yearly | 1 (0.97%) |
| - less than once a year | 1 (0.97%) |
| Live near hospital? (yes, n(%)) | 79 (76.70%) |
| Relationship (n(%)) | |
| - spouse | 13 (12.62%) |
| - parents | 15 (14.56%) |
| - sibling | 38 (36.89%) |
| - offspring | 33 (32.04%) |
| - other | 4 (3.88%) |
| Education (n(%)) | |
| - under high school | 83 (80.58%) |
| - over college | 18 (17.48%) |

**Table 3 (abstract 000274)** The result of family satisfaction survey

| | Total mean±SD (or n(%)) |
|---|---|
| The courtesy, respect and compassion your family member (the patient) was given. | 81.67 ± 15.99 |
| How well the ICU staff assessed and treated your family member's pain. | 83.10 ± 16.07 |
| How well the ICU staff assessed and treated your family member's breathlessness. | 82.38 ± 16.23 |
| How well the ICU staff assessed and treated your family member's agitation | 82.28 ± 16.65 |
| How well the ICU staff showed an interest in your needs | 81.97 ± 16.51 |
| How well the ICU staff provided emotional support to you | 82.21 ± 16.95 |
| The teamwork of all the ICU staff who took care of your family member. | 82.21 ± 16.22 |
| The courtesy, respect and compassion you were given. | 81.90 ± 14.91 |
| How well the nurses cared for your family member. | 81.55 ± 16.41 |
| How often nurses communicated to you about your family member's condition. | 81.73 ± 17.15 |
| How well doctors cared for your family member. | 78.61 ± 20.71 |
| How satisfied are you with the atmosphere (mood) in the ICU waiting room? | 63.36 ± 34.48 |
| How satisfied are you with the atmosphere (mood) of the ICU? | 78.64 ± 18.98 |
| How satisfied are you with your participation in daily rounds? | 79.57 ± 17.68 |
| How satisfied are you with your participation in the care of your critically ill family member? | 80.05 ± 16.48 |
| How satisfied are you with the LEVEL or amount of health care your family member received in the ICU? | 78.64 ± 17.99 |
| How often doctors communicated to you about your family member's condition. | 80.48 ± 17.33 |
| Willingness of ICU staff to answer your questions. | 80.77 ± 17.15 |
| How well ICU staff provided you with explanations that you understood. | 79.76 ± 18.05 |
| The honesty of information provided to you about your family member's condition. | 80.24 ± 18.24 |
| How well ICU staff informed you what was happening to your family member and why things were being done. | 80.24 ± 18.24 |
| The consistency of information provided to you about your family member's condition | 83.01 ± 16.12 |
| How included or excluded did you feel in the decision making process? | 78.16 ± 15.13 |
| How supported did you feel during the decision making process? | 78.88 ± 14.33 |
| Did you feel you had control over the care of your family member? | 77.50 ± 15.28 |
| When making decisions, did you have adequate time to have your concerns addressed and questions answered? | 76.00 ± 15.86 |

**Table 4 (abstract 000274)** Characteristics of family member associated with family satisfaction

| | Satisfaction level | | p-Value |
|---|---|---|---|
| | Yes | No | |
| Death | 74.11 | 82.36 | 0.007 |
| Hospital Acquired Infection | 79.35 | 80.43 | 0.710 |
| Length of stay (Less than average) | 78.75 | 82.03 | 0.294 |
| Admitted at night | 82.1 | 78.27 | 0.318 |
| Admitted at weekend | 80.15 | 80.09 | 0.982 |
| Pressure-sore | 74.72 | 80.80 | 0.271 |
| Thrombosis | 83.45 | 79.74 | 0.331 |
| Ventilator | 79.7 | 81.44 | 0.625 |
| Re-intubation | 77.9 | 80.72 | 0.424 |
| Tracheostomy | 79.76 | 81,59 | 0.621 |
| Renal replacement therapy | 78.4 | 80.95 | 0.395 |

**Table 1 (abstract 000274)** Demographic characteristics of patients

| | Total (n=103) |
|---|---|
| Age (mean±SD) | 48.1 ± 21.9 |
| Sex (male, n(%)) | 52 (50.49%) |
| ICU admission at night (yes, n(%)) | 68 (66.02%) |
| ICU admission at on weekend (yes, n(%)) | 22 (21.36%) |
| APACHEII (median, range) | 20 (0–75) |
| Required invasive mechanical ventilation (yes, n(%)) | 82 (79.61%) |
| Required_re-intubation (yes, n(%)) | 23 (22.33%) |
| Required tracheostomy (yes, n(%)) | 52 (50.49%) |
| Renal replacement therapy (yes, n(%)) | 36 (34.95%) |
| Hospital acquired infection (yes, n(%)) | 33 (32.04%) |
| - CLABSI | 6 (5.83%) |
| - VAP | 27 (26.21%) |
| - CAUTI | 14 (13.59%) |
| - SSI | 3 (2.91%) |
| Pressure sore at ICU discharge (yes, n(%)) | 10 (9.71%) |
| Length of ICU Stay (median, IQR) | 11 (1–180) |
| ICU readmission within 48hrs after discharge (yes, n(%)) | 1 (0.97%) |
| Death in ICU (yes, n(%)) | 27 (26.21%) |

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3. This research was supported by Korea International Cooperation Agency.

**Topic:** Health Services Research and Outcome

## 000276 Exhaled VOCs associated with hyoxemia after abdominal surgery

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**Introduction:** One of the most common postoperative complications is pulmonary complications, among which postoperative hypoxemia the most significant impact on patients, and the mortality rate of patients with hypoxemia is more than 10 times higher than that of the control group [1]. Abdominal surgery is one of the most common

types of postoperative hypoxemia [2–6]. Therefore, how to identify patients who are prone to be complicated with hypoxemia after abdominal surgery has become the focus of attention of many physicians. And the Exhaled volatile organic compounds (VOCs) analysis, which provides us a new method to predict postoperative hypoxemia [7–9].

**Objectives:** To identify characteristic volatile organic compounds (VOCs) associated with postoperative hypoxemia in patients undergoing abdominal surgery.

**Methods:** We prospectively enrolled 76 patients with tracheal intubation who were admitted to intensive care unit (ICU) after abdominal surgery at Peking University People's Hospital from December 10, 2022 to June 30, 2023. The basic information related to the perioperative period of patients was collected, and exhaled air of patients was collected within 24 h after admission to ICU through endotracheal intubation, and thermal desorption gas chromatography mass spectrometry (TD–GC–MS) was used for analysis and detection, and VOCs components in exhaled air of patients were analyzed. To observe whether hypoxemia occurred 24 h after surgery, the patients were divided into hypoxemia group and non-hypoxemia group, and the exhaled VOCs of the two groups were compared. Lasso regression analysis was used to screen valuable VOCs variables, and then Logistics regression analysis was performed to determine VOCs related to postoperative hypoxemia.

**Results:** Among the 76 patients, 27 had hypoxemia and 49 had no hypoxemia. Lasso regression analysis was performed on VOCs in exhaled air of the patients. Three compounds that might be related to postoperative hypoxemia were screened out, and the three compounds were put into multivariate Logistic regression analysis. The results showed that the increased contents of allyl methyl sulfide (OR:1.000, $P=0.03$), benzothiazole (OR:1.000, $P=0.041$) and the decreased contents of 2,3,6-trimethyldecane (OR:1.000, $P=0.009$) in exhaled breath were associated with the occurrence of postoperative hypoxemia. The three VOCs were used to predict postoperative hypoxemia, and the AUC was 0.785 (95% CI: 0.675, 0.895).

**Conclusions:** This study shows that the increase of allyl methyl sulfide, benzothiazole and the decrease of 2,3,6-trimethyldecane in exhaled breath are associated with the occurrence of postoperative hypoxemia. These three VOCs have good predictive value for postoperative hypoxemia.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000277

## The Experience of International Cooperation With Multimodal Telemedical Knowledge Exchange Platform During Military Conflict in Ukraine


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**Introduction:** During the war conflict, all Ukrainian doctors and medical associations are standing united to face the horrific consequences of war andergrowing anxiety in society. Recognizing the acute need for additional resources, our group developed a multimodal knowledge-sharing platform to provide trauma, critical care, and disaster medicine education and clinical support for clinicians working in Ukraine during the ongoing conflict. Using the Checklist for Early Recognition and Treatment of Acute Illness and Injury (CERTAIN) program, a multimodal trauma critical care knowledge exchange platform was created for clinicians practising in these institutions. In addition, we developed a program of weekly ICU telerounding sessions with collaborating clinicians.

**Methods:** From the early beginning of the Ukrainian conflict, a group of international trauma and critical care experts in collaboration with the Ukrainian doctors created a multimodal knowledge-sharing platform for clinicians caring for critically ill patients. The main teleeducation intervention consisted of a series of case discussions and webinars on established approaches to battlefield trauma and critical care, held by a mixed faculty of expert intensivists, surgeons, emergency physicians, and anesthesiologists from the United States, United Kingdom, and Ukraine. A secure messaging service was used to connect clinicians participating in this initiative, enabling them to ask general clinical questions and exchange educational material via a private chat group on an on-demand, asynchronous basis. In the practical part, we started educational telerounding sessions with the interprofessional faculty for Ukrainian ICU patients with implementing MAYO critical care standards in everyday practice.

**Results:** Since the program launch, 906 participants have joined the messaging group, and 16 teleeducation sessions have been delivered, with more than 5000 total views. The CERTAIN website has had about 5000 visits, mainly from Ukraine and the United States. Of the about hundred completed post-session surveys about 90% of respondents rated the course content excellent or very good, and 99% recommended it to others. Weekly, one-hour-long sessions were conducted between September 2023 and February 2024. Educational telerounding sessions using video platforms are flexible, accessible tools to bridge barriers of distance, and language and help to reinforce adherence to critical care processes. The CERTAIN standardized approach was positively received, and adopted by our Ukrainian partner hospital.

**Conclusions:** This study found that a multimodal intervention to provide education and clinical support for the care of critically ill trauma patients in response to the conflict in Ukraine was feasible, inexpensive, and associated with a high degree of clinician engagement and satisfaction. This approach can be used as a model for the development of further education and quality improvement interventions in remote and austere environments during global emergencies and disasters.

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**Topic:** Trauma

## 000278 D

## o cardiac biomarkers the days before extubation predict extubation failure?

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000278

**Introduction:** Extubation failure is associated with higher mortality, morbidity, ICU length of stay, and healthcare costs (1,2). Accurate timing of extubation in patients with COVID-ARDS is both challenging and important, as extubation failure rate is reported to be up to 20% (3,4). Clinical and respiratory variables are generally used to predict extubation failure. Previously we observed that a single Hs-Troponin-T measurement was associated with extubation failure (5). It is unknown whether serial assessment of cardiac biomarkers in the days preceding extubation add significant prognostic information.
**Objectives:** To investigate the association between serial measurements of Hs-Troponin-T (Hs-TnT) and NT-proBNP on the days preceding extubation with extubation failure.
**Methods:** This was a single-center retrospective cohort study. From March 2020 until March 2022, 602 mechanically ventilated patients with COVID-ARDS were screened for eligibility. Patient were eligible for inclusion if they were primarily liberated from mechanical ventilation. The primary endpoint was extubation failure (i.e. reintubation within 7 days). Cardiac biomarkers (Hs-TnT and NT-proBNP) were measured daily during ICU admission.
We constructed linear mixed effect models to describe the evolution of Hs-TnT and NT-proBNP for patients with extubation success and failure. Furthermore, we constructed two logistic regression models to investigate the association between cardiac biomarkers and extubation failure. The first model was built to determine whether the area under the curve (AUC) per cardiac biomarker was associated with extubation failure. The AUC was calculated based on 4 repeating biomarker measurements before extubation. The second model was built to determine whether the change in biomarker value over the days was associated with extubation failure. To determine the change, we calculated the slope per patient per biomarker (the slope originated from the linear mixed model).
**Results:** In total 297 patients met the inclusion criteria (median age 60 years [IQR, 51–67], 70% male). Extubation failure occurred in 21.5%. Patients with extubation failure had a higher SOFA score on the day of extubation (5 [IQR, 3–7] versus 3 [IQR, 2–4], $p < 0.001$) and a longer duration of mechanical ventilation (11.5 days [IQR, 7.3–15] versus 8 days [IQR, 6–11.3], $p < 0.001$). In Fig. 1 the average evolution of log2 transformed Hs-TnT (A) and NT-proBNP (B) the days preceding extubation are depicted for patients with extubation success and failure. Log2 transformed Hs-TnT and NT-proBNP were significantly higher in patients with extubation failure ($p < 0.001$, $p = 0.004$, respectively). Both the crude log2 AUC of Hs-TnT and log2 AUC NT-proBNP were associated with extubation failure (Table 1). However, after adjustment for age, Charlson Comorbidity Index, duration of mechanical ventilation and SOFA score, the effect dissipated. The crude ORs for the slope of Hs-TnT (OR 2.42 (95%CI: 0.49–12.14)) and NT-proBNP (OR 0.88 (95% CI:0.32–2.41)) were not associated with extubation failure.

**Table 1 (abstract 000278)** Crude and adjusted Odds Ratios for extubation failure

| | Unadjusted ORs | Adjusted ORs |
|---|---|---|
| Log2 AUC Hs-TnT | 1.52 (1.23–1.90) | 1.20 (0.90–1.59) |
| Log2 AUC NT-proBNP | 1.26 (1.07–1.50) | 0.95 (0.75–1.20) |
| Age | 1.02 (1.00–1.05) | 1.02 (0.98–1.06) |
| Charlson Comorbidity Index Score | 1.14 (0.98–1.31) | 0.91 (0.70–1.15) |
| Duration of iMV before extubation (days) | 1.09 (1.03–1.15) | 1.08 (1.02–1.14) |
| SOFA score on the day of extubation | 1.42 (1.26–1.62) | 1.36 (1.18–1.57) |

**Conclusions:** Our data indicate that the log2 AUC and slope for both Hs-TnT and NT-proBNP have no additional value to predict extubation failure in patients with COVID-ARDS. This contrasts the predictive value of a single measurement of Hs-TnT on the day of extubation. To further clarify these findings, research on this topic is needed in patients without COVID-ARDS.

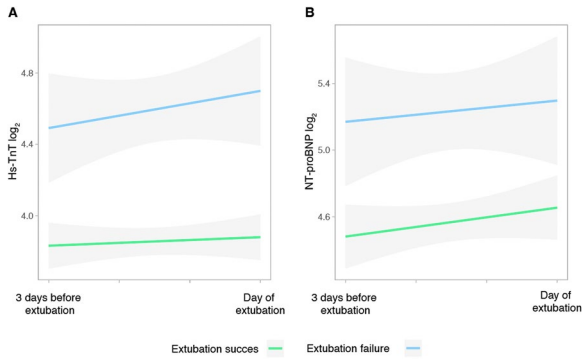


**Fig. 1 (abstract 000278)** Evolutions of log2 Hs-TnT (A) and log2 NT-proBNP (B) over the days before extubation in patients with extubation success (green) and extubation failure (blue)

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000279

### The effect of Intensive Care Unit-specific Virtual Reality on mental health and perceived quality of care of relatives of ICU patients: a randomized controlled trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000279

**Introduction:** Relatives of Intensive Care Unit (ICU) patients often experience psychological distress, contributing to the Post-Intensive Care Syndrome Family (PICS-F). This distress is frequently linked to a lack of understanding about the ICU setting and treatment modalities. Despite this, effective strategies to mitigate these psychological effects remain limited (1, 2). Given the positive reception and impact of ICU-specific Virtual Reality (ICU-VR) among survivors of critical illness, enhancing ICU aftercare perspectives, we propose that a targeted VR educational program (ICU-VR-Family) could meet informational needs and alleviate psychological stress in ICU patients' relatives (3, 4).
**Objectives:** To evaluate the acceptance of the ICU-VR-Family intervention and investigate its potential to alleviate symptoms of PICS-F, enhance quality of life, and improve perceptions of ICU care quality.
**Methods:** This multicenter, randomized controlled trial divided participants into either an intervention or control group. While all participants received standard care, those in the intervention group were also given a one-time ICU-VR-Family session during an ICU visit and received VR glasses with a link for at-home use. We collected data through questionnaires at various stages: upon enrollment, at the patient's ICU discharge, and at one, three, and six months post-discharge.
**Results:** We enrolled 189 relatives (median age 48, 95% range 23–72; 101 females, 53%) of 161 patients (median age 62, 95% range 25–80; median APACHE-IV 63, 95% range 11–123). The intervention group comprised 100 relatives of 81 patients compared to 89 relatives of 80 patients in the control group. Despite no significant differences in psychological distress or mental quality of life, the intervention was well-received: 90% would recommend ICU-VR-Family, 82% appreciated the continuous information provided, 81% preferred the VR approach over traditional brochures, and 76% reported better understanding of their relative's treatment in the ICU.
**Conclusions:** While ICU-VR-Family did not significantly affect psychological distress or quality of life, it was favorably regarded as an educational tool. It effectively conveyed information about ICU treatment, enhancing satisfaction among users. These findings advocate for incorporating ICU-VR-Family into routine practice, warranting further investigation into its optimal application.

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5. Stichting Coolsingel (foundation), DSW, Stichting Thea (foundation), and Stichting SGS (foundation) funded the development of ICU-VR. The funding sources had no role in writing this manuscript.

**Topic:** Information systems and Data Science

## 000280

### Use of perioperative midodrine in patients undergoing simultaneous bilateral native nephrectomy with kidney transplantation in patients with autosomal dominant polycystic kidney disease: a retrospective comparative study with historical control

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000280

**Introduction:** Simultaneous bilateral native nephrectomy with kidney transplantation (BNNKT) for patients with autosomal dominant polycystic kidney disease (ADPKD) has been shown to be a safe and feasible alternative compared to a staged surgical approach under the direction of an experienced surgical team. However, hypotension after removal of the native kidneys is common and likely due to decreased renin-angiotensin levels. One recent single-center series of 51 ADPKD patients who underwent laparoscopic BNNKT noted that roughly 70% of these patients required ICU-level care post-procedure, predominantly due to hypotension and the need for ongoing vasopressor therapy. Midodrine, an oral alpha-1 adrenergic agonist prodrug, has been used off-label to treat refractory hypotension of various etiologies including in ICU patients. The use of midodrine for patients with ADPKD undergoing BNNKT has not been reported before.
**Objectives:** Assess whether administration of perioperative midodrine for patients with ADPKD undergoing BNNKT would result in a decreased need for ICU admission related to hypotension requiring vasopressor therapy post-procedure.
**Methods:** A treatment protocol of midodrine administration (20 mg PO q8 hours for 48 h) was implemented by our transplant team from March 2023 through March 2024 for ADPKD patients presenting to our institution for BNNKT. The first dose of midodrine was administered pre-operatively. Our primary outcome of interest was ICU admission rate due to ongoing vasopressor requirements for hypotension. Data from the cohort receiving midodrine was compared to retrospective historical controls for patients who underwent the same procedure without perioperative midodrine use. Patients were excluded from the analysis if they were admitted to the ICU for a reason other than treatment of hypotension with vasopressors (i.e., significant bleeding, diagnosed sepsis, monitoring).
**Results:** A total of 110 patients with ADPKD who underwent BNNKT from 2014 through March 2024 were included in the final analysis and of these, 19 received midodrine per protocol from March 2023 through March 2024. Within the midodrine treatment group, 47.4% (9/19) required ICU admission for ongoing vasopressor use compared to 61.5% (56/91) in the historical control group without midodrine use (RR 0.77, 95%CI: 0.47–1.27, $p = 0.31$, NNT:7) (Table 1).
**Conclusions:** The use of perioperative midodrine for ADPKD patients undergoing BNNKT appears to show a trend towards decreased vasopressor requirements and need for ICU admission post-procedure compared to a historical cohort who did not receive midodrine, although this was not a statistically significant difference. Including midodrine treatment as part of ongoing multidisciplinary enhanced recovery pathway for this unique patient population could be considered to further decrease the need for post-procedure ICU-level cares. Additional larger-scale studies could better inform the impact of midodrine therapy for these patients.

**Table 1 (abstract 000280)** Rate of ICU admission for Midodrine Group vs. Control Group

| | Total # Patients | ICU Admission (# patients) | No ICU Admission (# patients) | ICU Admission Rate (%) |
|---|---|---|---|---|
| Midodrine Group | 19 | 9 | 10 | **47.4** |
| Control Group | 91 | 56 | 35 | **61.5** |

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6. No grants or internal/external funding were used in support of this research.

**Topic:** Brain death, organ donation and transplantation

## 000281

### Does deep sedation have a negative prognostic effect on outcome in acute ischemic stroke patients who undergo mechanical thrombectomy?

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000281

**Introduction:** Ischemic stroke is a common cause of death and/or disability; endovascular treatment using mechanical thrombectomy in eligible patients is a tool that has significantly improved prognosis. Whether to perform mechanical thrombectomy under conscious sedation or general anesthesia is still controversial; there is limited data in the literature regarding the effect of maintaining deep sedation beyond the end of the procedure, during the early hours of admission to the ICU.
**Objectives:** To evaluate whether maintaining deep sedation for a maximum of 8 h after the end of mechanical thrombectomy negatively affects the prognosis of patients admitted to the ICU for acute ischemic stroke.
**Methods:** Retrospective study. Review of medical records of all patients admitted to our ICU for endovascular treatment for ischemic stroke from 01/01/2019 to 31/12/2023. Recorded data include demographic variables, involved vascular territory, fibrinolysis (yes/no), TICI, procedure complications, sedation (yes/no), reason for sedation (routine/complication), NIHSS at admission (NIHSS-0), NIHSS at 24 h (NIHSS-24), and at ICU discharge (NIHSS-Dis). To assess patients' neurological evolution, the change in NIHSS at 24 h and at discharge (ΔNIHSS (0–24) and ΔNIHSS (0-Dis)) was calculated. The statistical analysis of quantitative variables is presented using the mean ± standard deviation (SD), or the median with percentiles 25 and 75 in situations of high dispersion and non-normality. Regarding qualitative variables, they will be expressed in absolute and relative frequencies. For comparisons between two groups of each quantitative variable, in addition to Box-Plot graphs, the Mann–Whitney test for comparing medians will be used, given the absence of normality. The software used is the IBM SPSS Statistics package, version 29.02. A $p \leq 0.05$ will be considered statistically significant.
**Results:** The study spans 5 years and includes 364 patients. Affected territories: right: 40.54%; left: 53.3%; posterior: 6.3%. TICI 3 achieved in 61%; 2c in 8%; 2b in 12.4%; 2a in 8.2%. TICI 0: 6.9%. 76.4% of patients did not receive fibrinolysis. 160 patients (46.4%) received deep sedation for < 8 h after thrombectomy. 43 patients receiving sedation due to complications are excluded from calculations. Patients are analyzed separately depending on whether they received fibrinolysis. Regarding the variable ΔNIHSS (0–24): in sedated patients, the median is 8, and the mean is 7.45 (+ 9.04); in non-sedated patients, the median is 6, mean 5.46 (+ 9.06); although data show some advantage for sedated patients, the difference does not reach statistical significance (Table 1). Regarding the variable ΔNIHSS (0-Dis), in sedated patients, the median is 11.5 and the mean is 10.81 (+ 7.5), and in non-sedated patients, the median is 12, and the mean is 11.62 (+ 7.74), with no significant differences (Table 2). No differences were found when analyzing separately patients who did/did not receive fibrinolysis (Tables 3 and 4).
**Conclusions:** Sedation for up to 8 h after mechanical thrombectomy does not negatively affect the initial evolution of patients admitted for ischemic stroke. A beneficial effect has been observed in the first 24 h, although not statistically significant.

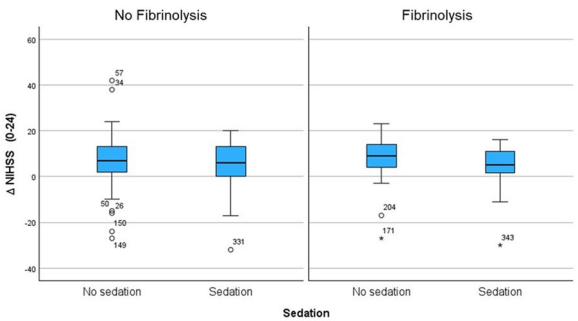


**Table 3 (abstract 000281)**

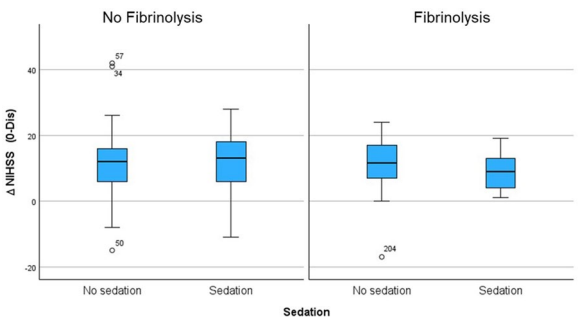

**Table 4 (abstract 000281)**

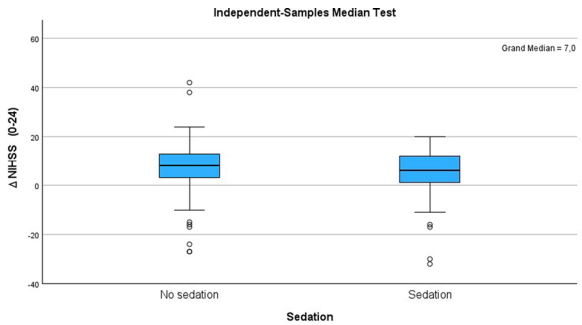


**Table 1 (abstract 000281)**

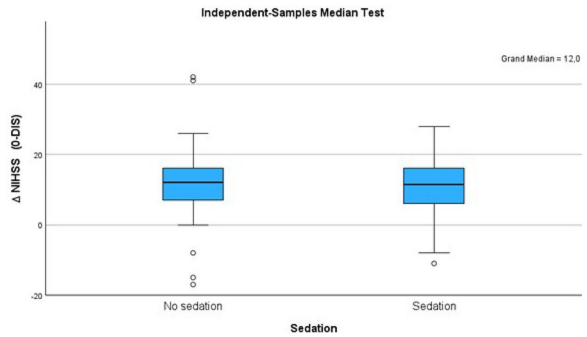


**Table 2 (abstract 000281)**

**Topic:** Neurointensive care

## 000284

### ECMO-associated nosocomial infections within patients under selective intestinal decontamination protocol

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000284

**Introduction:** ECMO, extracorporeal membrane oxygenation, is a support therapy for respiratory and/or cardiac failure refractory to conventional measures. ECMO time and patient outcome are directly related to the infections during the use of ECMO.
**Objectives:** To present the epidemiology of nosocomial infections (NIs) associated with extracorporeal membrane oxygenation (ECMO) therapy in adult patients receiving selective digestive decontamination (SDD).
**Methods:** We retrospectively analyzed adult patients treated between January 2019 and December 2023 with extracorporeal circulatory support using exclusively percutaneous cannulation, veno-venous (VV), veno-arterial (VA) ECMO and CO2 elimination therapy (ECCOR), from more than 48 h. We use the term nosocomial infection (NI) defined by the ECDC. All patients were intubated before ECMO and received selective digestive decontamination protocol which consists of administrating enteral solution + oral paste: colistin, tobramycin, amphotericin B, and vancomycin, as well as parenteral antibiotic therapy: Ceftriaxone 2 g or Levofloxacin 500 mg every 24 h for 3 days.
**Results:** We analyzed 93 patients, of which 70 men and 23 women with a median age of 53 (45–59) years. A total of 56 patients received VV ECMO, 32 VA ECMO, and 5 ECCOR. The most common etiology was ARDS due to COVID-19 pneumonia for VV ECMO and acute myocardial infarction (AMI) for VA ECMO. The prevalence of NIs was 16%. We also present the prevalence broken down by pathologies: VAP 11.8%, UTI 2.2%, Pulmonary Aspergillosis 1%, Catheter Bacteremia 1%. The most frequent germs were P. aeruginosa, E. Coli, and S. pneumoniae (Fig. 1). As a whole, the sample has presented a mortality of 40%, and the patients diagnosed with NIs had a mortality of 30% and 34% without NIs respectively, a difference that is not statistically significant (Fig. 2). The median time on ECMO was 11 (7–18) days in the entire sample, 12 (8–34) in patients with NIs, and 11 (7–11) days in the group without NIs, a statistically non-significant difference (Fig. 3).
In recent years, ECMO-related nosocomial infections research has achieved significant growth. However, to our knowledge, there are no other publications on nosocomial infections in patients on ECMO therapy receiving DDS. The results on NIs in ECMO patients have been very heterogeneous, with prevalence between 8.8 and 64% and mortality rates between 31.5 and 75.4%.
**Conclusions:** Our results are in the lower part of the range with a prevalence of 16% and a mortality of 30% in patients with NIs and ECMO support. What is different from most other studies is that in our case there was no difference in mortality and days of ECMO with or without the presence of nosocomial infection. Results that could be influenced by DDS protocol and its ability to reduce nosocomial infections.

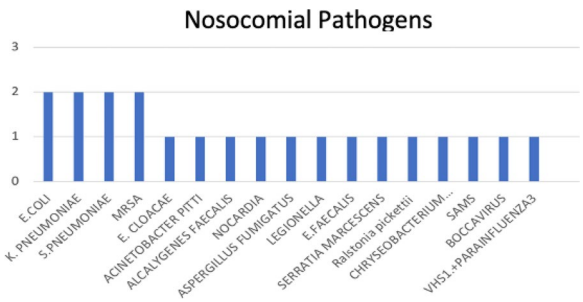


Figure 2.

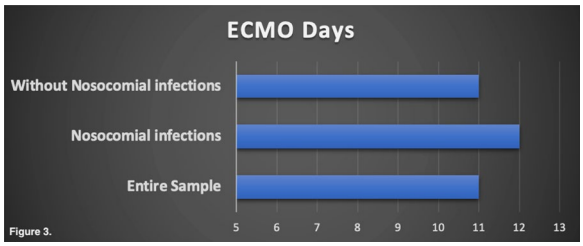

Figure 3.

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**Topic:** Infections and prevention

## 000288

### A step forward to a green intensive care unit through the reduction of nebulization materials, a waste audit

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000288

**Introduction:** The intensive care unit (ICU) of Erasmus MC aims to be fully circular in 2030. One of the procedures that require a lot of redundant materials is nebulisation with medication. However, we lack specific data about the current waste, including both products and medication, and possible greener alternatives.
**Objectives:** Reducing waste and medication use is an important step forward to a green ICU1. Searching for possible solutions could help the environment and reduce costs. The goals were to explore 1) the reduction of nebulisation waste and 2) the medication spillage per nebulisation moment.
**Methods:** The design of the study is a waste audit. In our ICU we use MESH nebulisation (Aerogen, United kingdom) for mechanical ventilated patients, and JET nebulisation (Teleflex Medical, USA) for all other patients. We made an inventory of al used nebulisation medication and used nebulisation products over 2023. A previous study showed that JET has a greater residue compared to MESH nebulization2.
For calculation of nebulisation medication spillage we made the assumption that every Jet nebulisation product was used only once. MESH products are used from 7 to 28 days depending on the product. The number of used JET products was used to calculate the number of MESH products needed in the same period.
**Results:** The total of nebulisation medication administrations was 31.186 in 2023 (85/day). The type of nebulised medication was mostly NaCl 0.9% (35%) and Salbutamol with Ipratropiumbromide (38%) (Fig. 1). Based on medication spillage of 0.8 ml to 2.5 ml per Jet nebulisation, this resulted in 6 L to 20 L total medication waste. For MESH nebulisation, the spillage is 0.2 ml, resulting in 1.6 L total.
Almost 8000 JET products were used, with a total waste of 651 kg. If MESH products were used, the total number of products would have been 1600 with a total waste of 145 kg. This means, a reduction of materials and medication used and reduction of waste (Fig. 2).
**Conclusions:** The waste audit identified that MESH nebulization reduces the spillage of medication. It reduces the amount of materials needed for nebulization and it reduces the amount of waste generated, compared to JET nebulization. By changing our practice to MESH nebulization products we are contributing to a greener ICU.

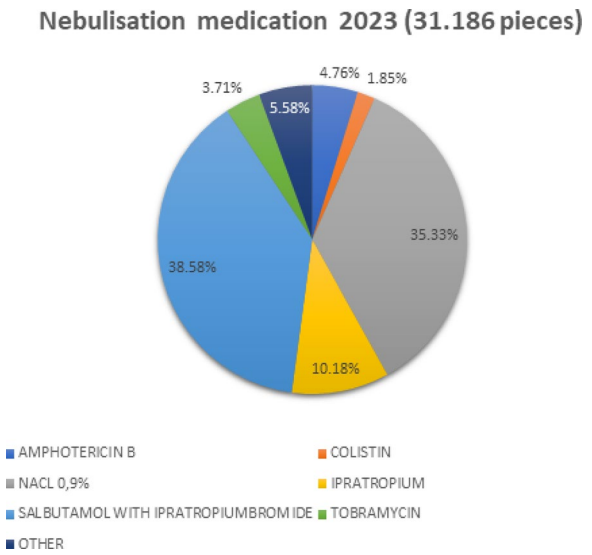


**Fig. (abstract 000288)** Most commun used nebulisation medication in our ICU

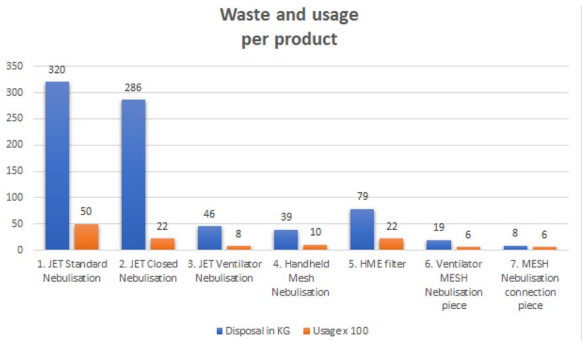


**Fig. (abstract 000288)** The blue columns show the number of waste, the orange columns sow the total products used (× 100) for the amount of waste. Column 2. Include an filter due to an closed system principle. We need to at an filter to MESH nebulisation (column 5) to create this principle. Column 4 is an calculation based on used Jet nebulisation products

**Reference(s)**

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**Topic:** Health Services Research and Outcome

## 000289

### Using continuous electronic urine output monitoring for the management of acute cardio-renal syndrome in patients with acute decompensated heart failure

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000289

**Introduction:** Patients admitted for acute decompensated heart failure (ADHF) are at high risk for type I cardio-renal syndrome (CRS) related to venous congestion and diuretic resistance. Positive fluid balance has been associated with adverse outcomes, including acute kidney injury (AKI) and mortality. In critically ill patients, urine output (UO) is used both to assess deterioration of renal function as well as for management of fluid balance.
**Objectives:** We investigated the possible effect of real-time UO monitoring, fluid balance, renal outcomes, and 30-day mortality of patients admitted to the cardiac intensive care unit (ICU) with ADHF.
**Methods:** We included 50 patients admitted to the cardiac ICU from July 2021 and June 2023 with ADHF. Their standard Foley catheter was connected to an electronic monitoring system (Clarity-RMS sensor kit) that continuously monitors UO in real time. Its technology is described elsewhere (1). The UO monitoring system displays UO trends on the consoles that are updated in real time. UO trends were utilized to guide an individualized approach for the pharmacologic management of each patient, based on blood pressure, hourly UO, and total fluid balance. Daily and accumulated fluid balance was registered at up to 72 h following admission. Patient outcomes included change in fluid balance, incidence of AKI, and 30-day mortality. The case series group was than compared to a historical group of 50 matched controlled patients admitted between 2019 and 2020. Patients were matched according to cause of admission, age, and glomerular filtration rate.
**Results:** In the study cohort, the median age was 71 ± 12 years, and 36 (72%) were men. In the historical cohort, the median age was 71 ± 13 years, and 36 (72%) were men.
Patients in the electronic urinary monitoring cohort demonstrated significantly more negative daily and cumulative fluid balance as compared to the historical cohort ($P < 0.001$ for all, Figure 1). Incidence of AKI and the combined endpoint of AKI and 30-day mortality was significantly lower in the electronic UO monitoring cohort (24% vs. 46%, $P = 0.0197$ and 40% vs 78%, $P < 0.0001$, respectively). These changes were more prominent in the subgroup of patients with chronic kidney disease (Figure 2).
**Conclusions:** We demonstrated that real-time monitoring of UO was associated with better prevention of fluid overload and the management of type I CRS in patients with ADHF. Further studies on larger populations are required to validate the potential utility of UO trending in the management of critically ill patients with ADHF.

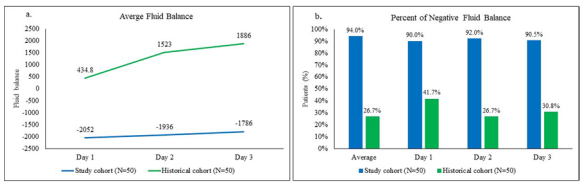


**Fig. 1 (abstract 000289)** Average daily fluid balance (a) and percent of negative fluid balance (b) in the study groups

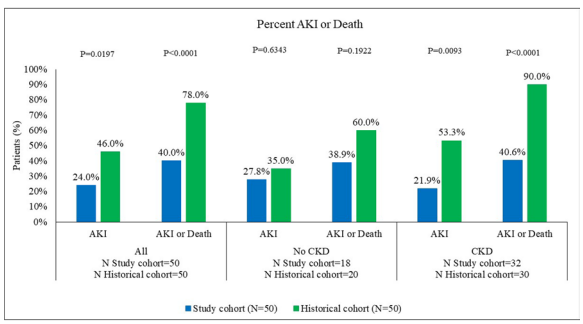


**Fig. 2 (abstract 000289)** Combined outcome of the study groups

**Topic:** Acute kidney injury and haemofiltration

## 000290

### Neutrophil gelatinase-associated lipocalin (NGAL) levels for early prediction and ruling out future contrast nephropathy

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000290

**Introduction:** The diagnosis of acute kidney injury (AKI) is of importance among patients with ST segment elevation (STEMI) undergoing primary coronary intervention (PCI). It is often delayed given the need in serial measurements of creatinine or other serum markers. Neutrophil gelatinase-associated lipocalin (NGAL) is a proven marker for AKI, although its role as an early predictor in this setting was scarcely addressed before.
**Objectives:** We aimed to investigate the diagnostic utility of sequential NGAL measurements for both prediction and ruling out of AKI among patients with ST segment elevation (STEMI) undergoing primary coronary intervention (PCI).
**Methods:** We included 133 patients with STEMI treated with PCI. Blood samples for plasma NGAL were drawn immediately before PCI (NGAL 0) and 24 h after PCI (NGAL 24). Optimal threshold for the development of AKI was determined using receiver-operating characteristic curves (ROC). Patients were also assessed for the dynamics between NGAL 0 and NGAL 24 levels.
**Results:** Mean age was 62 ± 13 years and 78% were men, and a total of 20 (15%) developed AKI. Patients with AKI demonstrated higher plasma NGAL 0 levels (164 ± 42 vs. 95 ± 30 ng/mL; $p < 0.001$) as well as NGAL 24 levels (142 ± 41 vs. 93 ± 36 ng/mL; $p < 0.001$). There were no significant changes between NGAL 0 & 24 h within the two groups (Figure 1). According to the ROC curve analysis, the optimal NGAL 0 level for AKI prediction was > 125 ng/mL (AUC 0.841, 95% CI 0.801–0.961, $p < 0.001$), with a sensitivity and specificity of 70% and 84%, respectively (Figure 2), while the negative predictive value of NGAL 0 < 125 ng/mL was 94%.
**Conclusions:** Among STEMI patients, NGAL levels before primary PCI may be utilized both for ruling out and for the prediction of AKI.

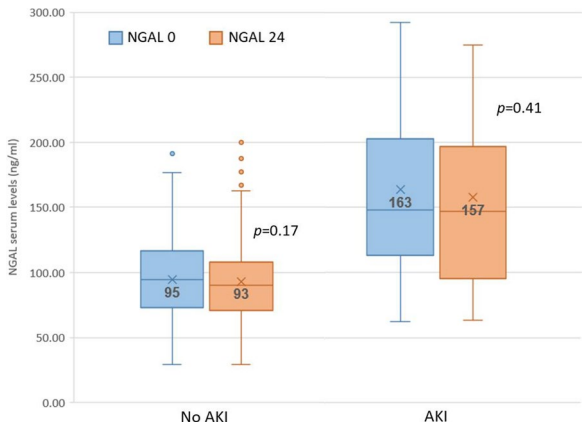


**Fig. 1 (abstract 000290)** NGAL 0 and 24 h in patients with vs. without AKI

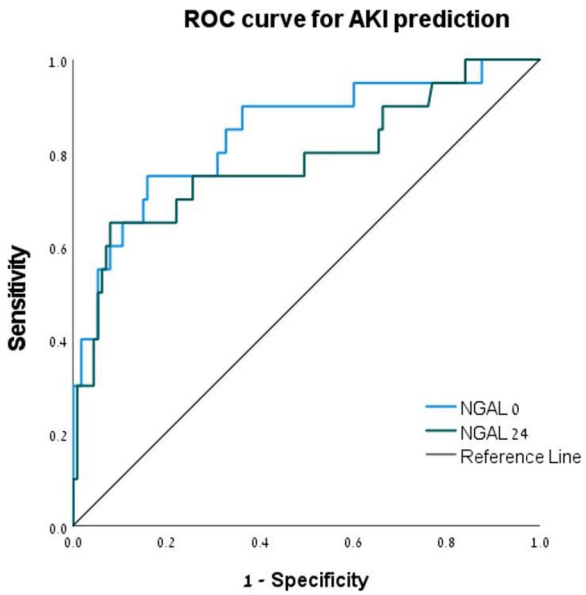


**Fig. (abstract 000290)** AUC for NGAl 0 and 24 h

**Topic:** Acute kidney injury and haemofiltration

## 000291

### Enhancing ERAS compliance in a tertiary surgical centre: a multidisciplinary approach

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000291

**Introduction:** The Bristol Royal Infirmary is a tertiary surgical centre in Southwest England with an Adult Intensive Care Unit (ITU) catering to postoperative care. Standardized recovery pathways such as Enhanced Recovery After Surgery (ERAS) are implemented for all elective surgical patients. ERAS protocols are comprehensive perioperative care plans aimed at expediting post-surgical recovery. However, inadequate adherence and documentation poses threats to patient safety and well-being.
**Objectives:** This audit aimed to assess ERAS compliance, identify challenges, involve multidisciplinary teams, and emphasize the importance of early collaboration.
**Methods:** This was a retrospective audit of all adults admitted to general ITU after an elective upper gastrointestinal, lower gastrointestinal, maxillofacial, or thoracic procedures. Data were recorded and analysed on Microsoft excel. Two audit cycles were conducted over 4 months. This involved semi-structured interviews with nursing staff, analysis of procedural steps, and discussions with nursing and physiotherapy teams. Between the cycles, an electronic prompt was added for nursing staff to check after each encounter. Physiotherapy leads were also contacted to discuss barriers and to disseminate findings.
**Results:** Initial ERAS compliance was at 49%, with notable challenges such as declining mobility documentation over time. During the first audit cycle ($n = 40$), a trend of diminishing compliance with progressing days was observed, along with inconsistent documentation during night-time shifts and inadequate recording of drain output/input specific to ERAS. In the second audit cycle ($n = 27$), an overall improvement in compliance to 55% was noted. Notably, compliance rates for upper GI surgical cases, which typically involving extended hospital

stays, showed significant improvement. Nurses reported common themes for challenges, including paper forms, unsure of responsibility, and divergence in recovery plans.
**Conclusions:** The audit highlighted challenges in ERAS compliance, stressing the importance of collaboration. Comprehensive teamwork led to increased patient safety measures and compliance. This fostered standardized and evidence-based recoveries for patients and their families. Interviewing nurses and our modest improvement in ERAS compliance demonstrated the importance of integration of ERAS protocols in electronic systems.

**Topic:** Perioperative care

## 000292

### Evaluation of the Seraph® 100 Microbind® affinity blood cartridge as a potential adjunctive blood purification strategy for *Staphylococcus aureus*-induced septic shock: in vitro adsorption and bactericidal activity assessment

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000292

**Introduction:***Staphylococcusaureus* infections, particularly methicillin-resistant strains, can induce severe conditions, provoking an overwhelming immune response and contributing to systemic inflammation and organ failure. Effective antibiotic therapy and meticulous supportive care are crucial in the ICU to manage *Staphylococcusaureus*-induced septic shock. In this context, blood purification strategies target the microorganism and associated toxins, contributing to the systemic inflammatory cascade.
**Objectives:** This in-vitro study aimed to analyze the potential removal, through adsorption, by the Seraph® 100 Microbind® Affinity Blood Cartridge against *Staphylococcus aureus*. Subsequently, the study assessed whether the adsorptive capabilities of bacteria were maintained and, if so, whether the bacteria retained its bactericidal activity.
**Methods:** The study employed an in vitro model of hemoperfusion to characterize the adsorption performed by the Seraph® 100 Microbind® Affinity Blood Cartridge on a circulating bacterial load inoculated in blood for the experiment. A volume of 200 ml of blood served as a negative control (CTR-). The remaining 600 mL were enriched with a concentration of *S. aureus* bacteria equal to $1 \times 106$ and incubated for 4 h at 37 °C. At 4 h, the blood was divided into two glass bowls and stirred at 37 °C: 300 mL were circulated at a speed of 120 mL/min via a dedicated test platform (Galileo) with Seraph100, while another 300 mL was stirred and used as a positive control (CTR+) [Figure 1]. At times T0, CTR- and CTR+, and T1 and T2 (1 h and 2 h of treatment), samples were taken for injection into vials for blood cultures and placement on CNA agar.
**Results:** This study demonstrated that the S100ABC reduces the circulating bacterial load (from $1 \times 10^6$ at T0 to $0.25 \times 10^6$ at T6h) with a removal ratio of 75%, leading to the adsorption of bacteria onto the cartridge. Bacteria were found adhering to the beads contained in the cartridge.
**Conclusions:** Our preliminary data show that the Seraph® 100 Microbind® Affinity Blood Cartridge effectively reduces the circulating bacterial load. The Seraph® 100 Microbind® Affinity Blood Cartridge could be an adjunct sorbent for reducing *S.aureus* in human blood, supporting antibiotic therapy in patients with *S.aureus*-induced septic shock.

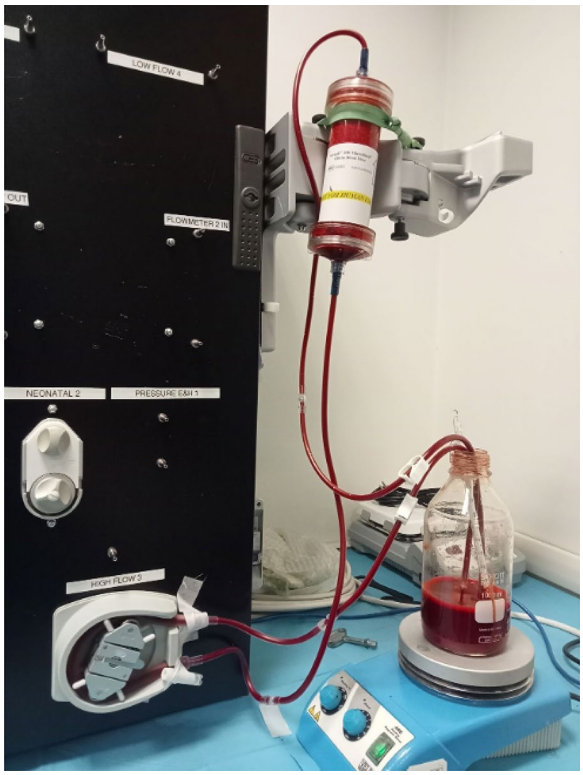


**Fig. 1 (abstract 000292)** Extracorporeal therapy in the treatment of sepsis: in vitro assessment of the effect of an absorbent cartridges on the circulating bacterial concentration (2 h of hemoperfusion)

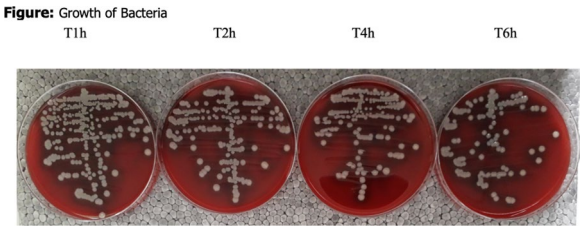


**Fig. (abstract 000292)** Growth of bacteria

**Reference(s)**

1. Selig DJ, Reed T, Chung KK, Kress AT, Stewart IJ, DeLuca JP. Hemoperfusion with seraph 100 microbind affinity blood filter unlikely to require increased antibiotic dosing: a simulations study using a pharmacokinetic/pharmacodynamic approach. Blood purif. 2023; 52(1):25–31. https://doi.org/10.1159/000524457. Epub 2022 May 6.
2. Selig DJ, Reed T, Chung KK, Kress AT, Stewart IJ, DeLuca JP. Hemoperfusion with seraph 100 microbind affinity blood filter unlikely to require increased antibiotic dosing: a simulations study using a pharmacokinetic/pharmacodynamic approach. Blood Purif. 2023; 52(1):25–31. https://doi.org/10.1159/000524457. Epub 2022 May 6.
3. None

**Topic:** Sepsis

## 000296

### Relation between initial hypothermia, course of the body temperature, and mortality in patients with septic shock: a post hoc analysis of an interventional, randomized, and multicenter trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000296

**Introduction:** In patients with septic shock, the association between the hypothermia at inclusion, the course of the body temperature during the first 24 h and the mortality remains uncertain. In this present study, we analyzed the statistical association between these three variables in a post hoc analysis of a randomized multicenter interventional trial.
**Methods:** Patients with septic shock were included within 6 h after the initiation of the norepinephrine (≥ 0.1 µg/kg/min). After inclusion, body temperature was assessed every 2 h during the first 24 h. Hypothermia was defined as a temperature < 36 °C (1). Mortality was assessed at day 90.
**Results:** We included 756 patients, of which 103 (13.6%) were with hypothermia at inclusion. After adjustment for confounding factors, as compared with patients without hypothermia at inclusion, patients with hypothermia at inclusion had a higher mortality (HR 1.88, 95% CI [1.36–2.61], *P* value < 0.001). Three groups of patients according to the evolution of the temperature were identified (Figure 1A). "Without hypothermia" (86.6%) corresponding to patients without any hypothermia; "transient hypothermia" (10%) corresponding to patients with hypothermia at inclusion and being normothermic during the first 24 h; and "persistent hypothermia" (3.4%) corresponding to patients with hypothermia at inclusion and during the first 24 h. The "persistent hypothermia" group had the highest mortality rate. Patients with transient or without hypothermia had similar mortality (Figure 1B).
**Conclusions:** In patients with septic shock, hypothermia at inclusion and persistence of hypothermia during the first 24 h were associated with higher mortality at day 90. Patients with transient hypothermia or without hypothermia during the first 24 h of the septic shock had the same mortality.

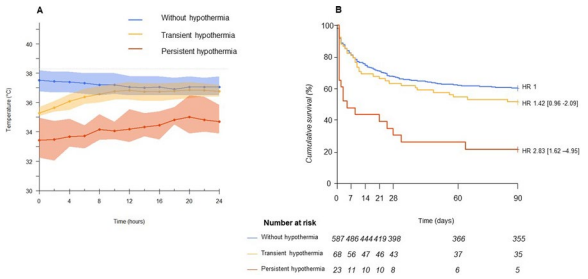


**Fig. 1 (abstract 000296)** Clusters of patients according to the evolution of the body temperature during the first 24 h of the septic shock (A) and survival according to the course of the temperature (B)
*Patients "without hypothermia" corresponded to patients without hypothermia during the first 24 h; patients with "transient hypothermia" corresponded to patients with hypothermia at inclusion but whose hypothermia had corrected within the first 24 h.*
Patients with "persistent hypothermia" corresponded to patients with hypothermia at inclusion and whose hypothermia persisted during the first 24 h.
Kaplan–Meier curves represent the survival according to the course of temperature during the first 24 h of the septic shock. Hazard ratios (HR) were calculated using a Cox model. We defined the group of patients without hypothermia as the reference. HR were adjusted on SOFA, lactate, community-acquired infection, past medical history of cancer, and the presence of mottling at inclusion.

**Reference(s)**
1. None

**Topic:** Sepsis

## 000297

### Analysis of C-reactive protein kinetics and cytorreductive surgery and hyperthermic intraperitoneal chemotherapy post-operative complications: a systematic review and meta-analysis

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**Introduction:** In seeking new therapeutic options for the treatment of cancer, the use of hyperthermic intraperitoneal chemotherapy (HIPEC) with associated cytoreductive surgery (CRS) has been growing. The post-operative management of these patient is reasonably difficult, and mostly occurs in the intensive care setting. One of the significant challenges is the interpretation of laboratory values and the correlation with arising complications.
**Objectives:** To evaluate the association between increased C-reactive protein (CRP) and the occurrence of complications after combined CRS and HIPEC.
**Methods:** A systematic search of databases was performed, including Embase, PubMed, and Cochrane Library. Observational studies evaluating postoperative complications and CRP kinetics in patients

undergoing CRS + HIPEC were included. For continuous variables, the results were expressed as mean difference with their 95% confidence interval (CI) and CRP values were evaluated on the first, third, and fifth post-operative days (POD).
**Results:** 238 studies were initially identified and screened by two independent evaluators. Four studies were included in the meta-analysis, with no significant difference found in the CRP value between the groups with and without complications on POD1 ($P$ value = 0.52). On POD3 and POD5, however, a statistically significant difference was identified between the groups ($P$ value = 0.04 and 0.0001, respectively).
**Conclusions:** Post-operative CRP values seemed to correlate with increased complications, especially after POD3. This laboratory test may have significant value in early detection of infectious complications; however, more studies are needed at this time to further understand the correlation.

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2. Not applicable.

**Topic:** Perioperative care

## 000298

### The ability of qSOFA to predict mortality in ward patients requiring rapid response team and suspected to have sepsis

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**Introduction:** The Quick Sequential Organ Failure Assessment (qSOFA), which is based on the presence of systolic BP ≤ 100 mmHg, respiratory rate ≥ 22/min, and altered mentation, has been used to predict the outcomes of patients with sepsis outside the ICU. We described patients in the ward who needed rapid response team activation and were suspected to have sepsis and evaluated the ability of qSOFA to predict hospital mortality.
**Methods:** This retrospective study was conducted in King Abdulaziz Medical City—Riyadh and included ward patients who needed activation of the critical care response team (CCRT) in 2019 and were suspected to have sepsis. We calculated qSOFA score (range: 0–3) at the time of CCRT activation for all patients. We compared hospital nonsurvivors to survivors and assessed the ability of qSOFA to predict hospital mortality using logistic regression and receiver-operating characteristic (ROC) curve analyses.
**Results:** The study included 390 patients with suspected sepsis (age: 64.4 ± 19.2 years, 41.5% females, qSOFA: 1.6 ± 0.8). 120 patients (30.8%) died in the hospital. Compared to hospital survivors, nonsurvivors were older (67.7 ± 16.4 vs. 62.9 ± 20.2 years, $p = 0.01$), and had higher prevalence of ischemic cardiac disease ($p = 0.007$), chronic obstructive pulmonary disease ($p = 0.002$) and chronic kidney disease ($p = 0.001$). Hypotension (systolic BP < 90 mmHg) ($p = 0.04$) and a drop in Glasgow Coma Scale by more than 2 points ($p = 0.001$) as reasons for CCRT activation were more common in nonsurvivors. Nonsurvivors also had higher qSOFA score (1.8 ± 0.8 vs. 1.6 ± 0.7, $p = 0.005$; 65.8% had qSOFA ≥ 2 vs. 51.9%, $p = 0.01$) and higher lactate levels (3.1 vs. 2.1 mmol/L, $p < 0.0001$). Sepsis was confirmed in 58.0% of nonsurvivors vs. 38.7% of survivors ($p < 0.0001$). Nonsurvivors required more ICU admission (54.2% vs. 28.5%, $p < 0.001$), vasopressor therapy (35.0% vs. 14.8%, $p < 0.0001$), and mechanical ventilation (30.0% vs. 11.1%, $p < 0.0001$). Multivariable logistic regression analysis showed that higher qSOFA score was associated with hospital mortality (odds ratio per unit increment: 1.60, 95% confidence interval [CI] 1.13–2.26). However, the ROC curve analysis showed that qSOFA at the time of CCRT activation alone had poor discrimination between nonsurvivors and survivors (area under the curve [AUC]: 0.58, 95% CI 0.52–0.65) and was similar to serum lactate at the time of CCRT activation (AUC: 0.55, 95% CI 0.48–0.62) (Figure 1). In patients with confirmed sepsis, qSOFA did not perform better (AUC: 0.57, 95% CI 0.48–0.66) and was similar to serum lactate (AUC 0.54, 95% CI 0.45–0.63) (Figure 1).
**Conclusions:** In ward patients who needed rapid response team for suspected sepsis, hospital mortality was high at 30.8%. A higher qSOFA score was associated with hospital mortality. However, it alone did not discriminate well between hospital nonsurvivors and survivors on ROC curve analysis.

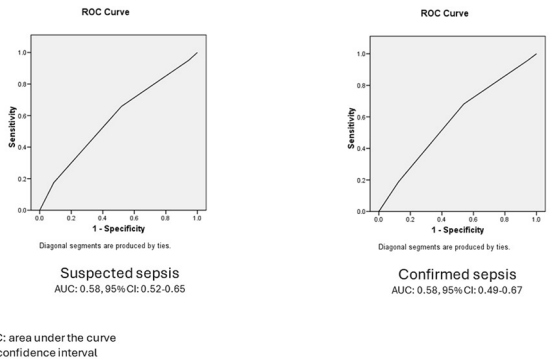


**Fig. 1 (abstract 000298)** ROC curves of qSOFA. Receiver operator characteristic (ROC) curve analysis for the predictive ability of quick SOFA for hospital mortality

**Topic:** Sepsis

## 000299

### Assessing patient perceptions of a therapeutic music program in the intensive care unit

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**Introduction:** Implementing music in the intensive care unit (ICU) can help to promote a healing environment in a usually busy and stressful hospital setting. A therapeutic music program was implemented in 2019 using student and volunteer musicians at an academic medical center. The volunteer musicians played classical genre music songs for patients using a variety of instruments, including piano, cello, viola,

violin, oboe, flute, and saxophone. During the pandemic, the program was converted to live virtual with the use of two large i-Pads on wheels. The program has since resumed with both live and virtual formats. Data were collected on an ongoing basis to assess patient, clinical staff, and musicians perceptions of the therapeutic music program.
**Objectives:** The objectives of this session are to review the process of implementing and evaluating a therapeutic music program in the ICU and highlight implications for critical care clinicians.
**Methods:** Data were collected from 15 nursing staff, 6 volunteer musicians, and 50 patients using an online anonymous survey. Responses to five open-ended questions assessed participants' perceptions of the music. Quantitative data were collated and aggregated, and qualitative data were obtained, transcribed, and analyzed using NVivo, which provided the ability to quantify the qualifiable data of open-ended prose.
**Results:** Majority (66.7%) identified that therapeutic music was acceptable in the ICU. Similarly, a majority (73.3%) indicated that therapeutic music was appropriate and feasible. Seven (7) major themes were identified by the participants, including emotions evoked, preferred genre of music and instruments, life significance of music, power of music, and feedback. The majority (94%) experienced positive emotions from the music. Additionally, the majority (90%) indicated that they enjoyed the music experience and would participate in the future.
**Conclusions:** The findings suggest that therapeutic music, both in a live and virtual format, was well-received and provided tangible benefits to patients. The results have application to clinical practice and are being used to further refine and expand the program to promote a healing environment for patients, family members, and ICU staff. Additional research will explore the impact of a "dose–response" of music on the electroencephalographic (EEG) patterns, using a multisite design, with an ultimate aim of mitigating the onset or duration of ICU-related delirium.

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3. Vanderbilt University Arts Discovery and Innovation Grant

**Topic:** Health services research and outcome

**000302**

## Real-time prediction model for short-term atrial fibrillation risk in critically ill patients using single-lead ECG

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**Introduction:** Atrial fibrillation (AF) is a common arrhythmia in critically ill patients, contributing to substantial morbidity and mortality. Nearly half of ICU patients newly develop AF in intensive care unit (ICU), with about 18% persisting upon discharge.
Existing ECG-based prediction models for AF predominantly have utilized mainly 12-lead ECGs and focused on long-term risk in outpatients, with limited external validation.
Our study aims to develop a real-time prediction model using single-lead ECG signals to assess short-term AF risk in critically ill patients.
**Methods:** Adult patients admitted to medical and surgical ICUs except for cardiothoracic ICUs in Seoul National University Hospital between January 2020 and August 2022 were included. ECG signals from Lead II, sampled at 500 Hz during ICU stays, were extracted. Our AI-based ECG classifier categorized signals into normal sinus rhythm (NSR), AF, noisy signals, or other rhythms. AF-classified signals were reviewed by three experts, defining AF rhythms lasting over 30 s with agreement from two or more experts. Patients were grouped based on AF history: AF group (history of AF + AF rhythm), new-onset AF (NOAF) group (no history of AF + AF rhythm), and Control group (no history of AF or AF rhythm).
The process of model development is shown in Figure 1. Model development involved classifying 30-s ECG segments into four types according to the changes in RR interval and the development of AF: NSR, Pre-AF, AF, and changes in RRI (Fig 1a). The evaluation of the hypothesis regarding the significant difference between the ECG segments of Pre-AF and changes in RRI is confirmed in Fig. 1b. A late fusion-based multi-modal approach utilized two independent feature extractors: f1, a 2-D ResNet50 capturing irregular RRI patterns (from recurrence plot), and f2, a convolutional recurrent neural network connected with 1-D ResNet6 and 2-layer bi-LSTM to extract morphological changes from raw ECG signals (Fig 1c). During training, the ADAM optimizer with a batch size of 32 and learning rate of 1e−4 was used, halving the learning rate every 5 epochs. Loss weighting addressed dataset imbalance, achieving convergence within 5 epochs.
The model classified ECG segments into NSR, Pre-AF, AF, and changes in RRI to predict AF development. Model performance was evaluated using AUROC and AUPRC, training on different datasets (small-scale AF, large-scale AF, NOAF, and AF + NOAF) with external validation using the Atrial Fibrillation Prediction Database (AFPDB) dataset, which was publicly open dataset.
**Results:** In the study, 672, 50, and 87 cases of patients were categorized into normal, AF, and NOAF groups, respectively. A total of 321,584 segments of NSR, 56,761 segments of changes in RR interval, 53,813 segments of Pre-AF, and 25,435 segments of AF ECGs were analyzed. Performance metrics for each model are summarized in Table 1. The model trained with the NOAF dataset exhibited strong predictive performance for NOAF, achieving an AUROC of 0.96 and AUPRC of 0.83, with predictions made 78.6 min in advance. For predicting AF, the model trained with both NOAF and AF datasets demonstrated the highest performance, achieving AUROCs of 0.97 and 0.82 for internal and AFPDB datasets, respectively. This model predicted AF development 38.9 min 21.8 min in advance for internal and AFPDB datasets, respectively.
**Conclusions:** We developed a deep-learning model to predict the risk of AF in critically ill patients. Although the performance slightly declined during external validation with an open dataset, our model still showed good performance for real-time prediction, predicting AF onset more than 20 min in advance.

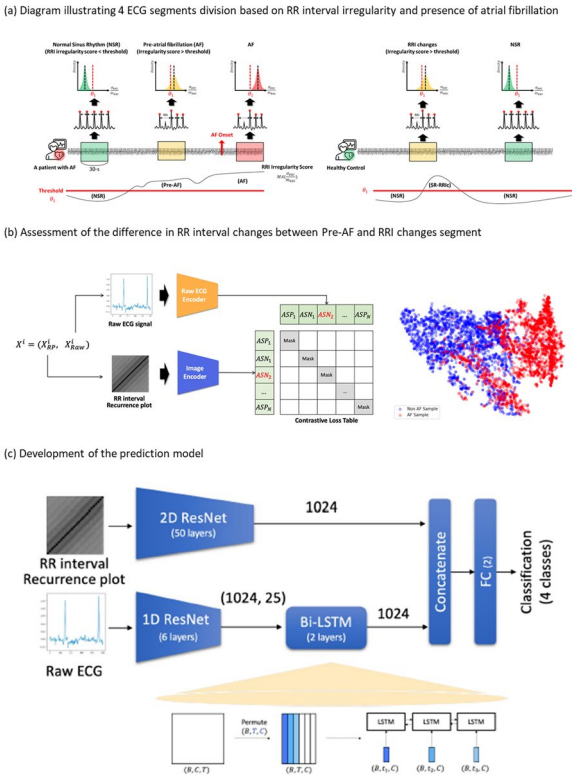


**Fig. 1 (abstract 000302)** Overview of the process of the data preprocessing and model development

**Table 1 (abstract 000302)** The performance of the each model according to the training datasets for prediction of new-onset atrial fibrillation and atrial fibrillation in internal dataset, and atrial fibrillation in external dataset

| | | NOAF (SNUH) | | | AF (SNUH) | | | AFPDB | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | AUROC | AUPRC | PTH | AUROC | AUPRC | PTH | AUROC | AUPRC | PTH |
| Trained with | AF only (S) | 0.89 | 0.44 | 56.1(51.4) | 0.94 | 0.75 | 40.7(46.3) | 0.71 | 0.71 | 20.1(26.8) |
| | AF only (L) | 0.76 | 0.60 | 47.9(41.3) | 0.97 | 0.92 | 40.0(46.3) | 0.73 | 0.70 | 19.7(25.7) |
| | NOAF only | 0.96 | 0.83 | 70.2(78.6) | 0.73 | 0.52 | 39.7(39.0) | 0.77 | 0.82 | 26.0(29.0) |
| | All (AF+NOAF) | 0.96 | 0.76 | 53.7(43.7) | 0.97 | 0.89 | 34.6(38.9) | 0.82 | 0.52 | 16.8(21.8) |

NOAF, new-onset atrial fibrillation; SNUH, Seoul National University Hospital; AF, atrial fibrillation; AFPDB, Atrial Fibrillation Prediction Database; S, small-scale; L, large-scale; AUROC, Area Under the Receiver Operating Characteristic; AURPC, Area Under the Precision-Recall Curve; PTH, predicted time horizon.
The PTH is presented as mean(median) value.

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4. This work was supported by the Korea Health Technology Research & Development Project through the Korea Health Industry Development Institute, funded by the Ministry of Health & Welfare, Republic of Korea (grant number HI21C1074).

**Topic:** Information systems and data science

## 000303

### Diagnostic accuracy of PCR-based molecular tests in cerebrospinal fluid (CSF) samples of critically ill patients with suspected central nervous system (CNS) infection

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000303

**Introduction:** CNS infections are severe conditions with significant associated morbidity and mortality. Timely diagnosis and initiation of antimicrobial treatment (AT) are crucial outcomes. While CSF culture is the gold standard, its sensitivity and specificity may decrease if AT has already started.
**Objectives:** To investigate the diagnostic accuracy of multiplex PCR molecular tests in CSF samples from patients with suspected CNS infection. Secondary objectives were concordance of results and identification of pathogens in the conventional culture that are not included into the panel.
**Methods:** Prospective observational study of AT decisions during the implementation phase of the FilmArray® Panel Meningitis/Encephalitis, FilmArray® Sepsis Panel (BCID) in patients admitted from May 2021 to December 2023. Simultaneous CSF samples were sent for culture, PCR-based tests, and neurotropic virus PCR test. Descriptive statistics was performed with Stata 14.2.
**Results:** Forty patients with suspected CNS infection were admitted, 26 (62.5%) were male, and mean age was 58 ± 16. 22 (55%) underwent spinal tap for CSF analysis because of suspected CNS infection, altered consciousness 11 (27.5%), seizures 6 (15%), or other reasons 1 (2.5%). FilmArray® Panel for Meningitis/Encephalitis was used in 34 (85%) of cases, while the FilmArray Sepsis (BCID) Panel was used in the remaining 6 (15%).
8 (20%) of the 40 CSF multiplex PCR panels tested positive, with 7 (87.5%) being under AT started prior to CSF sampling. Diagnostic accuracy of molecular tests is shown in Table.

| | Positive culture | Negative culture | |
|---|---|---|---|
| Positive multiplex PCR | 6 | 2 | PPV 75% |
| Negative multiplex PCR | 0 | 32 | NPV 100% |
| | Sensibility 100% | Specificity 94% | |

*Streptococcus pneumoniae* was detected in two cases, *Neisseria meningitidis* in two cases, *Herpes Simplex Virus 1* in 3 samples, and *Human Herpesvirus 6* in one sample. In three cases, culture and neurotropic virus PCR provided information not provided by the multiplex PCR tests: Epstein–Barr Virus was detected in two patients, and *Staphylococcus hominis* was isolated in one case in culture.
**Conclusions:** Molecular multiplex PCR tests of CSF samples have clinically meaningful diagnostic performance parameters and allow for swift adjustment of AT. However, as some potential pathogens are not included, multiplex PCR and conventional methods should be used in combination.

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**Topic:** Sepsis

## 000306

### The characteristics and outcomes of patients admitted to the ICU with severe influenza (2018–2022)

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**Introduction:** Severe influenza infection requiring ICU admission continues to be a challenge to the healthcare system with its high mortality. We evaluated the characteristics and outcomes of patients with influenza admitted to a tertiary-care ICU in Riyadh, Saudi Arabia.
**Methods:** This was a retrospective cohort of adult patients admitted with PCR-confirmed influenza to the ICU of King Abdulaziz Medical City-Riyadh, Saudi Arabia between January 1, 2018, and May 31, 2022. We compared the clinical characteristics, management, and outcomes of hospital nonsurvivors to survivors.
**Results:** During the 53-month study period, 675 patients were hospitalized with influenza and 151 (22.4%) were admitted to the ICU. There was no ICU admission between May 2020 and September 2021, during which SARS-CoV-2 was circulating at a high level in Riyadh, Saudi Arabia (Figure 1). Influenza A was responsible for most cases (H1N1 33.8%, H3N2 27.8%, untyped influenza A 15.2%, and Influenza B 23.2%). 34 patients (22.5%) died in the hospital. Nonsurvivors were older (69 ± 16 vs. 62 ± 20 years, $p = 0.04$), and had more prevalent ischemic heart disease (29.4% vs. 13.7%, $p = 0.03$), immunocompromised state (14.7% vs. 1.7%, $p = 0.002$), and acute kidney injury (29.4% vs. 10.3%, $p = 0.005$). Pulmonary Severity Index was slightly higher in nonsurvivors (120 ± 32 vs. 108 ± 34, $p = 0.06$). Respiratory culture was obtained in 102 patients (67.5%) with bacterial growth other than normal flora in only 24 patients (15.9%). *Pseudomonas aeruginosa* ($N = 11$, 2 were multidrug resistant) and *Staphylococcus aureus* ($N = 9$; 4 were methicillin-resistant) were the most common cultured bacteria. Bacterial growth was more common in nonsurvivors (35.3% vs. 10.3%, $p < 0.0001$). Only two patients (1.3%) had infection with Aspergillus species. Oseltamivir and antibacterial therapy were provided to almost all patients (anti-pseudomonal coverage in 64.2% and anti-MRSA coverage in 54.7% of patients). Corticosteroid therapy was used in most patients (72.2%) with no difference between nonsurvivors and survivors ($p = 0.84$). Nonsurvivors required more vasopressor therapy (85.3% vs. 55.6%, $p = 0.002$) and invasive mechanical ventilation (61.8% vs. 44.0%, $p = 0.07$). The duration of mechanical ventilation was longer in nonsurvivors (13 ± 8 vs. 7 ± 8 days, $p = 0.01$). On logistic regression analysis, age (odds ratio [OR], 1.04; 95% confidence interval [CI] 1.01–1.08), immunocompromised state (OR, 37.25; 95% CI 2.70–514.09), and vasopressor therapy (OR, 3.14; 95% CI 1.04–9.48) were independently associated with hospital mortality.
**Conclusions:** Among patients admitted to the ICU with influenza, most cases were due to Influenza A, almost one in three patients had bacterial coinfection and one in five died in the hospital. Older age, immunocompromised state, and presence of shock predicted mortality.

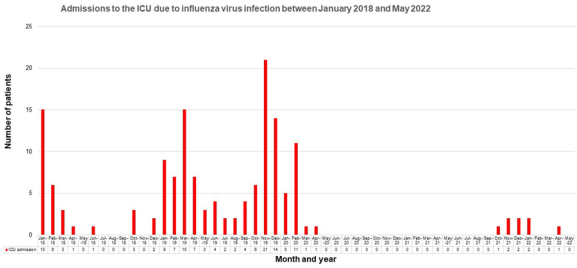


**Fig. (abstract 000306)** Distribution of admissions during the study period (Jan 2018–May 2022)

**Topic:** Infections and prevention

## 000307

### The epidemiology of post-extubation respiratory supports in Japan: a retrospective cohort study using the intensive care unit registry database in Japan

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000307

**Introduction:** Noninvasive ventilation (NIV) and high-flow nasal cannula (HFNC) to prevent reintubation have been used for patients with high risks of extubation failure. Considering the guideline recommendations based on accumulating evidence, the selection of the post-extubation respiratory supports may have changed [1,2]. However, a few studies investigated the epidemiology of the respiratory supports after extubation.
**Objectives:** This study aimed to address the epidemiology of post-extubation respiratory supports, and the transition of clinical outcomes in patient with those supports in Japan.
**Methods:** We performed a retrospective cohort study using the Japanese Intensive Care PAtient Database (JIPAD). From April 2018 to March 2022, we included the adult patients (> 18 years) who underwent mechanical ventilation for at least 24 h from ICU admission. Patients who underwent tracheostomy prior to ICU admission or extubation attempt, with P/F ratio greater than 300 within 24 h from ICU admission, and who had missing data for clinical outcome were excluded. We also excluded patients in the institutions that did not consecutively register cases on the JIPAD during the whole study period.
We investigated whether NIV or HFNC were used after extubation. And then, the patients were classified into four groups according to the respiratory supports after extubation: conventional oxygen therapy (COT group), NIV only (NIV group), HFNC only (HFNC group), and combination of NIV and HFNC (NIV + HFNC group). We evaluated the severity score (Acute Physiology and Chronic Health Evaluation [APACHE] score, Sequential Organ Failure Assessment [SOFA] score), the standardized mortality ratio (SMR) calculated using the APACHE III score, the duration of mechanical ventilation, and the length of ICU stay. Categorical variables were analyzed by the Cochran–Armitage trend test and continuous variables by the Jonckheere–Terpstra trend test.
**Results:** Of the 10,062 eligible patients in 38 ICUs, COT, NIV, HFNC, and combination of NIV and HFNC were performed in 7434, 554, 1581, and 493 patients, respectively. From 2018 to 2022, the proportion of patients with COT (75.0% to 72.6%, $P = 0.007$) and NIV (5.9% to 4.7%, $P = 0.020$) decreased with a significant trend. In contrast, those with HFNC increased significantly (14.2% to 18.2%, $P < 0.001$). APACHE II and SOFA score at ICU admission tended to decrease significantly in the COT and HFNC groups.

The SMR showed no increasing or decreasing trend for each group. The duration of mechanical ventilation and the length of ICU stay increased in the COT group, but did not change in the other groups.
**Conclusions:** In the 4 years since 2018, the proportion of patients undergoing HFNC after extubation has increased. Clinical outcomes in patients with HFNC after extubation did not change, despite a decreasing trend in severity scores. The threshold for HFNC use to prevent reintubation may have been lower.

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**Topic:** Acute respiratory failure and mechanical ventilation.

## 000308

### Practices, predictors, and outcomes of do-not-resuscitate orders in patients with critical COVID-19

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**Introduction:** Early in the pandemic, Do-Not-Resuscitate (DNR) orders were commonly used in patients with severe Coronavirus 19 disease (COVID-19) due to the high disease-fatality rate, fear of viral spread during cardiopulmonary resuscitation, and limited bed capacity. As practices of DNR orders vary by setting, we evaluated the practices of DNR orders in patients with severe COVID-19 at a tertiary-care hospital in Saudi Arabia.
**Methods:** This was a retrospective cohort study of patients with acute hypoxemic respiratory failure due to COVID-19 who were admitted to the adult intensive care units (ICUs) of King Abdulaziz Medical City in Riyadh, Saudi Arabia between March and December 2020. We compared patients who had DNR orders during ICU stay with those who had full code. We also described the clinical status on the day of DNR order implementation.
**Results:** We studied 193 patients who had acute hypoxemic respiratory failure due to COVID-19 (median age 60 years [interquartile range: 51, 69], males 73.5%, hypertension 59.6%, diabetes 65.3%). Respiratory management in the ICU included the use of high-flow nasal oxygen (70.4%), noninvasive ventilation (61.4%), invasive mechanical ventilation (52.6%), and prone positioning (44.0%). 54 patients (28.0%) had DNR orders on a median of 15 days (interquartile range: 5, 20) after ICU admission (no differences in demographics, more diabetes in patients with DNR orders but similar other comorbidities compared with the full code patients). On the day of the DNR order, 33 patients (61.1%) were on vasopressors, 5 (9.3%) on noninvasive ventilation, 49 (90.7%) on invasive mechanical ventilation (median fraction of inspired oxygen 0.70 [interquartile range: 0.54–0.90]), and 23 (46.9%) on renal replacement therapy, and the median sequential organ failure assessment score was 14.5 (Interquartile range: 13.0, 17.0). On multivariable logistic regression analysis, none of the baseline variables including age, sex, body mass index, premorbid condition, vasopressor therapy, and invasive versus noninvasive mechanical ventilation including high-flow nasal oxygen were associated with DNR orders. Of the 54 patients with DNR orders, 46 (85.2%) died in the ICU and 51 (94.4%) in the hospital.
**Conclusions:** DNR orders were commonly used in patients with severe COVID-19 during the first wave of the pandemic, mostly after 2 weeks of ICU admission. While baseline characteristics and respiratory support mode did not predict DNR orders, persistent severe organ failure during ICU stay probably did. Almost 95% of patients with DNR orders died in the hospital.

**Topic:** Ethics and end-of-life care

## 000309

### The clinical utility of C-reactive protein and procalcitonin in patients with severe influenza

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**Introduction:** Severe influenza is frequently associated with increased morbidity and mortality. This study evaluated the value of C-reactive protein (CRP) and procalcitonin (PCT) in predicting bacterial coinfection, ICU admission, and mortality in patients with severe influenza.
**Methods:** This was a retrospective study of adult patients with influenza who were admitted to a tertiary-care hospital in Riyadh, Saudi Arabia between 2018 and 2022. We compared admission levels of CRP and PCT in patients with and without bacterial coinfection (defined as growth of bacteria, including normal respiratory flora, within 48 h of admission), those who needed and did not need ICU admission, and hospital survivors, and nonsurvivors. We performed receiver-operating characteristic (ROC) curve analysis to assess the ability of admission CRP and PCT levels, change in CRP and PCT levels between admission and day 3–5, admission leukocyte count and Pneumonia Severity Index to predict bacterial coinfection, ICU admission, and hospital mortality.
**Results:** The study cohort comprised 675 patients with influenza; 42 out of the 241 patients who had respiratory culture (17.4%) had bacterial coinfection; 151 (22.4%) needed ICU admission and 50 (7.4%) died in the hospital. On admission, CRP was measured in 321 patients (median: 53 mg/L, interquartile range [IQR]: 19, 96) and PCT in 241 (median: 0.26 ng/L, IQR: 0.10, 0.86). CRP levels were similar in patients with and without bacterial coinfection ($p = 0.92$), patients who needed and did not need ICU admission ($p = 0.27$), and survivors and nonsurvivors ($p = 0.18$). PCT levels were similar in patients with and without bacterial coinfection but were higher in patients who needed ICU admission compared with those who did not (median: 0.35 ng/L, IQR: 0.20, 1.60 versus 0.23 ng/L, IQR: 0.09, 0.73; $p = 0.001$) and in nonsurvivors compared with survivors (median: 1.04 ng/L, IQR: 0.26, 3.87 versus 0.24 ng/L, IQR: 0.10, 0.73; $p < 0.0001$). The ROC curve analysis showed that CRP had poor predictive value for bacterial coinfection (area under the curve [AUC]: 0.507, 95% confidence interval [CI] 0.357, 0.658), ICU admission, and hospital mortality (Figure 1). On the other hand, PCT predictive ability was fair for bacterial coinfection (AUC: 0.630, 95% CI 0.471, 0.790), ICU admission (AUC: 0.642, 95% CI 0.565, 0.719), and good for hospital mortality (AUC: 0.735, 95% CI 0.638, 0.832) (Figure 1). However, PCT predictive ability was close to that of admission leukocyte count (AUC for mortality: 0.681, 95% CI 0.597, 0.765) and Pulmonary Severity Index (AUC for mortality: 0.698, 95% CI 0.626, 0.771). Changes in CRP and PCT over time had an uncertain ability to predict hospital mortality (Figure 1).
**Conclusions:** In our study, which was limited by a relatively small sample size, we found that PCT performed better than CRP in predicting bacterial coinfection and outcomes. However, PCT did not perform much better than admission leukocyte count and Pneumonia Severity Index in predicting hospital mortality.

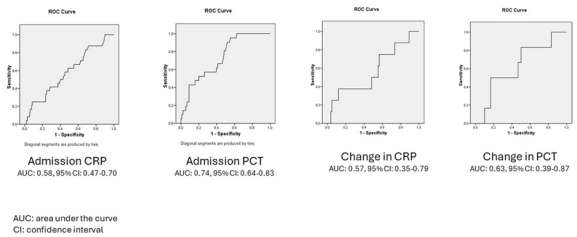


**Fig. (abstract 000309)** Receiver-operator characteristic (ROC) curve analysis for the predictive ability of C-reactive protein (CRP) and procalcitonin (PCT) for hospital mortality. Change in CRP and PCT was assessed as the difference between day 3–5 value and baseline value divided by the baseline value

**Topic:** Health services research and outcome

## 000310

### Increasing illness severity of patients admitted to the intensive care unit (ICU) demonstrated by the APACHE II score over a 6-year period

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AQ2 **Introduction:** Severity of illness impacts resources required to treat patients and severity of illness scoring can be used to predict outcomes and mortality. Several such scoring systems have been used in intensive care, including the Acute Physiological and Chronic Health Evaluation II (APACHE II) score(1). APACHE II was first introduced in 1985 and is still used worldwide. It looks at 12 variables within 24 h of admission to produce a score out of 71, with a higher score correlating to a higher mortality risk and thus a higher degree of illness severity (2).
**Objectives:** To determine if illness severity has changed over the last six years in patients being admitted to ICU at East Surrey Hospital in the United Kingdom (UK).
**Methods:** APACHE II scores for 4540 patients admitted to ICU at East Surrey Hospital from 1/1/2018 to 30/11/2023 were analysed. Inferential statistics were performed using the Kruskal–Wallis test with a post hoc Bonferroni corrected comparison to determine specific differences between the years. The analysis was carried out using R (version 4.3.2).
**Results:** Table 1 shows the average age and median APACHE II scores for admissions to ICU by year. Overall, there was an increase in APACHE II score over the 6-year period with a median score of 14 and 18 in 2018 and 2023, respectively. Both 2022 and 2023 demonstrated significant difference when compared to preceding years (Table 2).

**Table 1 (abstract 000310)** Average age and median APACHE II scores for admissions to ICU by year

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|
| Age (years) | 65.1 | 64.0 | 60.6 | 61.6 | 62.2 | 62.9 |
| APACHE II score | 14 | 15 | 14 | 15 | 16 | 18 |

**Table 2 (abstract 000310)** Post hoc Bonferroni corrected comparison of years

| | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|
| 2019 | 0.0166 | | | | |
| 2020 | 1.0000 | 0.0020 | | | |
| 2021 | 0.0978 | 1.0000 | 0.0167 | | |
| 2022 | 0.0000 | 0.0039 | 0.0000 | 0.0023 | |
| 2023 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

**Conclusions:** The statistically significant increase in APACHE II score from 2018 to 2023 indicates an increase in predicted mortality and thus increased illness severity of ICU admissions at East Surrey Hospital. Since 2020, there has been an increase in APACHE II score each year, which may imply the score will continue to rise in the future. Predictably, continued increases in illness severity and mortality risk will impact the resources required to ensure adequate treatment of future ICU admissions. As this was a single-centre study, it may be beneficial to expand this study across the UK to see if other units are experiencing a similar trend in increasing illness severity.

**Reference(s)**

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**Topic:** Health services research and outcome

## 000311

### Rapid response team perspectives on cardiopulmonary resuscitation performance in the cath lab: insights from the "WE-CaRe" initiative

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**Introduction:** In-hospital cardiac arrest (IHCA) is increasingly recognized as a distinct type of cardiac arrest (CA), and its incidence varies between countries (1). Despite the availability of immediate, high-quality cardiopulmonary resuscitation (CPR) for IHCA, mortality rates remain high (2). Due to its unique nature, cardiac arrest in cardiac catheterization laboratories requires a multifaceted approach and is often stressful (3). The specific challenges and need for high-quality CPR in cath labs are occasionally mentioned in the literature (3).
**Objectives:** This study aimed to gain insights into healthcare providers' standpoints and attitudes toward adult and paediatric cardiac arrest management in the cath lab. This was intended to be an initial step toward improving the team's performance and dynamics during such scenarios.
**Methods:** We conducted a cross-sectional study at Aswan Heart Centre from December 2023 to January 2024 through a self-administered online survey divided into 4 domains (Figure 1) with a total of 42 questions, including 3 open-ended questions. We have targeted 165 participants, including doctors and nurses, forming our rapid response team. The survey was pre-tested with a pilot study of ten participants. We reported results using descriptive statistics.

**Results:** The response rate was 58.1% (96 of 165), and the completion rate was 81.2%. 80% of the participants had ALS training in the past two years. Only 70% reported that they received feedback on their roles during CPR, and 63% reported not being involved in debriefing sessions on a regular basis. 22% mentioned the lack of clear role assignments during CPR, and 22% were unaware of the "closed-loop communication" concept. 27% reported feeling uncomfortable when giving feedback to their colleagues. The specific challenges related to the cath lab, along with proposed ideas for improvement, are summarized in Table 1.

**Table 1 (abstract 000311)** Summarized thematic analysis of responses to the open-ended survey questions

| Challenges encountered during CPR in the cath lab | | Proposed ideas for improvement of the cardiac arrest response in the cath lab | |
|---|---|---|---|
| **Challenges** | **Frequency** | **Ideas** | **Frequency** |
| 1. The noisy environment | 11 | 1. Avoid crowdedness | 11 |
| 2. Overcrowdedness | 7 | 2. Improve communication | 10 |
| 3. Multiple team leaders and medical orders | 8 | 3. Frequent, regular training | 8 |
| 4. Unclear messages and misunderstandings | 4 | 4. Mechanical compression devices | 8 |
| 5. Challenges related to the main operator (usually an interventional cardiologist) include fixating, anxious operators, etc. | 6 | 5. Assigning one team leader<br>6. Clear role assignments for each team member | 7<br>5 |
| | | 7. Prompt arrival of the rapid response team | 4 |
| | | 8. Considering the physical limitations of individual team members | 2 |

CPR: Cardiopulmonary Resuscitation

**Conclusions:** The cardiac catheterization lab is a distinct environment that poses multiple challenges, both technical and non-technical, during CPR. Noisy environments and crowded scenes are frequently encountered. Simulation training that imitates the Cath lab settings can prove to be useful. It is essential to develop national and international guidelines that address the specific needs for improving CPR quality in the cath lab.

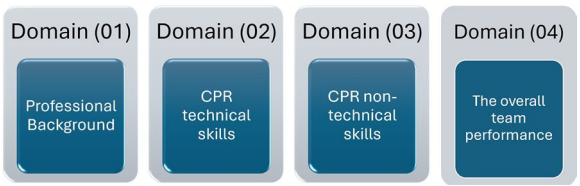


**Fig. 1 (abstract 000311)** The four domains of the "WE-caRe" online survey

**Reference(s)**

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**Topic:** Cardiac arrest

## 000312

### Monitoring adherence to the non-technical skills during cardiopulmonary resuscitation for victims of in-hospital cardiac arrest: the AHC-NTS Tool

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**Introduction:** International cardiopulmonary resuscitation (CPR) guidelines have consistently emphasized the importance of non-technical skills (NTS) during resuscitation (1). These skills have been part of CPR courses, particularly simulation training (2). Assessing non-technical skills during CPR is challenging and is considered an area for research and development (3, 4).
**Objectives:** The aim of our study was to audit the adherence of CPR team members at Aswan Heart Centre to the non-technical skills advised by the Advanced Cardiovascular Life Support (ACLS) curriculum.
**Methods:** We developed the AHC-NTS Tool (Figure 1), an audit tool for evaluating adherence to non-technical skills during CPR. We identified eight fundamental NTS for recording. Non-adherence was defined as at least one event that breached any of these concepts during the resuscitation attempt. Other technical skills were also included in our tool. The CPR committee at the Aswah Heart Center approved the tool in 2021. Rapid Response Team members were trained to use and complete this form, which was implemented in 2022. Data entry was conducted through REDCap.
**Results:** We analyzed 159 adult cardiac arrest events in the period between January 2022 and December 2023. Table 1 summarizes patients' demographics and event characteristics. ROSC was achieved in 93 (60.4%) of events. Chest compression interruption for more than 5 s was reported to occur in 93 (60.4%) events. Breaching the 10-s guidelines recommendations for endotracheal intubation, if required, was reported in 38 (24.5%) events. The CPR board was only used in 75 (48.1%) events. The frequencies of non-adherence to non-technical skills are summarized in Table 2.

**Table 1 (abstract 000312)** Patient demographics and events characteristics

| **Total number of events: *n* (%)** | **159 (100%)** |
|---|---|
| Gender: male, *n* (%) | 102 (64.2%) |
| Age: median (IQR) | 61 (52–67.5) years |
| Initial rhythm: *n* (%)<br>Shockable<br>Non-shockable | 48 (30.1%)<br>108 (67.9%) |
| Duration of the resuscitation: median (IQR) | 12 (4–27) min |

**Table 2 (abstract 000312)** NTS reported and the frequencies of non-adherence

| Individual non-technical skills reported in our tool: | *n* (%) |
|---|---|
| Assignment of clear roles and responsibilities | 7 (4.4%) |
| Clear messages are maintained during the code | 2 (1.3%) |
| Knowledge sharing | 20 (12.6%) |
| Constructive interventions | 5 (3.1%) |
| Closed-loop communication | 5 (3.1%) |
| Debriefing and summarization | 29 (18.2%) |
| Acknowledging the team's limitations | 3 (1.9%) |
| Mutual respect | 1 (0.6%) |

**Conclusions:** Non-technical skills are of the utmost importance for high-quality CPR. Monitoring non-technical skills is challenging due to their subjective nature. The most common technical issue during CPR is the prolonged interruption of chest compression. On the other hand, the most common non-technical issue is the lack of regular debriefing sessions. By developing local tools and guidelines for auditing adherence, we can significantly improve the quality of CPR.

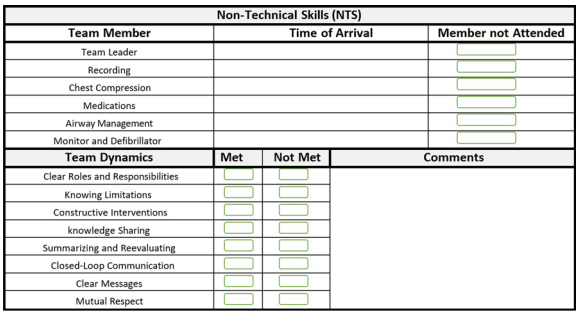


**Fig. 1 (abstract 000312)** Non-technical skills section of Aswan Heart Centre Cardiopulmonary Resuscitation Monitoring Tool (the AHC-NTS Tool)

**Reference(s)**

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**Topic:** Cardiac arrest

## 000313

### Association between early postoperative vasoactive-inotrope score and the risk of acute kidney injury in adult patients after coronary artery bypass grafting: single-center retrospective observational study

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**Introduction:** Acute kidney injury (AKI) is prevalent in patients after cardiac surgery (1). AKI is associated with increased postoperative mortality and morbidity (2). The vasoactive-inotrope score (VIS) was proposed in 2010 to expand the inotropic score (IS) to include other vasoactive medications (3, 4). VIS has shown good predictive accuracy for poor short-term outcomes after cardiac surgery, particularly in the pediatric population, based on multiple studies (2).The performance of VIS in predicting outcomes in the critically ill adult population remains an area for research.
**Objectives:** Our aim was to investigate whether a high Vasoactive-Inotrope Score (VIS) is a predictor for postoperative acute kidney injury (AKI) in adult patients after coronary artery bypass grafting (CABG).
**Methods:** We conducted a retrospective chart review study from January 2022 to December 2023. We included all adult patients who underwent CABG at our institution and whose medical charts could be retrieved. Demographic data, operative details, and post-operative AKI were recorded. VIS was calculated and reported three times: (1) at the time of ICU admission; (2) maximum VIS on the day of surgery (POD-0); and (3) maximum VIS on the first postoperative day (POD-1). AKI was identified based on the creatinine criteria of the KDIGO definition (5). Multivariate logistic regression, ROC curve, and Chi-squared statistics were used for analysis.
**Results:** We identified 140 eligible participants and were included in the analysis. 105 (75%) participants were males, and 100 (71.5%) had a BMI of 25 or more. The median (IQR) age was 56 (49–62) years. 51 (35%) patients developed AKI in different stages. When comparing patients who developed AKI and those who did not. We found a statistically significant difference between the two groups in age ($p < 0.001$), maximum POD-0 VIS ($p = 0.017$), and maximum POD-1 VIS ($p < 0.001$). Multivariate logistic regression showed that out of all variables, age (OR 1.06, 95% CI 1.01–1.1, $p = 0.007$) and maximum POD-1 VIS (OR 1.12, 95% CI 1.02–1.23, $p = 0.01$) were independent factors associated with postoperative AKI. ROC curve analysis showed that the best AUC was obtained for maximum POD-1 VIS (Figure 1).
The limitations of our study included a small sample size, the retrospective nature of the study design, and the use of creatinine criteria only for defining AKI.
**Conclusions:** Vasoactive-inotrope score in the early postoperative period can be a promising predictor for the development of AKI after cardiac surgery. In our study, advanced age and high maximum POD-1 VIS were independently associated with postoperative AKI after CABG. More large-scale studies are needed to confirm the role of VIS for critically ill patients.

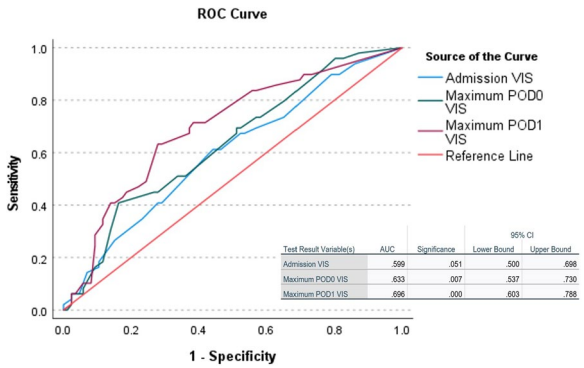


**Fig. 1 (abstract 000313)** Receiver-Operating Characteristic (ROC) comparing AUC of Vasoactive-Inotrope Score (VIS) at three different time points for predicting the risk of acute kidney injury after coronary artery bypass grafting in the study population. VIS, Vasoactive-Inotrope Score; Maximum POD0 VIS, Maximum Vasoactive-Inotrope Score on the day of surgery; Maximum POD1 VIS, Maximum Vasoactive-Inotrope Score on the first postoperative day

**Reference(s)**


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**Topic:** Acute kidney injury and haemofiltration

## 000315

## A multi-dataset analysis of the associations between treatment of acute myocardial infarction (AMI) in the ICU and patient outcomes


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**Introduction:** Much work has shown that disparities in the treatment of AMI exist in critical care. Preliminary findings from ongoing work show that disparities manifest differently across datasets [2]. Understanding their impact on patient outcomes is important for improved care.
**Objectives:** Examine whether there is an association between treatment and patient outcomes across multiple datasets.
**Methods:** This is a retrospective analysis of three public datasets: MIMIC-III [1], collected in MA, USA 2001–2012, eICU [3], hospitalizations across USA 2014–2015, and AmsterdamUMCDb (AUMC) [4], collected in Netherlands 2003–2016. Patients with a primary diagnosis of AMI and no comorbidities were extracted. A logistic regression model was fit to examine the association between demographic variables (sex, age, race, insurance, region), disease severity markers (length of stay, N/STEMI, shock diagnosis), analgesia and AMI-related treatments (ACE-inhibitor, antiplatelet, beta-blocker, statin) and two outcomes, in-hospital mortality (IHM) and discharge location (DL), dichotomized as discharge to home (D2H), favorable, vs elsewhere. Similar to [1], eICU and MIMIC were analyzed both separately and combined into a single dataset, henceforth called Combined. AUMC did not have DL information and was only analyzed for IHM.
**Results:** There were 91, 644, and 2521 patients in AUMC, eICU, and MIMIC, respectively, who met the inclusion criteria. Being older (odds ratio = 21.2-AUMC) and experiencing shock (6.5-MIMIC, 6.3-Combined) increased the odds of IHM. Additionally, older age (0.4-MIMIC, 0.3-Combined), incidence of shock (0.2-MIMIC, 0.17-eICU, 0.22-Combined), and longer stays (0.7-eICU, 0.8-MIMIC, 0.8-Combined) decreased the odds of D2H. Having insurance was protective against IHM and unfavorable discharge. In MIMIC, traditionally undertreated groups had worse outcomes; female patients had decreased odds of D2H (0.5), while Caucasians had decreased odds of IHM (0.7). Across all datasets, AMI-related treatments decreased odds of IHM; ACE-inhibitor (0.06-AUMC, 0.2-MIMIC, OR = 0.2-Combined), aspirin (0.2-MIMIC), beta-blocker (0.1-MIMIC, 0.15-Combined), and statin (0.5-MIMIC, 0.4-Combined). Similarly, they increased the odds of D2H; beta-blocker (6.0-MIMIC, 3-Combined) and non-aspirin antiplatelets (1.7-MIMIC, 2.6-eICU, 1.8-Combined). Analgesics greatly increased the odds of IHM and decreased the odds of D2H in MIMIC; any analgesia (47.5-IHM, 0.04-DL) and multimodal (3.3-IHM).
**Conclusions:** Unlike prior findings where disparities were varied across datasets, we find that the association between treatment and patient outcomes is consistent across them. Insurance and AMI-related drugs have a protective effect against unfavorable discharge, including mortality. We hypothesize that the link between analgesia and increased odds of poor outcomes is an indicator of disease severity, i.e., sicker patients are more likely to receive analgesia and are also more likely to experience poor outcomes. For equitable care and outcomes, disparities in access to insurance and orders of AMI-related drugs should be eliminated, because they are paramount for favorable outcomes.

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5. Paul Elbers, and Patrick Thoral, Amsterdam Medical Center, Netherlands for sharing their data with us, and for their help navigating the dataset to extract relevant cohorts and treatments.
6. Institute of Diversity Sciences (IDS), University of Massachusetts, Amherst, for the STEM for Social Justice Seed Grant funding.

7. University of Massachusetts, Amherst, Graduate School, for the Spaulding Smith Fellowship funding PM.

**Topic:** Cardiovascular issues in ICU

## 000316

### Role of selective plasma exchange in critically ill patients' comparison with plasma exchange

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000316

**Introduction:** Therapeutic plasma exchange (TPE) is a potentially lifesaving but also invasive procedure with risk of adverse events. Plasma separation can be performed by centrifugation or membrane techniques. In Japan, membrane separation has been the standard method for a long time. In recent years, there have been more reports on selective plasma exchange (SePE) therapy using Evacure Plus EC-4A10® (Asahikasei Medical Co., Ltd., Japan), which has a smaller pore size of 0.03 μm than conventional membrane plasma separator of 0.3 μm (OP-05D®, Asahikasei Medical Co., Ltd., Japan). The most unique point of SePE therapy is that it can remove Immunoglobulin G (IgG) with reduced loss of fibrinogen (Fib). The sieving coefficient (SC) of Evacure plus EC4A-10® is for IgG 0.5, Fib 0, while the SC of OP-05D® is approximately 1.0, respectively.
**Objectives:** The purpose of this study was to determine the differences in removal rates and adverse events between SePE and PE in ICU patients.
**Methods:** Patients who were treated with SePE in our ICU from February 2018 to January 2024 were included in the study. We retrospectively examined the details of SePE: IgG removal rate (RR-IgG), IgM removal rate (RR-IgM), and Fib removal rate (RR-Fib) based on medical records.
**Results:** We performed 49 sessions of SePE procedures in 13 patients: five of rapidly progressive glomerulonephritis (RPGN) with alveolar hemorrhage, four of autoimmune encephalitis, one of acquired hemophilia A (AHA), one of Guillain–Barre syndrome (GBS), one of myasthenic crisis, and one of thyroid crisis.
Albumin was used as replacement fluid for all sessions in our study consisting of 8 PE sessions and 49 SePE sessions. The median values of PE and SePE per session in each category were as follows: the processed plasma volume (PV) was 1.1 and 1.4 times the circulating PV, the RR-IgG was 79.6% and 61.9%, RR-IgM was 74.7% and 0%, and the RR-Fib was 76.3% and 17.2%, respectively (Table 1).
Regarding clinical efficacy, five cases of autoimmune encephalitis, and each case of myasthenic crisis, GBS and thyroid crisis were weaned from the ventilator. Five cases of RPGN achieved disappearance of hemoptysis and improvement of respiratory condition. In one case of AHA, the inhibitor was removed, and bleeding tendency was improved. The median value of decreased blood pressure before and after session of PE and SePE were 6.3% and 3.0%, respectively. None of our sessions had bleeding event. No FFP transfusion after SePE was needed due to the Fib reduction (< 100mg/dl). However, three of eight PE sessions showed Fib reduction and the median FFP transfusion was eight units.
**Conclusions:** SePE is slightly less efficient in IgG removement but can reserve Fib better than PE. This characteristic is ideal for SePE seems to be safer modality for severe and unstable patients in ICU with bleeding tendency and it is also economically cost-saving regarding the use of FFP. SePE should be preferred only when the target immunoglobulin is IgG-class as its removal rate of IgM is 0.

**Table 1 (abstract 000316)** PV: Plasma volume, RR-IgG-Immunoglobulin G remova; rate, RR-IgM: Immunoglobulin M remova; rate, RR-Fib: Fibrinogen removal rate

| | PE (n=8) | SePE (n=49) |
|---|---|---|
| Processed PV (times) | **1.10** [1.10-1.11] | **1.40** [1.38-1.48] |
| RR-IgG (%) | **79.6** [70.2-82.9] | **61.9** [51.8-68.7] |
| RR-IgM (%) | **74.7** [73.4-78.4] | **0.0** [0.0-3.7] |
| RR-Fib (%) | **76.3** [65.5-82.2] | **17.2** [8.1-21.0] |

median [IQR]

Comparison between PE and SePE using albumin as replacement fluid in ICU.

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**Topic:** Systemic diseases

## 000317

### Predicting organ dysfunction in septic patients: a prospective cohort study using rapid ex vivo immune profiling

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000317

**Introduction:** Sepsis is characterized by a dysregulated host immune response to infection, which includes a state of significantly impaired immune function known as immunoparalysis. This weakened state increases the risk of secondary infections from ordinarily non-pathogenic organisms, thereby contributing to morbidity and mortality. Rapid and accurate immune phenotyping to assess the severity of immunoparalysis may pave the way for targeted interventions that enhance the prognosis for these critically ill patients.
**Objectives:** We hypothesized that in septic patients, subclinical immunological deficits could be precursors to immune failure. These deficits may be measurable through ex vivo whole blood stimulation assays, which assess cytokine concentrations. A correlation between these measurements and subsequent organ dysfunction may exist, indicating that such assays could serve as early indicators of evolving immune failure.
**Methods:** In a prospective observational study, adult septic patients and critically ill but non-septic controls were identified within 48 h of critical illness onset. Ninety-six adult septic and critically ill non-septic patients were enrolled. Using a rapid, ex vivo assay based on responses to lipopolysaccharide (LPS), anti-CD3/anti-CD28 antibodies, and phorbol 12-myristate 13-acetate with ionomycin (PMA), cytokine responses to immune stimulants were quantified. The Ella(TM) automated immunoassay system (Bio-Techne, Minneapolis, MN) was used for triplicate measurement of interferon (IFN)γ, tumor necrosis factor

(TNF), and interleukin (IL)-6. Cytokine concentrations were available within 90 min. The primary outcome was the relationship between early cytokine production and subsequent organ dysfunction, as measured by the Sequential Organ Failure Assessment score on day 3 of illness (SOFAd3).

**Results:** Elevated levels of TNF and IL-6 post-endotoxin challenge were inversely correlated with SOFAd3. IFNγ production per lymphocyte was inversely related to organ dysfunction at day 3 and differed between septic and non-septic patients, suggesting a role for ex vivo lymphocyte IFNγ production as a biomarker in sepsis (Fig 1). Clustering analysis revealed two distinct immune phenotypes, represented by differential responses to 18 h of LPS stimulation and 4 h of anti-CD3/anti-CD28 stimulation (Fig 2).

**Conclusions:** Our rapid immune profiling technique offers a promising tool for early prediction and management of organ dysfunction in septic patients. This information could be pivotal for early intervention and for preventing irreversible organ damage during the acute phase of critical illness.

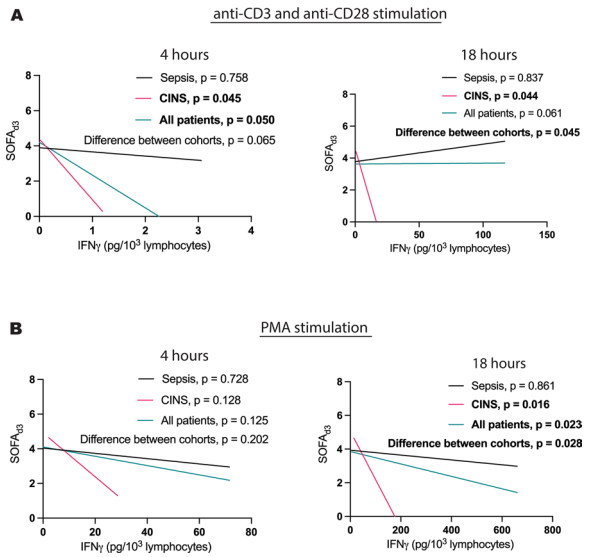
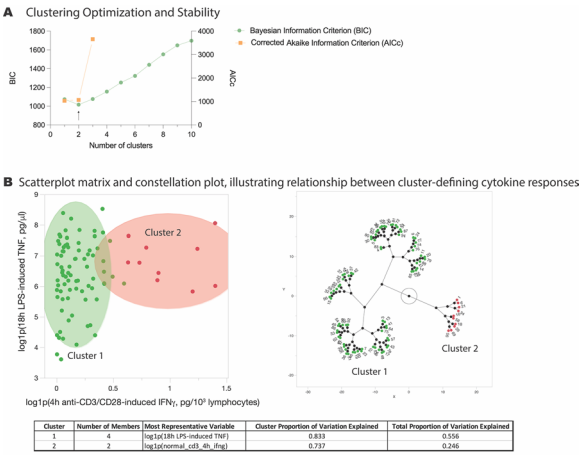



**Fig. 1 (abstract 000317)** Assessment of Ex Vivo interferon-gamma (IFNγ) production, per lymphocyte, as a predictor of subsequent organ dysfunction. Panel (A) displays interferon-gamma (IFNγ) production by $10^3$ lymphocytes following 4 and 18 h of anti-CD3/anti-CD28 stimulation. Panel (B) displays interferon-gamma (IFNγ) production by 10^3 lymphocytes following 4 and 18 h of phorbol 12-myristate 13-acetate (PMA) with ionomycin stimulation. The *p* values represent the statistical correlation between ex vivo cytokine output per cell and the SOFA score on day 3, after adjusting for confounding factors using the Acute Physiology and Chronic Health Evaluation II (APACHE II) score. 'Sepsis' refers to the relationship (slope) of the cytokine with SOFAd3 within the sepsis group, 'CINS' refers to the relationship (slope) of the cytokine with SOFAd3 within the critically ill but non-septic group, 'all patients' refers to the relationship (slope) of the cytokine with SOFAd3 with both groups combined, and 'difference between cohorts' compares 'sepsis' and 'CINS' to test for a significant difference between the slopes of the two groups




| Cluster | Number of Members | Most Representative Variable | Cluster Proportion of Variation Explained | Total Proportion of Variation Explained |
|---|---|---|---|---|
| 1 | 4 | log1p(18h LPS-induced TNF) | 0.833 | 0.556 |
| 2 | 2 | log1p(normal_cd3_4h_ifng) | 0.737 | 0.246 |

**Fig. 2 (abstract 000317)** Optimization of clustering for cytokine responses following ex vivo stimulation. (A) Gaussian Mixture Modeling (GMM) was employed to determine the optimal number of clusters, revealing cytokine responses that most characteristically defined each cluster. Arrow indicates the optimal cluster number based on Bayesian Information and Corrected Akaike Information Criteria. (B) A scatterplot matrix and constellation plot were constructed using the two cytokine responses that most accurately represented each of the two clusters identified in (A). The analysis was conducted on log-p-transformed cytokine concentrations subsequent to stimulation with LPS and anti-CD3/anti-CD28 antibodies

**Reference(s)**
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**Topic:** Sepsis

## 000318

### Assessing seasonal trends in illness severity of patients admitted to critical care

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000318

**Introduction:** Seasonal variations in temperature are well known to be correlated with adverse health outcomes. UK studies have identified winter excesses in hospital admissions for asthma, falls, certain types of road accidents, atrial fibrillation, heart failure, pulmonary embolism, stroke, and critical illness (1, 2). It is often presumed that patients admitted to ICU in winter months are more unwell than those admitted in the summer; however, evidence for this is lacking. An understanding of the seasonal variations in demands on ICU services can help plan the allocation of beds and facilitate the prompt admission and management of critically unwell patients.

**Objectives:** To understand and assess if there is a seasonal trend to the illness severity of patients admitted to our critical care unit.

**Methods:** To measure illness severity, we used the Acute Physiology and Chronic Health Evaluation II Score (APACHE II) which, despite its limitations, provides a standardized and objective measure of the severity of illness in critically ill patients and continues to be used worldwide.

Between 1 January 2018 and 30 November 2023, deidentified data for 4767 patients were sampled, and of these, APACHE II scores were available for 4540 critical care patients. Given the large size of this cohort, multiple imputation was not needed to provide expected values for missing data. These data were analysed by creating a time series for monthly median APACHE II scores and additive seasonal

decomposition of the same data. All analyses were performed using R (version 4.3.2).

**Results:** Visual inspection of the time series for monthly median APACHE scores from 2018 to 2023 (Figure 1) shows irregular peaks, with a slight increasing trend towards the end, suggesting an increased acuity of patients towards the end of 2022 and start of 2023. These peaks do not occur with any regularity, suggesting that there is no seasonality to this data.

The seasonal decomposition method of examining data for seasonality involves breaking the time series into three components—the linear trend (in this case an asymptotic increasing trend), the seasonal component and random residuals (3), as seen in Figure 2. From the seasonal decomposition data, it appears that there is a seasonal component to the data; however, this only accounts for 5% of the data overall, with the trend contributing over 50%.

**Conclusions:** In our unit, we have demonstrated that there is no significant evidence to support the view that patients admitted to ICU in winter months are more unwell than those admitted in the summer, which is most likely the result of cognitive bias. We recognize that using the APACHE II score as a marker for acuity in this patient cohort may not be the best discriminator to determine seasonality. Nonetheless, our study underscores the importance of ongoing monitoring and adaptive resource allocation strategies to effectively manage critical care patient loads throughout the year.

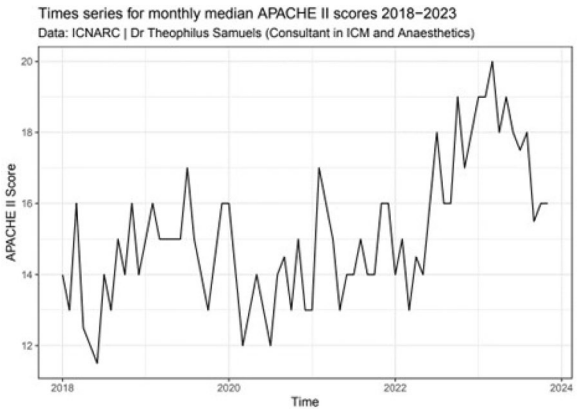


**Fig. 1 (abstract 000318)** Time series for monthly median APACHE II scores 2018–2023. Data: ICNARC, Dr Theophilus Samuels (Consultant in ICM and Anaesthetics)

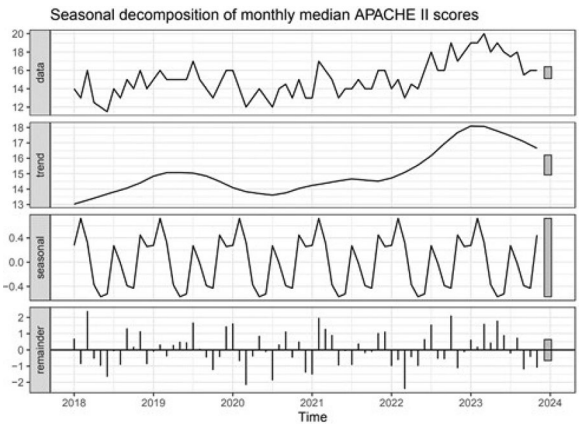


**Fig. 2 (abstract 000318)** Seasonal decomposition of monthly median APACHE II scores

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**Topic:** Health services research and outcome

## 000319

### Comparing ICNARC physiology and APACHE II mortality prediction models in critical care patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000319

**Introduction:** Mortality prediction scores are a valuable tool in critical care to assist in the assessment of illness severity, guiding decision-making and shaping service delivery and design through appropriate resource allocation. Several scores have been developed with the aim of increasing the accuracy of severity of illness classification and mortality prediction.

The Acute Physiology and Chronic Health Evaluation II (APACHE II) score was introduced in 1985 and is calculated from 12 data points within the first 24 h of admission [1]. Whilst there have been further iterations, APACHE II is still widely used and is easily calculated using online tools. The Intensive Care National Audit & Research Centre (ICNARC) Physiology score was developed for use in the United Kingdom in 2007 as part of a program to analyse data from UK adult intensive care units aiming to improve care quality and patient outcomes [2]. The model used in this study is from 2018 (*h*2018 model).

Given that multiple scoring systems are in use, it is useful to understand the comparative performance of different mortality prediction models.

**Objectives:** To assess the predictive performance of the ICNARC Physiology Score and the APACHE II Score in determining mortality risk amongst critical care patients.

**Methods:** We examined deidentified data for 1383 patients admitted to critical care between 1/1/20 and 31/12/21 at a single site district general hospital in Surrey, UK.

Area under the receiver-operating characteristic curves (AUROC) provides a metric for assessing and comparing diagnostic accuracy of classification models, with a higher number indicating greater accuracy. AUROC values of 0.7–0.8 are generally regarded as "acceptable" and 0.8–0.9 "outstanding" [3]. In addition to producing receiver-operating characteristic (ROC) curves, we also compared both models using performance metrics and mean squared error (MSE) estimates.

**Results:** The AUC (Figure 1) for the ICNARC Physiology Score is 0.816, and the AUC for the APACHE II Score is 0.742. The ICNARC h2018 model generally performs better than the APACHE II model across various evaluation criteria (Table 1), including sensitivity, positive predictive value (PPV), negative predictive value (NPV), accuracy, and mean squared error (MSE).

**Conclusions:** We have demonstrated that both scoring systems show comparably good accuracy in predicting mortality outcomes. However, the ICNARC Physiology Score model does exhibit superior discriminative ability compared to the APACHE II model. In particular, the ICNARC model appears much better at discriminating true positives. Nevertheless, both models remain in use today for critical care units in the UK and this analysis suggests that the APACHE II scoring system does remain a valid scoring system despite it being nearly 40 years since its Introduction.

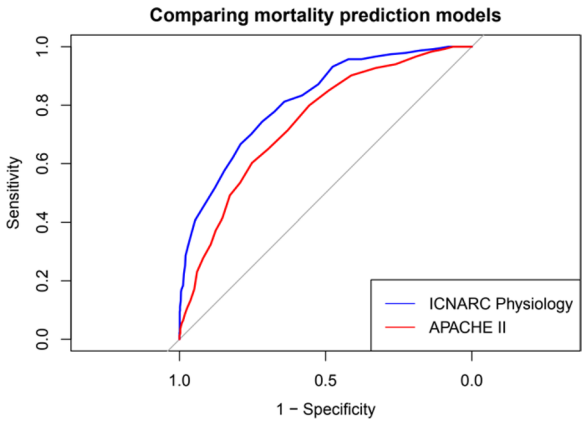


**Fig. 1 (abstract 000319)** ROC curves for ICNARC Physiology Score and APACHE II Score

**Table 1 (abstract 000319)** Performance metrics for ICNARC Physiology Score and APACHE II Score

| | Sensitivity | Specificity | PPV | NPV | Accuracy | MSE |
|---|---|---|---|---|---|---|
| ICNARC $h_{2018}$ model | 0.29 | 0.98 | 0.74 | 0.87 | 0.86 | 0.14 |
| APACHE II model | 0.09 | 0.98 | 0.49 | 0.84 | 0.83 | 0.17 |

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**Topic:** Health services research and outcome

## 000320

## The disconnect between alarm priority and reality on the ICU: a retrospective analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000320

**Introduction:** The high number of alarms in the ICU, most of them clinically irrelevant, leads to alarm fatigue among health care staff [1]. Ninety-five percent of nurses report feeling the burden of alarm fatigue, which has been linked with desensitization, delayed responses to alarms, and endangerment of patient safety [1–3]. According to nurses, especially the inability to discern the priority of alarms is a main obstacle to effective alarm management [2, 4, 5]. Current alarm monitors classify alarms into low (yellow) and high (red) priority alarms based on threshold excess, to inform of potentially life-threatening drops or increases of vital signs. However, it is uncertain whether this accurately assesses the priority of alarms or reflects the need for clinical interventions in response to the alarms.

**Objectives:** Assess whether the vital sign monitor alarm priorities align with the need for clinical interventions, serving as a proxy for the actual importance of the alarm.

**Methods:** Following IRB approval (Ethics vote no. EA1/127/18), alarm data were collected from monitoring devices on 15 ICUs in a tertiary care center over 23 months. Alarms were annotated as either clinically relevant or non-relevant based on whether and which clinical interventions followed them [6]. High and low blood pressure (BP), high and low heart rate (HR), and low peripheral oxygen saturation (SpO2) alarms were included as alarm types. Retrospectively, the performance of high-priority (red) alarms in predicting the alarms to be followed by an adequate clinical intervention was analyzed as compared to the baseline performance of low-priority (yellow) alarms. Specifically analyses of receiver-operating characteristic curves (ROC-Curves), precision–recall curves (PR-Curves), and confusion matrices were performed.

**Results:** In total, we analyzed 6,324,824 alarms, with 533,445 (8.4%) of these being high-priority alarms. For all alarm types analyzed, the area under the ROC-Curve (AUROC) of high-priority alarms was between 0.506 and 0.547, only slightly above the baseline of 0.5 (Figure 1). For the area under the PR-Curve (AUPRC), all alarm types beat their respective baseline, but none improved upon it by more than 10% or 1.5 percentage points (Figure 1). Sensitivity and positive predictive value (PPV) were low for all alarm types; therefore, high-priority alarms did not detect alarms needing clinical interventions at high rates and clinical interventions did not follow high-priority alarms at much higher rates (Table 1).

**Conclusions:** The currently available and implemented system in bedside vital sign monitoring devices of alarm priority offers little help in predicting situations where patients need clinical interventions. For all alarm types analyzed, the performances of high-priority alarms were too poor to be useful in clinical practice, as they were only marginally better than a random guess. Therefore, healthcare staff cannot rely on this system for prioritizing alarms or evaluating the acuity and criticality the alarm conveys. Ninety-nine percent of questioned nurses agree that alarms should inform about priority [5]. However, current systems are severely lacking in that regard.

Our findings support the need to research, develop, and implement newer and more predictive priority systems. Especially, AI-based approaches show very promising results, because they can analyze massive amounts of data to determine the priority of an alarm [7]. More intelligent patient monitoring could help to improve alarm management, reduce alarm fatigue, and improve patient safety [3, 8].

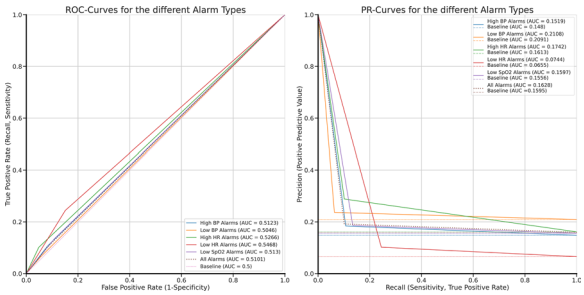


**Fig. 1 (abstract 000320)** ROC-Curves and PR-Curves for all alarm types. The two graphs show the receiver-operating characteristics curves (ROC-Curves) and the precision–recall curves (PR-Curves) for high-priority (red) alarms of all five alarm types analyzed. The two curves are drawn by analyzing the relationship of the false–positive rate and the true-positive rate (sensitivity, recall) for the ROC-Curve; and the recall (sensitivity, true positive rate) and the precision (positive predictive value) for the PR-Curve. In both graphs, the baseline of a random guess is drawn as a dotted line. The calculated area under the curves (AUC) are shown as a comparative metric in the legend

**Table 1 (abstract 000320)** Additional performance metrics for all alarm types. For high-priority (red) alarms of all alarm types, the Sensitivity (Recall, True-Positive Rate), Specificity (True-Negative Rate), Positive Predictive Value (PPV, Precision), and Negative Predictive Value (NPV) are shown. Additionally, the F1-Score was calculated, the harmonic mean between sensitivity and positive predictive value

| Alarm Type | Sensitivity (%) | Specificity (%) | PPV (%) | NPV (%) | F1-Score (%) |
|---|---|---|---|---|---|
| High BP | 10.70 | 91.76 | 18.40 | 85.53 | 13.53 |
| Low BP | 6.31 | 94.62 | 23.66 | 79.25 | 9.97 |
| High HR | 10.15 | 95.18 | 28.83 | 84.63 | 15.01 |
| Low HR | 24.45 | 84.90 | 10.19 | 94.13 | 14.38 |
| Low SpO2 | 13.42 | 89.17 | 18.60 | 84.83 | 15.59 |

Baseline rates for clinical relevance of low-priority (yellow) alarms were: High Blood Pressure (BP): 14.8%; Low Blood Pressure (BP): 20.9%; High Heart Rate (HR): 16.1%; Low Heart Rate (HR): 6.5%; Low peripheral oxygen saturation (SpO2): 15.6%.

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**Topic:** Information systems and data science

## 000321

### Circumstantial risk factors for death after intensive care unit-to-unit inter-hospital transfer: a Swedish registry study


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**Introduction:** Unit-to-unit transfer of a critically ill patient infers potentially harmful practical hazards, but other factors may also be crucial to outcome. Circumstantial factors previously associated with mortality include duration of intensive care, night-time discharge, and capacity transfer (1). Distance travelled and time in transit may also constitute indirect risks and are longer for inter-hospital than intra-hospital transfer. The aim of this study was to analyse the association between these circumstantial factors and the risk of death 30 days after unit-to-unit inter-hospital transfer.
**Methods:** Transfer data from 5 years before the pandemic were retrieved from the Swedish Intensive Care Registry where unit-to-unit transfers are categorised as (1) "clinical" when due to need for specialised care, (2) "capacity transfer" when due to a lack of resources, or (3) "repatriation" when patients are returned to the ICU closest to their home. Variables included age, sex, date and time of admission, SAPS3, surgical status, primary ICU ICD-10 diagnosis, date and time of discharge, destination, transfer category, and time of death. Patients with a registered first transfer between ICUs were eligible. Subsequent or incompletely registered transfers, intra-hospital transfers, and patients lacking SAPS3 data or survival status were excluded. The association of each exposure with the risk of death, expressed as the event odds ratio, OR (95% CI), was assessed by univariable and subsequent multivariable logistic regression with premeditated adjustment for ICD-10 diagnosis and Standardised Mortality Rate (SMR).
**Results:** Among 4327 inter-hospital transfers between Jan 1, 2015 and Dec 31, 2019, 2167 were clinical, 1351 capacity transfers, and 809 repatriations. Median (Q1;Q3) age was 65 (52;73) years with 37% women. Day in the referring ICU was 1 (0;3) and 16% were night-time transfers. Kilometres travelled were 58.3 (18.8:108) with 71% of transfer distances exceeding 25 kms. SAPS3 was 60 (50;70) in the referring ICU and 60 (51:70) in the receiving ICU, both significantly higher for patients in capacity transfer. Proportions deceased after 30 days were 24% after repatriation, 21% after clinical, and 28% after capacity transfer. Using univariable logistic regression, days in the referring ICU, capacity transfer and SAPS3 in the receiving ICU were all associated with a higher risk of death at 30 days. In the multivariable logistic regression with adjustment for ICD-10 diagnosis and SMR in the receiving ICU, the OR for these predictors did not remain statistically significant.
**Conclusions:** For unit-to-unit inter-hospital intensive care transfers in Sweden, we did not find duration of intensive care before transfer, night-time transfer, transfer distance, or capacity transfer category to be statistically associated with an increased risk of death 30 days later. This suggests that inter-hospital transfer is safe to carry out at any time of day and over long distances.


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**Topic:** Health services research and outcome

## 000322

### Albumin vs. crystalloid therapies and microcirculatory blood flow in ischemia/reperfusion-induced spinal cord injury: a randomized porcine trial


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**Introduction:** Spinal cord injury induced by ischemia/reperfusion is a major complication of aortic repair surgery. Current treatment options for ischemia/reperfusion-induced spinal injury focus on optimizing macrohemodynamic variables 1. However, microcirculatory blood flow is essential for tissue oxygenation and organ function. Microcirculatory blood flow may be improved by fluid administration (2,3). It remains unknown whether albumin is superior to crystalloids for spinal cord microcirculatory blood flow during ischemia/reperfusion-induced spinal cord injury. We tested the hypothesis that fluid therapy with albumin compared to fluid therapy with crystalloids improves spinal cord microcirculatory blood flow in pigs with ischemia/reperfusion-induced spinal cord injury.
**Methods:** We conducted a randomized trial in 38 pigs with induced ischemia/reperfusion by supra-celiac aortic-cross-clamping. Pigs were randomized to receive either albumin or crystalloids. Spinal cord microcirculatory blood flow was measured using Laser-Doppler probes. The primary outcome was spinal cord microcirculatory blood flow 4.5 h after ischemia/reperfusion-induced spinal cord injury. Secondary outcomes included spinal cord tissue oxygenation, spinal cord function as assessed with somatosensory-evoked potentials (SEPs), and spinal cord histopathological damage including morphometric analysis of hypoxic marker (ferritin light chain). Additional outcome measures were macrohemodynamic variables.
**Results:** There were no important differences in spinal cord microcirculatory blood flow in pigs assigned to fluid therapy with albumin compared to pigs assigned to fluid therapy with crystalloids (327.2 (228.8–425.6) vs. 276.9 (178.5–375.3) arbitrary units, $p=0.476$). There were also no important differences in spinal cord tissue oxygenation (52.4 (39.4–65.5) vs. 44.0 (31.8–56.2) %, $p=0.349$) as well as somatosensory-evoked potential amplitudes (0.161 (0.082–0.241) vs. 0.167 (0.082–0.253) µV, $p=0.136$) and latencies (37.6 (32.9–42.4) vs. 40.2 (35.5–44.8) ms, $p=0.446$) of the tibial nerve between the groups. Neuropathological analysis of the spinal cord revealed no important difference between groups (2.69, [0.2–6.2] vs. 2.58 [0.3–7.2] hypoxic neurons $mm^{-2}$, $p=0.851$). In addition, morphometric analysis of ferritin light chain expression, a marker for hypoxia, did not show important differences between groups (0.50 vs. 0.48 positive pixel per region of interest (%); $p=0.863$). Macrohemodynamics including spinal cord perfusion pressure were better in pigs assigned to albumin therapy compared to crystalloid therapy.
**Conclusions:** Our model produced reliable ischemia with markedly reduced spinal cord microcirculatory blood flow, tissue oxygenation, and hypoxic changes. Fluid therapy with albumin compared to fluid therapy with crystalloids therapy did not improve spinal cord microcirculatory blood flow in pigs with ischemia/reperfusion-induced spinal cord injury.

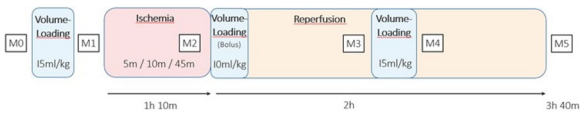


**Fig. 1 (abstract 000322)** Schematic of experimental protocol. Specimens received volume loading after baseline measurements. After another measure point ischemia was performed by supra-celiac aortic-cross-clamping with preconditioning. Measurements were taken at the end of the last clamping interval. A volume bolus was given when reperfusion was initiated. Two hours after reperfusion, another volume loading step was performed with measure points before and after. At the endpoint, 4, 5 h after the 45 m clamping interval, final measurements were taken

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4. Grifols Albus Award 2021

**Topic:** Perioperative care

## 000323

### Right heart function and not total ECMO blood flow or cannulation strategy determines blood recirculation in veno-venous ECMO: preliminary results of the 'ECMO Circulation trial'

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**Introduction:** Veno-venous extracorporeal membrane oxygenation (VV-ECMO) can maintain systemic oxygenation when conservative therapy fails to support pulmonary gas exchange in patients suffering from acute respiratory distress syndrome (ARDS). A pathophysiological peculiarity of VV-ECMO is the partial recirculation of total ECMO blood flow, which is delivered through the return cannula, into the drainage cannula. This recirculation fraction (R*f*) does not contribute to systemic oxygenation and has to be subtracted from QB to determine the effective extracorporeal flow (QEFF; QEFF = QB x (1 − R*f*) (1). Total ECMO blood flow and cannula position are supposedly the main determinants for R*f* (1), but data from a pilot study suggest that right-ventricular dysfunction (RVD) may be more important (2). Thus, we tested the hypothesis whether RVD is the primary limiting factor for effective ECMO blood flow (QEFF) during VV ECMO therapy.
**Methods:** In an ongoing prospective clinical trial (ClinicalTrials.gov: NCT04754854, Charité ethics approval number: EA1/156/20), we measured R*f* in ARDS patients on VV ECMO with a saline ultrasound dilution technique (3). RVD was evaluated with transthoracic (TTE) or transesophageal echocardiography (TEE), while ECMO, and hemodynamic and ventilator parameters were recorded at the same time. The distance of the cannulae tips were measured using X-rays or CT scans.
**Results:** Data from 41 patients were included in this preliminary analysis (7 female (17%); 26 (63%) COVID-19 pneumonia, age: 53 ± 12.4 years, days on ECMO before measurements: 2.6 ± 2.4; PaO2/FIO2 before ECMO: 89.6 ± 70.7 mmHg; PaCO2 90 ± 43.2 mmHg; arterial pH 7.22 ± 0.11; number (percent) or mean ± SD). The mean QB was 3.8 ± 0.73 L/min with a mean R*f* of 9 ± 8.8% (QEFF 3.5 ± 0.72 L/min). There was not a relevant correlation between QB and R*f* (R 0.177, p = 0.29) or the distance between cannulae tips and R*f* (R 0.061, p = 0.75). QB and R*f* did not differ between cannulation types (30 femoral-jugular cannulations: QB 3.9 ± 0.76L/min, Rf 9n ± 7.8; 8 bi-femoral cannulations: QB 3.5 ± 0.61 L/min, Rf 11 ± 13.2; $p > 0.05$ for each; note 3 dual lumen cannulas: QB: 3,8, 2,9, 3,1 L/min, R*f* 1,3, 7,3, 0%). Echocardiographic signs of RVD4, especially a right-ventricular/left-ventricular diameter ratio (RVLV) ≥ 1 were observed in 12 patients (29%). R*f* correlated significantly with RV/LV (R 0.523, $p < 0.01$), especially in cases with R*f* > 0% (Fig. 1).
Of note, patients with observed RVD had a higher ICU mortality (7 dead, 58%) compared to patients without RVD (4 dead, 14%, $p < 0.01$, Chi square test).
**Conclusions:** Neither total ECMO blood flow nor cannulation strategy determined effective ECMO blood flow in our patients. Instead, right heart dysfunction was the primary limiting factor for effective ECMO blood flow. The higher ICU mortality of patients with RVD supports a rigorous monitoring of RVD and possibly R*f* during VV ECMO therapy.

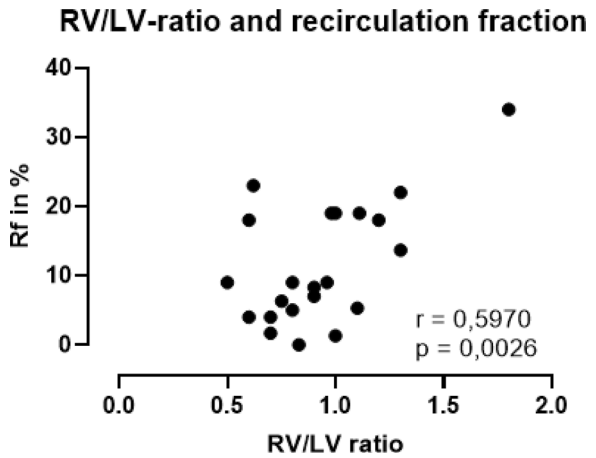


**Fig. 1 (abstract 000323)** Correlation between right-ventricular/left-ventricular diameter ratio (RV/LV) and the recirculation fraction (Rf) of total ECMO blood flow (QB) on veno-venous ECMO for patients with a Rf greater 0; *r* = Pearson correlation coefficient. QB was 3.8 ± 0.78 L/min, Rf 12 ± 8.4%, resulting effective ECMO blood flow (QEFF) 3.3 ± 0.72 L/min for the respective patients

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2. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors

**Topic:** Acute respiratory failure and mechanical ventilation

## 000324

### Correlation of optical sensor capillary refill time with near-infrared spectroscopy vascular occlusion test variables in healthy volunteers, a validation study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):000324**

**Introduction:** Shock is a life-threatening condition with persistent microcirculatory dysfunction despite receiving standard treatment. Capillary refill time (CRT) is a simple tool for assessing peripheral perfusion, but the conventional measurement using the glass slide technique is subjective. A prototype model of an electronic optical device has been developed for CRT assessment, which detects skin color changes with an RGB sensor. This technique offers a more objective approach compared to the conventional method.
**Objectives:** This study aimed to validate the accuracy and reliability of a prototype CRT measurement model in comparison to the glass slide and NIRS with VOT techniques.
**Methods:** In this prospective observational study of 50 healthy volunteers, we compared capillary refill time (CRT) using a conventional method (glass slide compression) with a prototype device (optical RGB sensor, pressure cuff, software analysis). Bilateral measurements were taken on the index fingers. Near-infrared spectroscopy vascular occlusion test (NIRS-VOT) on the thenar eminence was employed to obtain tissue oxygen saturation (StO2) variables. Correlations between CRT methods and NIRS-VOT were analyzed.
**Results:** The prototype device demonstrated good reliability with high intra-rater reliability for repeated measurements on the same hand side ($p$ value > 0.05 for both left and right hand). Strong positive correlation was observed between left and right hand measurements (Pearson $r = 0.7924$, $p$ value < 0.001). Additionally, the device showed a strong negative correlation with StO2 recovery slope (Pearson $r = -0.5011$, $p$ value < 0.001), supporting its validity. This correlation with StO2 was significantly stronger compared to the conventional glass slide method.
**Conclusions:** This study validates a novel optical electronic device for measuring capillary refill time (CRT). The device demonstrates good reliability and offers a more accurate assessment of CRT compared to the conventional glass slide method. This aligns with our findings of a strong negative correlation between the device's CRT measurements and the StO2 recovery slope, supporting its validity. Future studies should investigate the device's performance in clinical settings, particularly in shock patients, where accurate CRT assessment is critical for patient care.

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9. We would like to express our sincere gratitude to the healthy volunteers who participated in this study. Their willingness to contribute their time and effort was essential to our research. We also extend our thanks to the Medical Innovations Development (MIND) Center for providing the devices used in this study. Their support and expertise were invaluable to our work.

**Topic:** Sepsis

## 000326

### Low-dose ketamine and hallucinations in critically ill patients: prevalence and association with the phenotypes of disturbed behaviour

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**Introduction:** At sub-anaesthetic or low-dose levels, ketamine is a potential analgesic drug in critically ill patients. Although there is no consensus on the precise definition of a "low dose", infusion rates ranging from 0.15 to 0.5 mg/kg/h are commonly reported. Despite prior studies suggesting the possibility of an association between low-dose ketamine (LDK) and hallucinations in critically ill patients, a comprehensive study of this association has not been undertaken. In part, this is because the design of a large prospective study would be too complex due to the contemporaneous reporting requirements of hallucinatory incidents. Moreover, retrospective studies would be marred by recall bias. We hypothesised that bedside care givers would document hallucinatory incidents in the electronic clinical progress notes of critically ill patients. Further, we hypothesised that we could search these notes using natural language processing (NLP) techniques to identify patients who had experienced hallucinations during their critical care stay. In addition, we hypothesised that NLP could also be used to identify patients experiencing hyperactive or hypoactive disturbed behaviour. Finally, we hypothesised that we could use medication records of ketamine administration in these patients to study the association between LDK, hallucinations, and the phenotypes of disturbed behaviour.
**Objectives:** To study the association between LDK, hallucinations, and the phenotypes of disturbed behaviour in critically ill patients.
**Methods:** We obtained demographic data, medication records, outcomes, and electronic clinical progress notes for a cohort of critically ill patients. Using a previously validated NLP methodology, we scanned the notes for words that indicate a patient may have experienced hallucinations. We also scanned the notes for words that indicate a patient may have experienced hyperactive or hypoactive disturbed behaviour.
**Results:** We studied 7525 patients. We found that patients being treated with LDK were infused at an average rate of 0.11 (0.08–0.15) mg/kg/hour. We also found patients receiving LDK were younger (58.9 years vs 64.3, $p < 0.001$), had lower APACHE III scores (42.0 vs 48.0, $p < 0.001$), and were more likely to be admitted for surgical reasons (74.2% vs 46.5%, $p < 0.001$). Furthermore, these patients were less likely to be admitted with a diagnosis of cardiovascular disease (26.7% vs 33.7%, $p < 0.001$) and more likely to be admitted with a diagnosis of gastrointestinal disease (31.8% vs 15.7%, $p < 0.001$) disease or metastatic cancer (7.4% vs 4.1%, $p < 0.001$). Significantly, patients who received LDK were more likely to be identified by NLP as having experienced hallucinations (25.9%vs 6.6%, $p < 0.001$) and disturbed behaviour (63.5% vs 50.5%, $p < 0.001$). Finally, we found that LDK patients were more likely to be identified by NLP as having hypoactive disturbed behaviour when compared with patients not receiving LDK (51.8% vs 39.3%, $p < 0.001$).
**Conclusions:** Hallucinations are common in critically ill patients treated with LDK. Further, these patients are also likely to experience hypoactive phenotype of NLP diagnosed disturbed behaviour and, thus, likely delirium. Further investigation of these associations appears justified.

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**Topic:** Information systems and data science

## 000327

### Nationwide study on prescribing pattern of antibiotics in patients suffering from hospital-acquired infections

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000327

**Introduction:** Worldwide hospital-acquired infections (HAI) pose a AQ5 significant challenge to healthcare systems, contributing to increased morbidity, mortality, and healthcare costs. Most importantly, the emergence of antibiotic-resistant bacteria within hospital settings due to extensive antibiotic use, and the risk of cross-infections among high-density patient populations, especially in intensive care units (ICUs) are of particular concern.
**Objectives:** The objective of this study was to assess the prevalence of HAI, microbial aetiology, prescribing patterns of antibiotics in patients suffering from HAI within the Indian healthcare facilities and to contribute valuable insights to the global effort to fight against antibiotic resistance.
**Methods:** A questionnaire was distributed to healthcare providers managing HAI across diverse healthcare facilities in India. Participants were recruited using stratified random sampling, ensuring representation from various settings. Data were collected through offline surveys or in-person interviews, with responses anonymized.
**Results:** As per the study data, the overall prevalence of Extended Spectrum Beta Lactamases producers was 15–20% of the total HAI infections, as stated by > 34% of the respondents. Amongst the risk factors, major contribution was from longer hospital stays (81%), followed by surgical procedures (28%). Pneumonia (51%) represented the commonest type of hospital-acquired infection followed by urinary tract infections (46%). Amongst the organisms, Klebsiella reported to be majorly responsible for HAI by around 60% of the participants followed by *E. coli* (53%) and STAPHYLOCOCCUS AUREUS by > 23% of the doctors, respectively. When asked the preferred Agent to combat HAI, Piperacillin–Tazobactam was suggested by > 78% of the healthcare practitioners, for Multi-drug Resistant infections > 64% of the participants preferred Aztreonam due to its superior efficacy. Moreover, Aztreonam is also preferred by > 31% of the respondents in patients who are allergic to beta-lactam antibiotics.
**Conclusions:** In conclusion, this survey highlights the complex nature of antibiotic prescribing in the context of HAI and emphasizes the importance of evidence-based practices, infection control measures, and antimicrobial management efforts in mitigating the impact of HAI and addressing antibiotic resistance. This study provides a baseline for the antimicrobial prescribing pattern in Indian Healthcare Setting

and results may guide in the development of prescribing guidelines, monitoring of drug resistance patterns in future.

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**Topic:** Infections and prevention

## 000328

## Long-term application of selective digestive decontamination in a mixed ICU: 12-year impact on nosocomial multidrug-resistant infection, antibiotic consumption, and colistin and tobramycin colonization

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000328

**Introduction:** Selective digestive decontamination (SDD) has been associated with a reduction in mortality and ICU-acquired infection (NI) rates. However, the effect SDD in areas where multidrug-resistant Gram-negative bacteria (MRGNB) are endemic is of great interest.
**Objectives:** To analyze the impact on MRGNB NI, antibiotic consumption, and colistin and tobramycin colonization in patients with NI in an ICU after 12 years of SDD.
**Methods:** This study was conducted in a 30-bed-medical-surgical ICU. All consecutive patients admitted to the ICU between October 1, 2011, and September 30, 2023, who were expected to require tracheal intubation > 48 h were administered SDD (SDD study group) with a 4-day course of intravenous cefotaxime plus enteral colistin, tobramycin, nystatin in an oropharyngeal paste, and digestive solution. Oropharyngeal and rectal swabs were obtained on admission and once a week. We used ENVIN NI criteria. All patients admitted to ICU with NI in ICU between October 1, 2010, and September 30, 2011 (non-SDD group) were compared with the SDD study group. A univariate and a multivariate logistic regression analysis were performed. For each of the NIs, incidences per 1000 days of exposure in each cohort and the corresponding relative risks were obtained using Poisson regression. Statistical significance was $p \leq 0.05$. Colistin- and tobramycin-resistant colonization and antibiotic consumption as defined daily doses of antibiotics (DDD) were also analyzed.
**Results:** A total of 13,383 patients were admitted to ICU. We analyzed patients who developed NI, and 856 of them received SDD. There were no statistically significant differences between the two groups in terms of admission type or demographics. SDD patients had significantly fewer Extended Spectrum Beta-lactamase (ESBL) infections $p = 0.016$, Gram Negative Multidrug Resistant Bacteria (GNB-MR) $p = 0.004$ (Table 1), and *Acinetobacter* spp. infections $p < 0.001$ (Table 2). There was also a significant reduction in the rates of ventilator-associated pneumonia (VAP), urinary tract infections, other secondary bacteremia, and multidrug-resistant bacteria infections (MR-GNB) in the SDD group versus the non-SDD group (Table 3). There was one *Clostridioides difficile* infection. Colistin-resistant colonization was 17.8% and tobramycin-resistant colonization was 24.8% of samples. There was a decrease in DDD/100 ICU stays after SDD.
**Conclusions:** After 12 years of SDD application, there was a significant reduction in ESB, GNB-MR, and *Acinetobacter* infections, as well as rates of VAP, secondary bacteremia, urinary tract infections, and MDRBI. There was a decrease in antibiotic consumption after SDD. Low rates of colonization by colistin- and tobramycin-resistant bacteria were also observed.

**Table 1 (abstract 000328)** SDD 12 years

| Patients with NI | *Selective Digestive Decontamination* No N = 110 | Yes N = 856 | P |
|---|---|---|---|
| Age, years | 59.5 ± 15.8 | 61.2 ± 14.1 | 0.24 |
| APACHE II score | 21.2 ± 7.7 | 20.4 ± 7.7 | 0.379 |
| Sex male | 74 (67.3) | 561 (67.5) | 0.936 |
| Trauma patients | 17 (15.4) | 88 (10.3) | 0.093 |
| Coronary artery disease patients | 19 (17.3) | 178 (20.8) | 0.412 |
| Emergency surgery | 34 (30.9) | 202 (23.6) | 0.128 |
| Neutropenia | 3 (2.8) | 33 (3.9) | 0.789 |
| Immunodepression | 3 (2.8) | 3 (0.3) | 0.022 |
| Parenteral nutrition | 26 (23.6) | 174 (20.3) | 0.526 |
| RRT | 34 (30.9) | 345 (40.3) | 0.043 |
| Malnutrition | 12 (10.9) | 82 (9.6) | 0.61 |
| Diabetes mellitus | 34 (30.9) | 260 (30.3) | 0.855 |
| COPD | 9 (8.2) | 136 (15.9) | 0.036 |
| Renal failure | 40 (36.4) | 153 (17.9) | < .001 |
| VAP | 59 (53.6) | 295 (34.4) | < .001 |
| CRB | 26 (23.6) | 331 (38.8) | 0.002 |
| Secondary bacteremia | 31 (28.2) | 216 (25.3) | 0.479 |
| Urinary infection | 29 (26.4) | 242 (28.3) | 0.716 |
| ATB 48 hours before admission | 28 (25.4) | 230 (27.7) | 0.656 |
| Death | 37 (33.6) | 302 (35.2) | 0.519 |
| *Acinetobacter baumannii* | 13 (11.8) | 8 (0.9) | < .001 |
| MRSA | 4 (3.6) | 12 (1.4) | 0.096 |
| ESBL | 38 (34.5) | 207 (24.1) | 0.016 |
| MR *Pseudomonas* | 10 (9.1) | 72 (8.4) | 0.791 |
| MR GNB | 12 (10.9) | 38 (4.4) | 0.004 |
| **Admission** | | | 0.243 |
| Medical | 79 (71.8) | 637 (74.4) | |
| Scheduled surgery | 10 (9.1) | 99 (11.6) | |
| Emergency surgery | 21 (19.1) | 120 (14.0) | |
| Inflammatory response: | | | 0.542 |
| Non sepsis | 2 (1.8) | 29 (3.4) | |
| Sepsis | 23 (20.9) | 154 (18.0) | |
| Septic shock | 85 (77.3) | 674 (78. 6) | |
| ICU days | 28 (16 ; 44.8) | 35.0 (21.0 ; 54.0) | 0.002 |

Data are means SD and frequencies (%) RRT: Renal replacement therapy; VAP: ventilator associated pneumonia;CRB: Catheter related bacteremia; ATB: antibiotic; COPD: chronic obstructive pulmonary disease; MRSA: methicillin resistant Sthaphylococcus aureus; ESBL: extended spectrum belalactamase; MR: multiresistant; GNB: gram negative bacteria.

**Table 2 (abstract 000328)** Multivariate logistic regression SDD 12 years

| | *p*-value | Odd-Ratio (95% CI) |
|---|---|---|
| ***VAP*** | < 0.001 | 0.467 (0.307,0.711) |
| ***COPD*** | 0.017 | 2.436 (1.171,5.067 |
| ***Renal failure*** | < 0.001 | 0.382 (0.243,0.601) |
| ***Acinetobacter infections*** | < 0.001 | 0.084 (0.032,0.219) |

SDD: Selective Digestive Decontamination; VAP: ventilator associated pneumonia; COPD: chronic obstructive pulmonary disease

**Table 3 (abstract 000328)** NI rates SDD 12 years. Incidences per 1000 days of exposure (Poissopn regression with overdispersion) NI rates

| | | SDD | | | Relative Risk |
|---|---|---|---|---|---|
| | | No | Yes | *p*-value | (95% CI) |
| **VAP / MV** | VAP/1000 days of MV | 10.31 | 3,97 | <0.001 | 0.385 (0.294 - 0.505) |
| **Urinary infections** | Infections/1000 days of catheter | 3.79 | 2.61 | 0.042 | 0.689 (0.481 - 0.988) |
| **Bacteremia related to catheter** | Bacteremia/1000 days of CVC | 3.59 | 3.75 | 0.822 | 1.047 (0.703 - 1.558) |
| **Secondary bacteremia** | Bacteremia /1000 ICU days | 4.69 | 2.16 | <0.001 | 0.461 (0.334 - 0.637) |
| **Multiresistant germs** | Multiresistant germs/1000 ICU days | 9.59 | 2.83 | <0.001 | 0.295 (0.233 - 0.373) |

SDD: Selective Digestive Decontamination; VAP: ventilator associated pneumonia; MV: mechanical ventilation; CVC: central venous caheter.

**Topic:** Infections and prevention.

## 000329

### Good outcome prediction after out-of-hospital cardiac arrest: a prospective multicenter observational study in Korea

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**Introduction:** This study aims to assess the ability of clinical examination, biomarker, electrophysiology, or brain imaging and their combination to predict good neurological outcomes at 6 months after CA.
**Methods:** This was a retrospective analysis of the Korean Hypothermia Network Prospective Registry 1.0. Good outcome predictors were defined as both pupillary light reflex (PLR) and corneal reflex (CR) were presented at admission, Glasgow Coma Scale Motor score (GCS-M) > 3 at admission, neuron-specific enolase (NSE) < 17 μg/L at 24–72 h, a median nerve somatosensory-evoked potentials (SSEPs) N20/P25 amplitude > 4 μV, continuous background without discharges on electroencephalogram (EEG), and absence of anoxic injury on brain CT and DWI.
**Results:** A total of 1327 subjects were included in the final analysis. Of those, 412 subjects had a good neurological outcome at 6 months after CA. GCS-M > 3 at admission had a highest specificity of 96.7% (95% CI 95.3–97.8) and normal brain DWI had a highest sensitivity of 96.3% (95% CI 92.9–98.4). When combining two predictors, the sensitivities tended to decrease (ranged 2.7–81.1%), and the specificities tended to increase ranged 81.3–100%. Normal brain CT and DWI had the highest sensitivity of 81.1%. Through the explorative variation of the 2021 European Resuscitation Council (ERC) and the European Society of Intensive Care Medicine (ESICM) prognostication strategy algorithm, good outcome was predicted with the specificities ranged 47.5–54.6% and sensitivities ranged 84.4–88.4% in patients not predicted by the algorithm.
**Conclusions:** Clinical examination, biomarker, electrophysiology, and brain imaging could predict good outcomes at 6 months after CA. When combining two predictors, specificity was further improved. With the 2021 ERC/ESICM guidelines, good outcome prediction might reduce the number of indeterminate patients and uncertainty of prognostication.

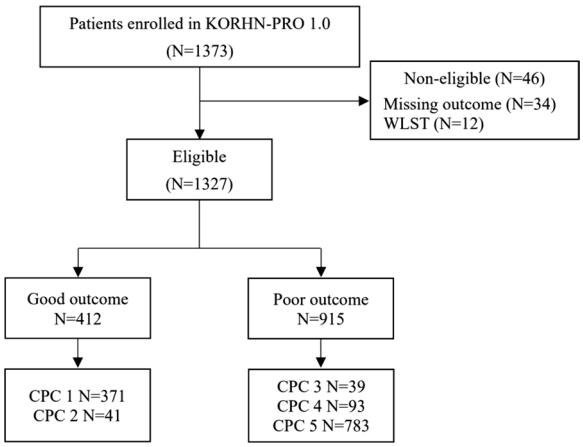


**Fig. 1 (abstract 000329)** Patients with outcome

**Table 3 (abstract 000329)** Prognostic accuracies of single prognosis methods of total patients (N = 1327)

| | Sensitivity | Specificity | PPV | NPV | TN | FN | TP | FP | N |
|---|---|---|---|---|---|---|---|---|---|
| Normal PLR and CR at admission | 56.6 (51.1–61.9) | 88.0 (85.6–90.1) | 65.7 (60.9–70.3) | 83.2 (81.4–84.9) | 725 | 146 | 190 | 99 | 1160 |
| GCS-M 4 at admission | 12.1 (9.1–15.6) | 97.1 (95.8–98.1) | 65.3 (54.3–74.9) | 71.2 (70.4–72.0) | 883 | 357 | 49 | 26 | 1315 |
| GCS-M 5 at admission | 5.4 (3.4–8.1) | 99.7 (99.0–99.9) | 88.0 (68.8–96.1) | 70.2 (69.7–70.7) | 906 | 384 | 22 | 3 | 1315 |
| GCS-M 6 at admission | 0.7 (0.2–2.1) | 99.9 (99.4–100) | 75.0 (23.8–96.6) | 69.3 (69.1–69.4) | 908 | 403 | 3 | 1 | 1315 |
| GCS-M >3 at admission | 18.2 (14.6–22.3) | 96.7 (95.3–97.8) | 71.2 (62.1–78.8) | 72.6 (71.6–73.5) | 879 | 332 | 74 | 30 | 1315 |
| GCS-M >4 at admission | 6.2 (4.0–9.0) | 99.6 (98.9–99.9) | 86.2 (68.7–94.7) | 70.4 (69.8–70.9) | 905 | 381 | 25 | 4 | 1315 |
| NSE <17 μg/L at 24 h | 22.8 (17.0–29.4) | 93.7 (90.6–96.0) | 65.2 (53.8–75.0) | 70.0 (68.2–71.6) | 339 | 146 | 43 | 23 | 551 |
| NSE <17 μg/L at 48 h | 36.2 (30.0–43.0) | 95.3 (92.6–97.2) | 81.4 (73.0–87.7) | 72.3 (70.2–74.3) | 363 | 139 | 79 | 18 | 599 |
| NSE <17 μg/L at 72 h | 45.3 (38.3–52.4) | 92.2 (88.8–94.8) | 77.1 (69.5–83.3) | 74.3 (71.8–76.7) | 318 | 110 | 91 | 27 | 546 |
| NSE <17 μg/L at 24 h, 48 h and/or 72 h | 56.5 (50.4–62.5) | 90.2 (87.3–92.7) | 75.3 (69.6–80.1) | 80.0 (77.5–81.9) | 462 | 117 | 152 | 50 | 781 |
| N20/P25 amplitude >4 μV on SSEP | 42.7 (31.3–54.6) | 96.6 (92.8–98.8) | 84.2 (70.0–92.4) | 80.0 (76.6–82.9) | 171 | 43 | 32 | 6 | 252 |
| CNV without discharges on EEG | 64.4 (56.2–72.1) | 89.2 (85.3–92.4) | 73.3 (66.2–79.3) | 84.5 (81.4–87.2) | 289 | 53 | 96 | 35 | 473 |
| Absence of anoxic injury, brain CT | 87.1 (83.1–90.5) | 35.0 (31.7–38.5) | 37.0 (35.4–38.5) | 86.2 (82.3–89.3) | 268 | 43 | 291 | 497 | 1099 |
| Absence of anoxic injury, brain DWI | 96.3 (92.9–98.4) | 80.5 (76.0–84.5) | 74.9 (70.7–78.7) | 97.3 (83.4–89.2) | 289 | 8 | 209 | 70 | 576 |

Results presented in numbers or in percentages with 95% confidence intervals. Only patients with available results were included in the statistical analyses. Good neurological outcome was defined as Cerebral Performance Category Scale 1–2 at 6 months.

Abbreviations: PLR, pupillary light reflex; CR, corneal reflex; GCS-M, Glasgow Coma Scale-Motor grade; NSE, serum neuron-specific enolase; SSEP, short-latency somatosensory evoked potentials; EEG, electroencephalogram; CNV, continuous normal voltage; CT, computed tomography; DWI, diffusion-weighted imaging; PPV, positive predictive value; NPV, negative predictive value; TP, true positive (predicted and reported good outcome); TN, true negative (predicted and reported poor outcome); FP, false positive (predicted good outcome, reported poor outcome); FN, false negative (predicted poor outcome, reported good outcome)

**Topic:** Cardiac arrest

## 000331

### Risk factors for mortality in patients with nosocomial infection in an ICU after 12-year application of selective digestive decontamination

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**Introduction:** Recognition of risk factors for mortality and early intervention with appropriate administration of broad-spectrum antimicrobials in patients with nosocomial infection (NI) can significantly improve outcomes. Selective digestive decontamination (SDD) has been associated with reduced ICU mortality and acquired infection rates.
**Objectives:** To analyze the risk factors for mortality in patients with NI in an ICU after 12 years of SDD.
**Methods:** Patients with NI from October 1, 2010 to September 30, 2023 in a 30-bed polyvalent ICU were prospectively included. The SDD was applied for 12 years, from October 1, 2011 to September 30, 2023. Patients who required mechanical ventilation for more than 48 h were

given an enteral solution and a paste containing colistin, tobramycin, and nystatin every 8 h until discharge. Intravenous cefotaxime was also administered during the first 4 days. Rectal and pharyngeal exudates were collected on admission and weekly. ENVIN NI criteria were used. Categorical variables were summarized as frequencies and percentages and numerical variables as means and standard deviations or medians and interquartile ranges. Percentages were compared with the X2 test or Fisher's exact test, means with the t test and medians with the Wilcoxon test for independent data. A multidimensional logistic analysis was performed. It was considered significant if $p \leq 0.05$.

**Results:** Of the 13,383 patients admitted, 337 (34.88%) of the patients with NI died. In a univariate analysis, no statistically significant differences in ICU stay were found ($p = 0.059$). Multidrug-resistant (MR) *Pseudomonas* and MR Gram-negative bacteria (GNB) were significantly higher in patients who died (Table 1). Independent mortality risk factors were: renal replacement therapy Odds Ratio (OR): 4.460 (3.276; 6.074), neoplasm OR: 2.480 (1.512; 4.068), ventilator-associated pneumonia (VAP): 1.859 (1.342; 2.576), parenteral nutrition OR: 1.856 (1.290; 2.672), chronic obstructive pulmonary disease (COPD) OR: 1.749 (1.168; 2.617)), septic shock OR: 1.887 (1.376; 2.587), and APACHE II OR: 1.053 (1.031; 1.075) (Table 2).

**Conclusions:** In an ICU with long-term SDD application, the factors that were independently associated with mortality were: renal replacement therapy, neoplasm, VAP, parenteral nutrition, COPD, septic shock, and APACHE II. *MRs Pseudomonas* and MRs GNB also had significantly higher mortality.

**Table 1 (abstract 000331)** SDD 12 years and mortality. Characteristics of the patients according to survival

| | Alive N = 629 | Death N = 337 | P |
|---|---|---|---|
| Age, years | 59.4 ± 14.7 | 64.0 ± 13.0 | < .001 |
| APACHE II | 19.2 ± 7.3 | 23.0 ± 7.7 | < .001 |
| SDD | 555 (88.2) | 302 (89.6) | 0.519 |
| Sex male | 413 (67.6) | 222 (67.5) | 0.971 |
| Trauma patients | 92 (14.7) | 13 (3.9) | < .001 |
| Coronary artery disease patient | 124 (19.7) | 73 (21.7) | 0.46 |
| Emergency surgery | 153 (24.3) | 82 (24.5) | 0.958 |
| Immunosuppression | 48 (7.6) | 63 (18.8) | < .001 |
| Neutropenia | 14 (2.2) | 22 (6.5) | < .001 |
| Parenteral nutrition | 95 (15.1) | 104 (30.9) | < .001 |
| Ventricular device | 77 (12.2) | 9 (2.7) | < .001 |
| RRT | 157 (25.0) | 221 (65.6) | < .001 |
| Malnutrition | 42 (6.7) | 52 (15.4) | < .001 |
| Diabetes mellitus | 167 (26.6) | 127 (37.7) | < .001 |
| COPD | 76 (12.1) | 69 (20.5) | < .001 |
| Renal failure | 91 (14.5) | 101 (30.0) | < .001 |
| Cirrhosis | 20 (3.2) | 22 (6.5) | 0.015 |
| Neoplasm | 39 (6.2) | 51 (15.1) | < .001 |
| VAP | 198 (31.5) | 155 (46.0) | < .001 |
| CRB | 246 (39.3) | 111 (32.9) | 0.051 |
| Secondary bacteremia | 151 (24.1) | 96 (28.5) | 0.139 |
| Urinary infection | 185 (29.4) | 86 (25.6) | 0.209 |
| ATB 48 hours before admission | 139 (22.7) | 119 (36.5) | < .001 |
| *Acinetobacter spp.* | 14 (2.2) | 7 (2.1) | 0.88 |
| MRSA | 11 (1.8) | 5 (1.5) | 0.758 |
| ESBL | 149 (23.7) | 96 (28.5) | 0.102 |
| *MR Pseudomonas* | 38 (6.1) | 44 (13.1) | < .001 |
| MR GNB | 24 (3.8) | 26 (7.7) | 0.009 |
| Admission: | | | < .001 |
| Medical | 439 (69.8) | 276 (82,2) | |
| Scheduled surgery | 89 (14.1) | 20 (6.0) | |
| Emergency surgery | 101 (16.1) | 40 (11.9) | |
| Inflammatory response: | | | < .001 |
| Non sepsis | 21 (3.3) | 10 (3.0) | |
| Sepsis | 140 (22.3) | 37 (11.0) | |
| Septic Shock | 468 (74,4) | 290 (86.1) | |
| ICU days | 33.0 (20.0 ; 50.0) | 36.0 (21.0 ; 58.0) | 0.059 |

Values are means ± SD and frequencies (%) . SDD: Selective digestive decontamination; RRT: Renal replacement therapy; VAP: ventilator associated pneumonia; CRB: Catheter related bacteremia; COPD: chronic obstructive pulmonary disease; MRSA: methicillin resistant Staphylococcus aureus; ESBL: extended spectrum belalactamase; MR: multiresistant; GNB: gram negative bacteria.

**Table 2 (abstract 000331)** Multivariate logistic regression SDD 12 years and mortality

| | P | Odd-Ratio (95% IC) |
|---|---|---|
| APACHE II | < .001 | 1.053 (1.031 ; 1.075) |
| Septic shock | < .001 | 1.887 (1.376 ; 2.587) |
| Parenteral nutrition | < .001 | 1.856 (1.290 ; 2.672) |
| RRT | < .001 | 4.460 (3.276 ; 6.074) |
| COPD | 0.007 | 1.749 (1.168 ; 2.617) |
| Neoplasm | < .001 | 2.480 (1.512 ; 4.068) |
| VAP | < .001 | 1.859 (1.342 ; 2.576) |

RRT: Renal replacement therapy; VAP: ventilator associated pneumonia;

**Topic:** Sepsis

## 000332

## The scope of practice of the intensive care unit dietitian in personalizing nutritional care

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**Introduction:** The scope of practice of the intensive care unit (ICU) dietitian (RD) has evolved over time; an increase involvement during multi-professional team (MPT) meetings, ward rounds and during critical decision-making, significantly improves the adherence of the patient to the nutrition care plan and nutritional support provided by the MPT (1, 2).

An ICU RD can improve the clinical outcome of a critically ill patient by shortening the length of stay with a trend towards lower mortality (3).

Population specific guidance is available for the ICU RD to refer to when creating a nutritional care plan, such as the ESICM, ESPEN, and ASPEN guidelines (4–6).

**Methods:** We evaluated and described the scope of practice of the ICU RD at different levels of healthcare and compared it to literature in addressing the nutritional needs of critically ill patients.

**Results:** The scope of practice of the ICU RD is summarized in Table 1.

**Table 1 (abstract 000332)**

| Level of health-care | Scope of practice |
|---|---|
| Micro | • Assessment of the patient and formulating the nutritional care plan:<br>• Evaluating current diagnoses and pre-existing conditions<br>• Anthropometry: Monitoring of weight, height, BMI, energy expenditure by indirect calorimetry, body composition<br>• Biochemistry and histology: Refeeding hypophosphatemia and -risk, electrolyte imbalance, septic markers, liver- and kidney function, protein metabolism, blood gasses<br>• Clinical signs: Assessing for micronutrient deficiencies<br>• Diet History: Identifying the appropriate route of feeding and the optimal feed, observing for gastro-intestinal intolerance, evaluating intentional and unintentional calories prescribed and received during the previous 24 h, speech therapy referral for texture modification<br>• Medication or medical treatments: Use of inotropes, vasopressors, sedatives, analgesic opioids, continues renal replacement therapy<br>• Identifying biological barriers to nutrition intake: Physiological (such as loss of appetite), psychological (such as depression), or functional (such as dysphagia)<br>• Facilitating the transition of nutritional management from ICU to the ward |
| Meso | • MDT discussion of difficult cases<br>• Identifying non-biological barriers to nutrition intake: organizational (such as missed meals due to medical procedures) and healthcare provider knowledge of the importance of nutrition<br>• Keeping up to date with scientific literature and continuing professional development through attending courses, congresses, or workshops |
| Macro | • Implementation, development or adaption of nutritional guidelines, protocols, improvement projects, and standard operating procedures<br>• Participation in scientific research and transfer of knowledge by training of dietitians and other colleagues |

**Conclusions:** The role of the modern, upskilled ICU dietitian encompasses different levels of expertise, which facilitates better nutritional care and outcomes of patients in a MPT ICU setting.

**Topic:** Metabolism, endocrinology, liver failure, and nutrition

## 000333

### Risk factors associated with disability and mortality in patients admitted to a neurotraumatic ICU with decompressive craniectomy after discharge: a 10-year prospective study

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**Introduction:** Second-level therapeutic actions to control intracranial hypertension (ICH) proposed by the European Brain Trauma Foundation include barbiturates, moderate hypothermia, and decompressive craniectomy (DC), but the results are controversial. Our aim was to evaluate factors associated with disability and mortality after ICU discharge in patients undergoing DC.
**Objectives:** To evaluate factors associated with disability and mortality, after ICU discharge, in patients with DC after 10 years.
**Methods:** Prospective study of patients admitted between January 1, 2013 and December 1, 2023 who required DC. The DC was performed for ICH refractory to medical treatment. The following were analyzed: main admission diagnosis; demographic data; neurological data (clinical examination and Glasgow Coma Score: GCS); hypotension; type of craniectomy and DC complications; Rankin scale and Glasgow Outcome Scale (GOS) at 30 and 60 days after ICU admission, at ICU discharge and 6 months after ICU discharge; preoperative serum lactate levels; hypo- and hyperglycemia; application of mannitol or hypertonic saline before and after DC; leukocytes and platelets before and after DC and other factors related to prognosis. Univariate analysis was performed for disability (Rankin > 3) and ICU mortality, 60 days after ICU admission and 6 months after ICU discharge. Statistical significance was set at $p \leq 0.05$. Data were analyzed using the R package version 4.2.1 (R Development Core Team, 2022).
**Results:** Sixty-one patients with CHD were analyzed. The majority. 26 (42.6%) were traumatic brain injury (TBI) and 9 (14.7%) patients with traumatic subarachnoid hemorrhage (SAH). There were 17 (27.8%) spontaneous SAH with DC. The most frequent complications were hydrocephalus 25 (41.7%) and need for reintervention 18 (31.6% of them). Demographic data and types of admission are shown in Table 1. Fourteen patients died upon discharge from the ICU (23.3%), 3 of them were SAH. Of the 26 (42.6%) patients with TBI and DC, 11 (42.3%) died, and 7 (26.92%) of them in the ICU. The median Rankin at ICU discharge was 5 (4–5) and the GOS was 3 (2–3). Rankin at 6 months after discharge from the ICU was 5 (3–6) and the GOS was 3 (1–4). Disability at 6 months after discharge from the ICU was significantly associated with platelet number before DC (Table 1). In the analysis of mortality after discharge from the ICU or months after discharge, we did not obtain other significantly associated risk factors (Table 2).
**Conclusions:** Mortality in patients with DC was 23.3% at ICU discharge of all patients. Patients with TBI and DC had a mortality of 26.92% at ICU discharge. The median Rankin and GOS scales reflect moderately severe disability in our DC patients at ICU discharge and 6 months later. Disability at ICU discharge was significantly associated with the number of platelets before DC.

**Table 1 (abstract 000333)** Univariate analysis of DC disability at ICU discharge

| | | *Rankin* | | |
|---|---|---|---|---|
| | Overall N = 61 | < 3 N = 10 | >= 3 N = 51 | P-value |
| Age (years) | 47.3 ± 14.6 | 43.7 ± 16.1 | 48.0 ± 14.3 | 0.405 |
| Sex female | 21 (34.4) | 4 (40.0) | 17 (33.3) | 0.725 |
| APACHE-II | 21.4 ± 5.3 | 22.4 ± 6.5 | 21.2 ± 5.2 | 0.563 |
| Diabetes mellitus | 7 (11.5) | 1 (10.0) | 6 (11.8) | 1 |
| Arterial hypertension | 13 (21.3) | 3 (30.0) | 10 (19.6) | 0.432 |
| Dislypemia | 10 (16.4) | 2 (20.0) | 8 (15.7) | 0.663 |
| Tumor | 4 (6.7) | 1 (11.1) | 3 (5.9) | 0.488 |
| Hydrocephalus | 25 (41.7) | 2 (22.2) | 23 (45.1) | 0.281 |
| Reoperation for complications | 18 (31.6) | 1 (12.5) | 17 (34.7) | 0.414 |
| Stroke Malignant middle cerebral artery | 12 (19.7) | 1 (10.0) | 11 (21.6) | 0.67 |
| Acute subdural hematoma | 22 (36.7) | 3 (33.3) | 19 (37.2) | 1 |
| Obliteration of base cisterns | 21 (35.0) | 2 (22.2) | 19 (37.2) | 0.473 |
| Focal contusion with edema and expansivity | 28 (46.7) | 5 (55.6) | 23 (45.1) | 0.721 |
| Evacuated Injury | 13 (21.7) | 2 (22.2) | 11 (21.6) | 1 |
| TBI | 26 (42.6) | 5 (50.0) | 21 (42.0) | 0.733 |
| OTI previous hospital admission | 18 (29.5) | 4 (40.0) | 14 (27.4) | 0.462 |
| OTI Emergency | 24 (39.3) | 2 (20.0) | 22 (43.1) | 0.29 |
| OTI on Surgery | 12 (19.7) | 3 (30.0) | 9 (17.6) | 0.397 |
| Transfusion prior to DC | 10 (16.9) | 1 (11.1) | 9 (18.0) | 1 |
| Pre-craniectomy seizures | 10 (16.9) | 1 (11.1) | 9 (18.0) | 1 |
| Bilateral arreactive mydriasis prior to DC | 5 (8.5) | 0 | 5 (10.0) | 1 |
| Both reactive pupils prior to DC | 42 (71.2) | 7 (87.5) | 35 (68.6) | 0.417 |
| One reactive pupil prior to DC | 8 (13.8) | 0 | 8 (15.7) | 0.577 |
| None-reactive pupils prior to DC | 6 (10.2) | 1 (12.5) | 5 (9.8) | 1 |
| ICU-Deaths | 14 (23.3) | 0 | 14 (27.4) | 0.1 |
| Hospital-Deaths | 8 (14.0) | 0 | 8 (16.7) | 0.332 |
| Six months after ICU discharge | 6 (11.8) | 0 | 6 (13.9) | 0.572 |
| Deaths | 22 (36.1) | 0 | 22 (43.1) | 0.01 |
| Midline shift on CT at admission | 6 (0 - 10) | 2 (0 - 10) | 6 (1 - 9) | 0.678 |
| GCS on admission | 8 (5 - 13) | 10 (6 - 13) | 8 (5 - 13) | 0.732 |
| GCS at ICU admission | 3 (3 - 7) | 4 (3 - 10) | 3 (3 - 7) | 0.264 |
| Number of platelets prior to DC | 224 (169 - 264) | 263 (249 - 291) | 211 (164 - 254) | 0.05 |
| Rankin ICU discharge | 5 (4 - 5) | 1 (1 - 1) | 5 (4 - 6) | < .001 |
| Rankin Hospital discharge | 5 (3 - 6) | 1 (1 - 1) | 5 (4 - 6) | < .001 |
| GOS ICU discharge | 3 (2 - 3) | 5 (4 - 5) | 3 (2 - 3) | < .001 |
| GOS months after ICU discharge | 3 (1 - 4) | 5 ( - 5) | 3 (1 - 3) | < .001 |

Data are means and medians (IQR) and frequences (%). SAH: subarachnoid hemorrhage; TBI:trauma brain injury; OTI: orotracheal intubation; DC: decompressive craniectomy.

**Table 2 (abstract 000333)** Univariate analysis of DC mortality 6 months after ICU discharge

| | Overall N = 61 | Survivors N = 39 | Non-survivors N = 22 | *p* |
|---|---|---|---|---|
| Age (years) | 47.3 ± 14.6 | 46.3 ± 14.4 | 49.1 ± 15.0 | 0.485 |
| Sex female | 21 (34.4) | 12 (30.8) | 9 (40.9) | 0.423 |
| APACHE-II | 21.4 ± 5.3 | 20.8 ± 5.5 | 22.5 ± 5.0 | 0.306 |
| Diabetes mellitus | 7 (11.5) | 4 (10.3) | 3 (13.6) | 0.695 |
| Arterial hypertension | 13 (21.3) | 8 (20.5) | 5 (22.7) | 1 |
| Dislypemia | 10 (16.4) | 7 (17.9) | 3 (13.6) | 0.735 |
| Tumor | 4 (6.7) | 2 (5.3) | 2 (9.1) | 0.619 |
| SAH | 26 (42.6) | 19 (48.7) | 7 (31.8) | 0.2 |
| Stroke Malignant middle cerebral artery | 12 (19.7) | 6 (15.4) | 6 (27.3) | 0.322 |
| Acute subdural hematoma | 22 (36.7) | 14 (36.8) | 8 (36.4) | 0.97 |
| Hydrocephalus | 25 (41.7) | 14 (36.8) | 11 (50.0) | 0.319 |
| Reoperation for complications | 18 (31.6) | 12 (33.3) | 6 (28.6) | 0.709 |
| Obliteration of base cisterns | 21 (35.0) | 14 (36.8) | 7 (31.8) | 0.694 |
| Focal contusion with edema and expansivity | 28 (46.7) | 19 (50.0) | 9 (40.9) | 0.496 |
| Evacuated Injury | 13 (21.7) | 8 (21.1) | 5 (22.7) | 1 |
| TBI | 26 (42.6) | 15 (39.5) | 11 (50.0) | 0.428 |
| OTI previous hospital admission | 18 (29.5) | 11 (28.2) | 7 (31.8) | 0.766 |
| OTI Emergency | 24 (39.3) | 14 (35.9) | 10 (45.5) | 0.463 |
| OTI on Surgery | 12 (19.7) | 9 (23.1) | 3 (13.6) | 0.509 |
| Transfusion prior to DC | 10 (16.9) | 7 (18.4) | 3 (14.3) | 0.45 |
| Pre-craniectomy seizures | 10 (16.9) | 6 (15.8) | 4 (19.1) | 0.733 |
| Bilateral arreactive mydriasis prior to DC | 5 (8.5) | 3 (7.9) | 2 (9.5) | 1 |
| Both reactive pupils prior to DC | 42 (71.2) | 29 (78.4) | 13 (59.1) | 0.114 |
| One reactive pupil prior to DC | 8 (13.8) | 4 (11.1) | 4 (18.2) | 0.462 |
| None-reactive pupils prior to DC | 6 (10.2) | 3 (8.1) | 3 (13.6) | 0.661 |
| ICU-Deaths | 14 (23.3) | 0 | 14 (63.6) | < .001 |
| Hospital-Deaths | 8 (14.0) | 0 | 8 (36.4) | < .001 |
| Six months after ICU discharge | 6 (11.8) | 0 | 6 (27.3) | 0.004 |
| Midline shift on CT at admission | 6 (0 - 10) | 5 (0 - 10) | 7 (1 - 9) | 0.804 |
| GCS on admission | 8 (5 - 13) | 9 (5 - 14) | 7 (5 - 12) | 0.348 |
| GCS at ICU admission | 3 (3 - 7) | 3 (3 - 7) | 3 (3 - 5) | 0.47 |
| Number of Platelets prior to DC | 224 (169 - 264) | 224 (182 - 264) | 220 (164 - 262) | 0.92 |
| Rankin ICU discharge | 5 (4 - 5) | 4 (2 - 5) | 6 (5 - 6) | < .001 |
| Rankin Hospital discharge | 5 (3 - 6) | 4 (1 - 5) | 6 (6 - 6) | < .001 |
| GOS ICU discharge | 3 (2 - 3) | 3 (3 - 4) | 1 (1 - 2) | < .001 |
| GOS months after ICU discharge | 3 (1 - 4) | 4 (3 - 5) | 1 (1 - 1) | < .001 |

Data are means and medians (IQR) and frequences (%). SAH: subarachnoid hemorrhage; TBI: trauma brain trauma injury; OTI: orotracheal intubation; DC: decompressive craniectomy.

**Topic:** Neurointensive care

## 000334

### P0.1 as predictor for effort in mechanically ventilated intensive care unit patients breathing spontaneously

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000334

**Introduction:** It is hypothesized that P-SILI is associated with patient effort in mechanical ventilation (Carteaux, 2021). It is, however, not easy to estimate patient effort. Direct measurement of parameters such as work of breathing (WOB) and pressure time product (PTP), requires the use of an esophageal catheter (Jubran 2005, Pham 2020), an invasive procedure that may not be suitable for all Intensive Care Unit (ICU) patients (Pham 2020). A surrogate measure for breathing effort is the P0.1, which measures the airway pressure during the first 0.1 s of inspiration during an occlusion manouver (Whitelaw 1975). The P0.1 showed an association with lung stress and diaphragm effort in the preceding hour (de Vries 2023). However, in a systematic review, Sato et al. could not define a definitive threshold differentiating between low and high effort because of study heterogeneity (Sato 2021). There still exists a lot of controversy about the exact correlation of the P0.1, patient effort, and its usefulness in estimating weaning failure or success. It would be of interest to study the correlation between the P0.1, the WOB and the PTP as measures of effort.
**Objectives:** This study aims to investigate whether there is a correlation between WOB, PTP, and P0.1 in mechanically ventilated ICU patients.
**Methods:** Data from two single-center prospective observational studies currently conducted in the Netherlands on the ICU of the LUMC (P23.068 and 2022–061) were utilized. The studies included patients who were subjected to mechanical ventilation and were breathing spontaneously with an esophageal balloon catheter in situ. We used the internal P0.1 value of the Hamilton C6 ventilator, which uses a quasi-occlusion method, together with the Pes signal from which we calculated the WOB and PTP. Three random minutes were sampled per patient and means were calculated thereof for each parameter. Statistical analysis was performed in R-studio version 4.1.3. A $p$ value < 0.05 was assumed to be significant.
**Results:** A total of 32 patients were included, resulting in 96 samples of 1 min. Mean value distribution was not normal and could not be log-normalized. Median of the mean values were as follows: P0.1, 4.2 cmH2O (IQR 1.6–6.3); WOB 4.5 J/min (IQR 2.7–7.1); PTP 73.3 cmH2O*s/min (IQR 45.1–97.7). Spearman's rank correlation coefficient was used to assess the correlation because of a non-normal distribution.
The correlations between P0.1 and WOB (Spearman $R^2 = 0.1786$, $p$-value < 0.001), and between P0.1 and PTP (Spearman $R^2 = 0.2538$, $p$ value < 0.001) were poor (Figures 1 and 2), while there was a good correlation between WOB and PTP (Spearman $R^2 = 0.8275$, $p$ value < 0.001) (Figure 3).
**Conclusions:** The observed low correlation between P0.1 and WOB/PTP suggests caution in using P0.1 as a surrogate for estimating effort in mechanically ventilated ICU patients.
The quasi-occlusion method of the Hamilton C6 used to determine P0.1 values might have influenced our results (Takane 2022).
Further research is necessary to investigate alternative measures or to refine methodologies for assessing respiratory effort in this population.

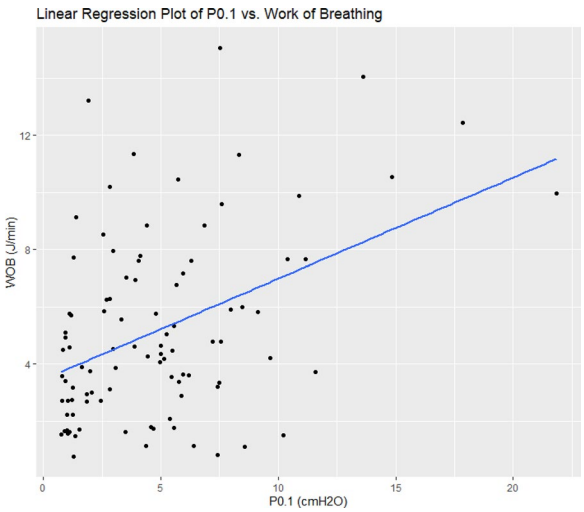


**Fig. 1 (abstract 000334)** Linear regression plot of the P0.1 (cmH2O) values compared to the work of breathing (J/min), Spearman R^2 = 0.1786, $p$ value < 0.001

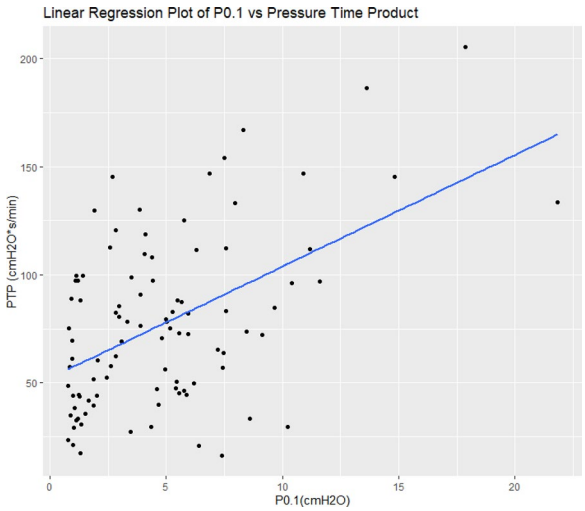


**Fig. 2 (abstract 000334)** Linear regression plot of the P0.1 (cmH2O) values compared to the pressure time product (cmH2O*s/min), Spearman $R^2 = 0.2538$, $p$ value < 0.001


**Fig. 3 (abstract 000334)** Linear regression plot of the WOB (J/min) values compared to the pressure time product (cmH2O*s/min), Spearman $R^2 = 0.8275$, $p$ value < 0.001

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000335

## The effectiveness of pendrin inhibitor in ventilator-induced lung injury

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**Introduction:** Mechanical ventilation does not work exactly like normal physiologic lungs, which can potentially lead to ventilator-induced lung injury (VILI). In VILI, various intracellular mediators are released and it may increase pendrin expression. Pendrin (SLC26A4) is a transmembrane anion exchanger that exchanges chloride with bicarbonate and iodide. Bronchial epithelial expression of pendrin is increased in a wide spectrum of airway inflammatory conditions. In this study, we analyzed the role of pendrin and the effectiveness of pendrin inhibitor (YS-01) in VILI.
**Methods:** We induced lung damage by applying a high tidal volume (HTV) of 30 ml/kg with a frequency of 100 breaths/min for 5 h in pendrin wild-type (WT) with or without pendrin inhibitor YS-01, as well as in pendrin-knockout (KO) 129SVEV mice in the supine or prone position. We used bronchoalveolar lavage fluid (BALF) analysis, inflammatory cytokine analysis, and a lung injury score to determine the extent of the damage. Pendrin expression was confirmed using western blotting, immunofluorescence (IF) staining, and transmission electron microscopy (TEM) with immunogold labeling Methods:
**Results:** In pendrin WT mice after HTV ventilation, the total cell count in BALF, lung injury score, and inflammatory cytokines, such as TNF-alpha, MIP-2, and IL-1 beta, were increased. However, in pendrin-KO mice, the total cell count, lung injury score, and inflammatory cytokines were decreased. In addition, those of WT mice in prone position also were decreased. When WT mice in supine position were administered YS-01, the total cell count in BALF were significantly decreased compared to those of WT mice in supine position (Figures 1, 2). Also, lung injury score and inflammatory cytokines of WT mice with YS-01 in supine position were decreased compared to those of WT mice in supine position and even in prone position (Figure 3).
**Conclusions:** We infer that pendrin plays a key role in VILI and pendrin inhibitor can improve lung injury in VILI. In addition, considering that pendrin inhibitor is superior to prone position in inflammatory cytokines level, pendrin inhibitor has the potential to act as effective treatment in VILI.

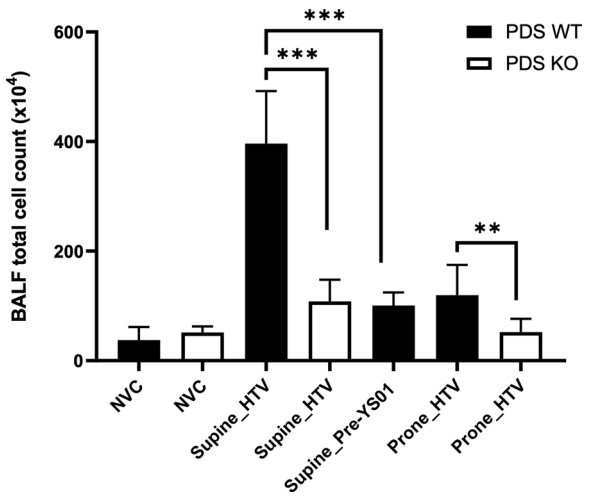


**Fig. 1 (abstract 000335)** Bronchoalveolar lavage fluid (BALF) total cell count in non-ventilation control group(NVC), high tidal volume (HTV) in supine position with or without YS01, and an HTV in prone position. $^{**}p < 0.01$, $^{***}p < 0.001$ analyzed by Student's unpaired two-tailed *t* test

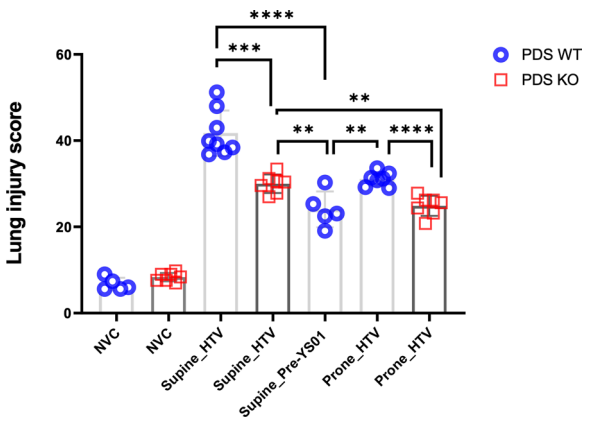


**Fig. 2 (abstract 000335)** Lung injury score in non-ventilation control group (NVC), high tidal volume (HTV) in supine position with or without YS01, and an HTV in prone position. $^{**}p < 0.01$, $^{***}p < 0.001$ analyzed by Student's unpaired two-tailed *t* test

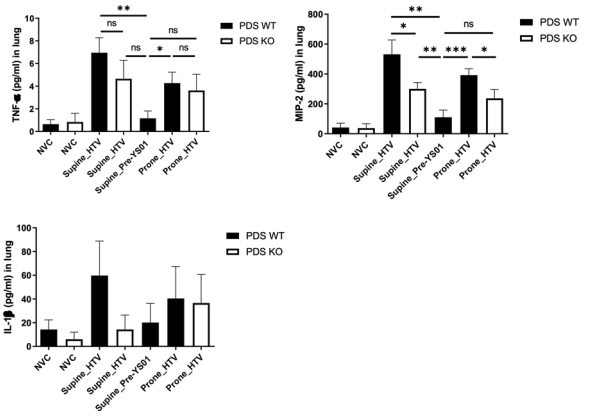


**Fig. 3 (abstract 000335)** Inflammatory cytokines in non-ventilation control group (NVC), high tidal volume (HTV) in supine position with or without YS01, and an HTV in prone position. $^{*}p < 0.05$ $^{**}p < 0.01$, $^{***}p < 0.001$ analyzed by Student's unpaired two-tailed *t* test

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000336

### Risk factors associated with delayed cerebral ischemia in patients with subarachnoid hemorrhage in a neurotraumatic ICU: a 10-year study

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**Introduction:** Approximately 20% of patients with aneurysmal subarachnoid hemorrhage (SAH) suffer delayed cerebral ischemia (DCI), which represents the main cause of death and treatable disability in these patients. Several studies have proposed markers to predict this complication. Numerous radiological risk scales have been developed, although their predictive capacity has been poorly studied and compared.

**Objectives:** To prospectively assess risk factors for DCI in patients with SAH admitted to a neurotraumatic ICU.

**Methods:** Prospectively collected data of patients admitted from October 2013 to December 2023 to a 10-bed Neurotraumatic ICU. We analyzed: main diagnosis at admission; demographics, including sex and race; neurological data (clinical examination, pupil reactivity and size, and Glasgow Coma Score: GCS; aneurysm localization and size; presence of intracranial hematoma (ICH); presence and volume of intraventricular bleeding; days to develop vasospasm; development of DCI; Fisher scale, Modified Fisher Scale (MFS), Hunt and Hess scale (HHS), Word Federation of Neurosurgeons scale (WFNS); presence of

vasospasm in Doppler or arteriography; delayed ICU admission; aneurysm treatment; complications, including infections; Glasgow Outcome Scale (GOS) at ICU discharge and 6 months after ICU discharge and several other risk factors. A univariate analysis of DCI was performed. The variables that showed significant association in univariate analysis were entered into the multivariate logistic regression analysis. To obtain a DCI prediction rule, a prediction model was obtained using the classification and regression trees (CART) procedure [1]. CART classifies data using a sequence of if–then rules. The basis of decision tree algorithms is the recursive binary partitioning of the data. First, the most discriminative variable is selected to split the data set into child nodes. The partitioning continues until some stopping criterion is reached. At each terminal node, the probability of DCI was estimated as the proportion of patients belonging to that node who developed the event. The tree was constructed according to the following algorithm: in the first stage, the tree grows until all cases are correctly classified, and in the second stage, we used the tenfold cross-validation method of successive pruning [1]. Finally, the tree that minimized the error measurement (deviance) was chosen. For this predictor, the corresponding ROC curve was obtained, and the AUC was estimated using a 95% CI. Data were analyzed using the R package, version 4.2.1 (R Development Core Team, 2022).

**Results:** A total of 278 patients with SAH were collected, of whom 64 (23, 0.02%) developed DCI. Demographic data and types of admission are shown in Table 1a and 1b. Anterior communicating artery (Aco) aneurysms were the most frequently encountered. The most frequent complications of patients with DCI were stroke 46 (71.9%) and hydrocephalus 34 (53.1%). Thirty-eight (13.7) (14. 6%) of the patients with SAH died at ICU discharge. Twelve (18.8%) of the patients with SAH and DCI died at ICU discharge. There was no statistically significant difference in mortality in patients with DCI vs. patients with SAH (Table 1a and 1b). The oriented patient was statistically independent associated with DCI in the multivariate logistic regression analysis (Table 2).The classification tree showed that: MFS $\leq 2$ had 93.5% odds of no DCI (Figure 1). The AUC was 0.671 (0. 609–0.732) (Figure 2).

**Conclusions:** Our data show that 23.02% of the patients studied had DCI. The oriented patient was statistically independent associated with DCI. The classification tree showed a high negative predictive value for DCI. Finally, mortality was not significantly higher in the patients studied than in the total patients with SAH.

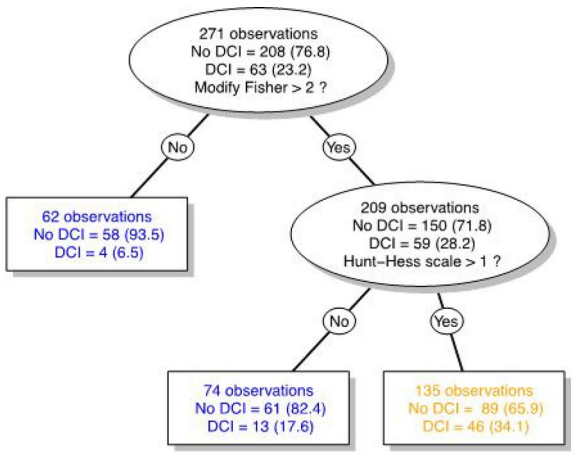


**Fig. 1 (abstract 000336)** Decision tree rule for the DCI

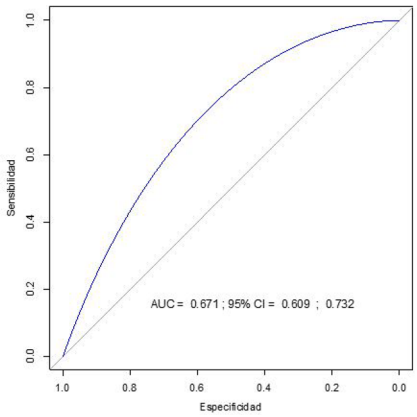


**Fig. 2 (abstract 000336)** ROC curve DCI

**Table 1a (abstract 000336)** Characteristics of the patients: overall and according to DCI

| | DCI | | | |
|---|---|---|---|---|
| | SAH N = 278 | No N = 214 | Yes N = 64 | P |
| Age (years) | 56.0 ± 14.6 | 57.0 ± 14.6 | 52.8 ± 14.4 | 0.042 |
| Sex female | 185 (66.5) | 137 (64.0) | 48 (75.0) | 0.102 |
| Apache-II at admission | 13.9 ± 7.6 | 13.1 ± 7.6 | 16.3 ± 7.2 | 0.003 |
| SOFA ICU admission | 2 (0 - 6) | 2 (0 - 5) | 5 (1 - 8) | 0.001 |
| Death | 55 (19.8) | 38 (17.8) | 17 (26.6) | 0.121 |
| Death at ICU discharge | 38 (13.7) | 26 (12.2) | 12 (18.8) | 0.177 |
| Hospital death | 16 (5.8) | 12 (5.6) | 4 (6.2) | 0.768 |
| Arterial hypertension | 124 (44.6) | 92 (43.0) | 32 (50.0) | 0.322 |
| Diabetes | 27 (9.7) | 21 (9.8) | 6 (9.4) | 0.917 |
| Dyslipemia | 64 (23.0) | 49 (22.9) | 15 (23.4) | 0.928 |
| Smoker | 117 (42.1) | 86 (40.2) | 31 (48.4) | 0.241 |
| Platelet inhibitors | 24 (8.6) | 20 (9.3) | 4 (6.2) | 0.439 |
| Emergency surgery at admission | 46 (16.6) | 30 (14.0) | 16 (25.0) | 0.038 |
| Oriented | 145 (52.4) | 127 (59.6) | 18 (28.1) | < .001 |
| Alert | 156 (56.1) | 134 (62.6) | 22 (34.4) | < .001 |
| Confused | 42 (15.1) | 31 (14.5) | 11 (17.2) | 0.596 |
| Stuporous | 66 (23.7) | 40 (18.7) | 26 (40.6) | < .001 |
| Bilateral mydriasis | 10 (3.6) | 8 (3.7) | 2 (3.1) | 1 |
| Anisochoric pupils | 30 (10.8) | 17 (7.9) | 13 (20.3) | 0.005 |
| Isochoric pupils | 241 (86.7) | 190 (88.8) | 51 (79.7) | 0.06 |
| Bilateral aneurysm | 244 (87.8) | 192 (89.7) | 52 (81.2) | 0.07 |
| No reactive pupil | 16 (5.8) | 11 (5.1) | 5 (7.8) | 0.539 |
| Anterior communicating artery aneurysm | 23 (8.3) | 15 (7.0) | 8 (12.5) | 0.162 |
| Posterior communicating artery aneurysm | 81 (29.1) | 61 (28.5) | 20 (31.2) | 0.672 |
| Aneurysm clipping | 53 (19.1) | 35 (16.4) | 18 (28.1) | 0.035 |
| Intravetricular thrombolysis | 4 (1.4) | 4 (1.9) | 0 | 0.577 |
| Embolization of the aneurysm | 161 (57.9) | 119 (55.6) | 42 (65.6) | 0.154 |
| Decompressive craniectomy | 13 (4.7) | 8 (3.7) | 5 (7.8) | 0.184 |
| Intraoperative aneurysm rupture | 18 (6.5) | 12 (5.6) | 6 (9.4) | 0.383 |
| Died after treatment | 6 (2.2) | 4 (1.9) | 2 (3.1) | 0.624 |
| External ventricular device | 135 (48.6) | 91 (42.5) | 44 (68.8) | < .001 |
| Hydrocephalus | 111 (39.9) | 77 (36.0) | 34 (53.1) | 0.014 |
| MV > 7 days | 88 (31.6) | 56 (26.2) | 32 (50.0) | < .001 |
| Frontal ICH | 46 (16.6) | 35 (16.4) | 11 (17.2) | 0.875 |
| Temporal ICH | 46 (16.6) | 35 (16.4) | 11 (17.2) | 0.875 |
| Vasospasm doppler | 60 (24.9) | 32 (17.5) | 28 (48.3) | < .001 |
| Vasospasm Arteriography | 58 (22.1) | 23 (11.3) | 35 (58.3) | < .001 |

Values are frequencies (%), means ± SD and medians (IQR). DCI: delayed cerebral ischemia, SAH: subarachnoid hemorrhage, SOFA: Sequential Organ Failure Assessment, MV: mechanical ventilation, ICH: intracerebral hematoma.

**Table 1b (abstract 000336)** Characteristics of the patients: overall and according to DCI

| | DCI | | | |
|---|---|---|---|---|
| | SAH N = 278 | No N = 214 | Yes N = 64 | p |
| Stroke | 80 (28.8) | 34 (15.9) | 46 (71.9) | < .001 |
| Acute cerebral isquemia | 22 (7.9) | 19 (8.9) | 3 (4.7) | 0.276 |
| Rebleeding 72 hours | 12 (4.3) | 7 (3.3) | 5 (7.8) | 0.155 |
| Ventriculitis | 23 (8.3) | 13 (6.1) | 10 (15.6) | 0.015 |
| Fisher scale | 4 (3 - 4) | 3 (3 - 4) | 4 (3 - 4) | 0.154 |
| Fisher modified scale | 4 (3 - 4) | 3 (2 - 4) | 4 (3 - 4) | 0.001 |
| Hunt and Hess scale | 2 (1 - 4) | 1 (1 - 3) | 3 (1.5 - 4) | < .001 |
| WFNS scale | 2 (1 - 4) | 1 (1 - 4) | 4 (1 - 5) | < .001 |
| APACHE vasospasm | 14 (8 - 18) | 13 (8 - 16) | 16 (9 - 20) | 0.056 |
| SOFA vasospasm | 4 (2 - 6) | 3 (1 - 4) | 4 (2 - 7) | 0.05 |
| Delayed ICU re-admission | 10 (2 - 24) | 9 (2 - 24) | 12 (5 - 24) | 0.066 |
| GCS on site | 15 (12 - 15) | 15 (13 - 15) | 14 (9 - 15) | 0.028 |
| GCS in the emergency room | 14 (10 - 15) | 14 (10 - 15) | 12 (7 - 15) | 0.002 |
| GCS at ICU admission | 14 (5 - 15) | 14 (7 - 15) | 8 (3 - 14) | 0.001 |

Values are frequencies (%), means ± SD and medians (IQR). DCI: delayed cerebral ischemia, SAH: subarachnoid hemorrhage, WFNS: World Federation Neurosurgical Societies, SOFA: Sequential Organ Failure Assessment, GCS: Glasgow coma score.

**Table 2 (abstract 000336)** Multivariate logistic regression DCI

| | P-lrt | Odd-Ratio (95% CI) |
|---|---|---|
| Patient oriented | < 0.001 | 0.242 (0.130; 0.452) |

DCI: Delayed cerebral ischemia

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**Topic:** Neurointensive care

## 000338

### Interrater and intrarater agreement of the Venous Excess UltraSound (VExUS) score in critically ill patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000338

**Introduction:** The Venous Excess UltraSound (VExUS) score is a promising tool to quantify venous congestion and has been validated in patients after cardiac surgery (1). There are several studies investigating its use in the Intensive Care Unit (ICU) (2, 3). However, the interrater and intrarater agreement of the VExUS score in critically ill patients is unknown.

**Objectives:** This study aims to evaluate the agreement of the VExUS score in critically ill patients.

**Methods:** This is a prospective cohort study conducted in a tertiary ICU in the Netherlands. Patients above 18 years of age and expected to be in the ICU for over 24 h were eligible. Interrater and intrarater agreements were assessed for VExUS score interpretation. Intrarater agreement was also assessed for VExUS acquisition. Raters were blinded to each other's interpretation and acquisition. Cohen's kappa coefficient and percentage agreement were used to determine agreement.

**Results:** Interrater interpretation was assessed by scoring 75 VExUS images by two independent raters and demonstrated a substantial agreement (kappa = 0.8, agreement = 86.7%). For intrarater interpretation, 75 VExUS images were scored twice and showed a good agreement (kappa = 0.9, agreement = 93.3%). For interrater acquisition, in 12 patients, images were acquired by two raters. A moderate interrater agreement was observed (kappa = 0.6, agreement = 83.3%). This moderate agreement was largely explained by the influence of the inferior vena cava measurement on the overall VExUS score.

**Conclusions:** In critically ill patients, agreement for interpretation and acquisition of the VExUS score is substantial to moderate. The vena cava measurement impacted VExUS score agreement the most, rendering the VExUS score agreement vulnerable to this influence. Nevertheless, the VExUS score appears to be reliable with a substantial agreement between and within observers.

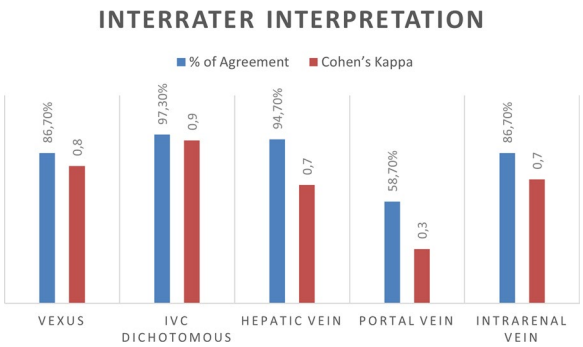


**Fig. 1 (abstract 000338)** Percentage of agreement and Cohen's Kappa of the VExUS score and individual components for interrater interpretation. IVC = inferior vena cava

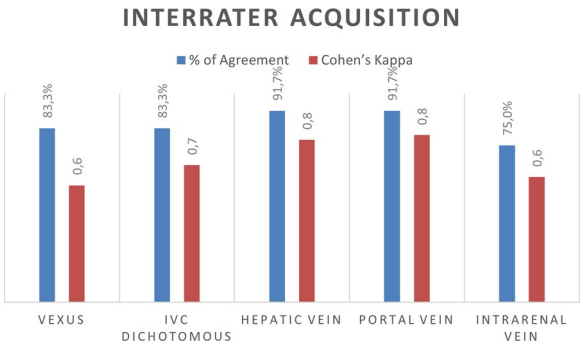


**Fig. 2 (abstract 000338)** Percentage of agreement and Cohen's Kappa of the VExUS score and individual components for interrater acquisition. IVC = inferior vena cava

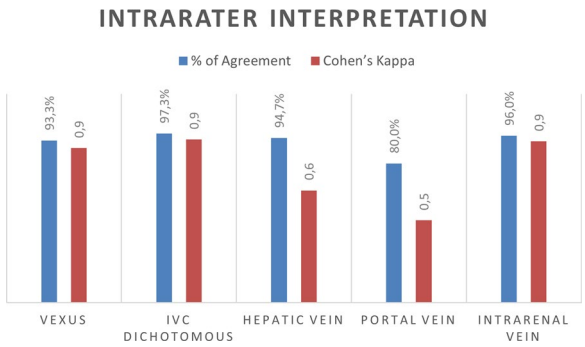


**Fig. 1 (abstract 000338)** Percentage of agreement and Cohen's Kappa of the VExUS score and individual components for intrarater interpretation. IVC = inferior vena cava

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**Reference(s)**

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**Topic:** Imaging in intensive care

## 000339

### The impact of levetiracetam loading dose vs. non-loading dose on seizure prophylaxis in neurocritical care patients: a multicenter, cohort study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000339

**Introduction:** Seizures represent a significant complication among critically ill patients, particularly prevalent in those receiving neurocritical care. In efforts to mitigate this risk, anti-epileptic medications are commonly employed for seizure prophylaxis in various acute neurological insults, such as traumatic brain injury (TBI), epidural hematoma (EDH), subdural hematoma (SDH), subarachnoid hemorrhage (SAH), and intracerebral hemorrhage (ICH).Levetiracetam (LEV), has been increasingly used as seizure prophylaxis in several critical care conditions. However, multiple studies have shown diversity in the best LEV dosage approach for seizure prophylaxis.
**Objectives:** The objective of this study is to compare the effectiveness of a non-loading dosage strategy with an LEV loading dose strategy for seizure prophylaxis in neurocritical care patients.
**Methods:** A retrospective cohort study conducted across multiple centers, including adults (over 18 years old) who were admitted to intensive care units and received levetiracetam as prophylaxis at two tertiary hospitals in Saudi Arabia between January 1, 2018, and December 31, 2022. Eligible patients were categorized into two groups based on levetiracetam loading dose use (non-loading vs loading dose). Patients were excluded if they received levetiracetam for treatment indication. The primary endpoint was an early onset of seizure which is defined as the onset of seizure within 7 days. While a late onset of seizure during ICU stay, recurrent seizure during ICU stay, the need for additional antiepileptic medication, ICU, and hospital length of stay, 30-day mortality and in hospital mortality were secondary endpoints. The multivariable linear and logistic regression analysis were employed as applicable. The study was approved by the research ethics committee with reference number (HA-02-J-008).
**Results:** A total of 1116 patients were screened for eligibility. Among them, 208 patients were included based on the eligibility criteria. 65 patients received LEV loading dose and 143 patients did not receive loading dose. The majority of baseline characteristics were balanced except for subdural hemorrhage and TBI. Compared to the loading dose group, the non-loading dose group had a higher incidence of early seizure onset, but the difference was not statistically significant (14.2% vs. 7.7%; OR: 0.46, 95% CI 0.16, 1.41; $p = 0.18$). Furthermore, there were no significant differences in the ICU length of stay between the two groups in the univariate analysis (9 vs. 6 days; $p = 0.49$). However, after linear regression, the ICU LOS was significantly longer in the LEV loading dose group (beta coefficient: 11.22, 95% CI 1.71, 20.73; $p = 0.02$). Additionally, the 30-day and in-hospital mortality rates, recurrent seizures during the ICU stay, late onset of seizures, and the need for additional antiepileptic medication were all not statistically significant.
**Conclusions:** Levetiracetam loading dose approach for prophylaxis in neurocritical patients was not associated with a lower incidence of early or late onset of seizure during ICU stay. Further studies with larger sample sizes are needed.

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**Topic:** Neurointensive care.

## 000340

### Prediction and validation analysis of post-extubation hypoxemia in postoperative patients managed with high-flow nasal cannula therapy

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**Introduction:** High-flow nasal cannula (HFNC) is commonly employed in hypoxemic patients and is gradually being utilized in post-extubation patients experiencing hypoxemia after surgical procedures [1–3]. While HFNC can serve as a successful oxygen delivery device, it may also prolong patients' stay in the intensive care unit, leading to the misallocation of healthcare resources [4]. On the other hand, there is an expectation that non-invasive physiological assessments to supplant invasive evaluations, Monitoring SpO2 and HR predicts HFNC weaning success, aiding treatment plan adjustments [5]. Monitoring

physiological data changes in real time enables continuous assessment, facilitating optimal prediction for liberation from HFNC.

**Objectives:** The aim of this study is to substantiate and attempt to establish a set of vital sign changes during HFNC use, further predicting the success of liberation from high-flow cannula. This provides a reference framework for future clinical respiratory care practices.

**Methods:** Using retrospective observations, we analyzed the changes in vital signs before and after the use of High-Flow Nasal Cannula (HFNC) in patients experiencing post-surgical extubation due to hypoxemia. We aimed to predict the success of weaning from HFNC. A total of 90 patients were included in the study, and their vital signs, including respiratory rate (RR), heart rate (HR), mean blood pressure (MAP), oxygen saturation (SpO2), and respiratory rate oxygenation index (ROX), were analyzed individually. Based on these changes, predictions were made regarding the success or failure of HFNC weaning. Subsequently, in validation group, 92 patients who underwent post-surgical extubation and were administered HFNC, the observation aimed to determine whether there was concordance between the variability of vital signs before and after using HFNC and the study group.

**Results:** HFNC weaning success in study group vs. in the validation group: SpO2 exhibited a significant increase of 4.21 vs. 0.76, while RR significant decrease by 2.2 vs. 0.9. HR variability significantly decreased (7.55; 1.65), the ROX index increased by 1.13 vs. 1.01. The duration of HFNC use was 5.08 days vs. 6.47. Finally, we conducted the standard error of the forecast, and the variability of each vital sign, all within the 95% confidence interval.

**Conclusions:** The variability of SpO2, RR, HR, ROX, and HFNC days remained consistent between the validation and study groups, with the numerical changes in the validation group showing a narrower range than those in the study group. These factors serve as predictive indicators for successful HFNC weaning in cases of hypoxemic respiratory failure post-surgery. Additionally, delays in intubation may exacerbate the disease course [6], highlighting the importance of careful decision-making regarding the timing of HFNC use and discontinuation.

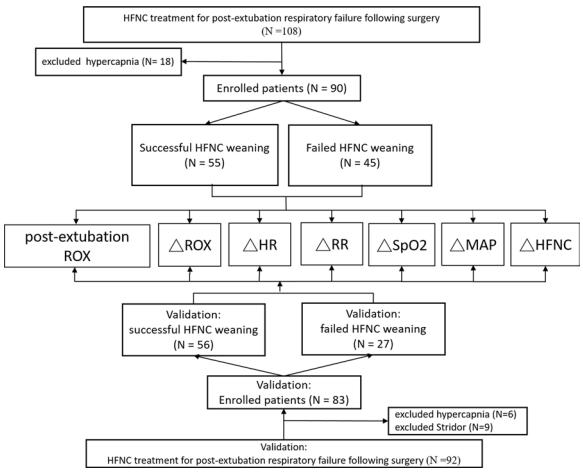


**Fig. 1 (abstract 000340)** Flowchart of study design and patient selection

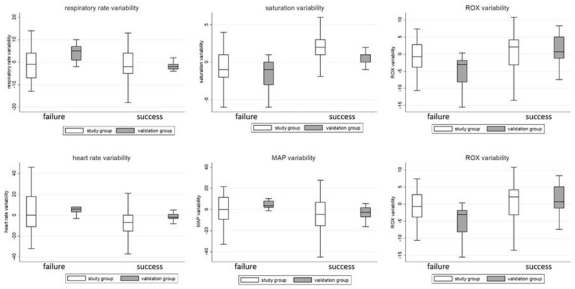


**Fig. 2 (abstract 000340)** The variability of SpO2, RR, HR, ROX, and HFNC days between the study and validation groups

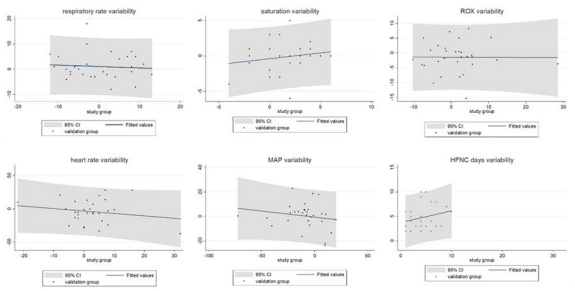


**Fig. 3 (abstract 000340)** The variability of each vital sign was assessed in the validation group and compared to that in the study group, while accounting for the standard error of the forecast within a 95% confidence interval

**Table 1 (abstract 000340)** Characteristics of patients with hypoxemic respiratory failure after surgery in the study group and validation group

| | Study group | | | Validation group | | |
|---|---|---|---|---|---|---|
| | Success | Failure | P value | Success | Failure | P value |
| observation | 55(61.11%) | 35(38.89) | | **56** | 27 | |
| Sex | | | 0.611 | | | 0.118 |
| Male | 3054.55%) | 21(60%) | | 25 | 17 | |
| female | 25(45.45%) | 14(40%) | | 31 | 10 | |
| Age | 69.76 | 72.77 | 0.3033 | 70.64(12.16) | 70.25(15.57) | 0.135 |
| CCI | 6.64(2.77) | 7.31(2.26) | 0.198 | 4.79(2.46) | 4.85(2.40) | 0.889 |
| Weaning profile before extubation | | | | | | |
| RSBI | 74.09(45.43) | 78.74(49.97) | 0.6499 | 76.38(46.97) | 83(52.12) | 0.534 |
| MIP | 35.2(11.58) | 32.49(13.31) | 0.3095 | 33.04(12) | 26.56(10.86) | 0.554 |
| MEP | 47.48 | 50.55 | 0.5566 | 34.70(19.20) | 29.96(17.34) | 0.553 |
| PF ratio | 275.74(107.34) | 198.67(101.68) | 0.0007** | | | |
| ABG data before extubation | | | | | | |
| FiO2 | 35.91(7.52) | 39.91(8.61) | 0.022* | | | |
| PaO2 | 96.57(27.10) | 78.93(20.26) | 0.001** | | | |
| PF ratio | 280.53(97.54) | 209.51(87.75) | <0.001** * | 312.86(111.82) | 303.71(99.33) | 0.818 |
| ROX | 14.87(5.30) | 9.42(6.85) | 0.001** | | | |

**Table 2 (abstract 000340)** Comparison of the noninvasive monitoring parameters of the patients with hypoxemic respiratory failure after surgery between the study group and the validation group

| | | study group | | | Validation group | | |
|---|---|---|---|---|---|---|---|
| | | success | failure | P value | success | failure | P value |
| Before HFNC | SAT | 96.60(2.88) | 94.56(2.55) | 0.001** | 97.69(2.39) | 97.94(2.36) | 0.7780 |
| | RR | 22.29(0.80) | 23.68(0.95) | 0.136 | 20.47(4.77) | 21.46(5.11) | 0.5916 |
| | HR | 98.58(16.20) | 103.97(19.06) | 0.155 | 86.7(16.29) | 86(19.11) | 0.9139 |
| | MAP | 84.98(3.45) | 86.22( 13.31) | 0.729 | 88.62(12.60) | 82.13(11.23) | 0.154 |
| | P/f ration | 280.53(97.54) | 209.51(87.75) | 0.001** | 312.86(111.82) | 303.71(99.33) | 0.818 |
| | ROX | 13.742(4.61) | 10.87(3.42) | 0.001** | 14.18(3.79) | 13.85(4.40) | 0.822 |
| After HFNC | SAT | 98.49(2.43) | 96.77(5.13) | 0.035* | 98.71(1.80) | 96.31(3.95) | 0.034* |
| | RR | 20.41(4.92) | 23.86(6.34) | 0.003** | 18.53(4.53) | 26.46(3.69) | 0.00** |
| | HR | 91.04(21.87) | 108.97(26.00) | 0.000** | 85.96(15.52) | 93.23(19.18) | 0.21 |
| | MAP | 86.22(13.31) | 84.98(3.45) | 0.728 | 85.10(10.98) | 87.64(12.70) | 0.56 |
| | ROX | 14.87(5.30) | 9.42(6.85) | 0.002** | 15.20(4.09) | 9.07(2.36) | 0.00** |
| Variability | SAT | 4.21(2.21) | 1.88(3.42) | 0.037* | 0.76(1.71) | -1.38(2.02) | 0.003** |
| | RR | -2.2(7.06) | 0.65(7.34) | 0.034* | -1.94(2.93) | 5(5.15) | 0.0001** |
| | HR | -7.55(18.14) | 4.52(21.11) | 0.002* | -1.65(6.86) | 7.23(8.75) | 0.0042** |
| | MAP | -2.40(17.33) | -1.12(20.91) | 0.753 | -3.53(10.53) | 5.51(8.15) | 0.02* |
| | ROX | 1.13( 6.62) | -0.86(5.61) | 0.032* | 1.01(4.25) | -4.78(4.48) | 0.0012** |
| | HFNC days | 5.08(6.60) | 2.68(4.31) | 0.005** | 6.47(2.03) | 2.62(0.51) | 0.000** |

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6. The authors are responsible for the content and writing of the manuscript. The authors would like to thank the facilitators in our Hospital, Taiwan, and the study participants, for their dedicated cooperation in making the study possible.
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**Topic:** Acute respiratory failure and mechanical ventilation

## 000341

## Evaluation of abdominal muscle thickness by ultrasound during mechanical ventilation


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**Introduction:** Abdominal muscles are crucial for an effective cough, which is a key factor in the success of weaning from mechanical ventilation. Cumulated abdominal muscle thickness has been correlated with expiratory pressures required to generate cough.
**Objectives:** This study aimed to evaluate by ultrasound the variations of abdominal muscle and diaphragm thickness after 7 days of mechanical ventilation. Secondary objectives were to identify factors associated with the variations of abdominal muscle thickness, to compare the variation of abdominal muscle and diaphragm thickness, and to evaluate the relation at day 7 between abdominal muscle thickness and either maximal expiratory pressure (MEP) or peak cough expiratory flow (PCEF).
**Methods:** Patients were included if intubated for less than 24 h and deemed to be on mechanical ventilation for at least 7 days. The thickness of the following muscles was measured by ultrasound, at the same location and standardized, at day 1 and 7: rectus abdominis, external oblique, internal oblique, transversus abdominis, and diaphragm. The main evaluation criteria were the cumulated thickness of the four abdominal muscles. The patients were assigned to the *decrease* group if muscle thickness decreased by more than 10% from day 1 to day 7, to the *increase* group if thickness increased by more than 10%, and to the *no change* group if the variation was less than 10% in either direction.
**Results:** 40 patients were included, and 31 of them were still on mechanical ventilation at day 7 and then kept for the analysis. The thickness of each muscle at days 1 and 7 is depicted in Table 1. Median cumulated thickness of abdominal muscles was 17.9 mm [IQR 15.5–21.8] at day 1 and 18.8 mm [IQR 14.9–21] at day 7 ($p = 0.44$). The cumulated thickness at day 7 decreased by more than 10% in 6/31 (19%), remained stable in 20/31 (65%) and increased by more than 10% in 5/31 (16%) patients. The duration of neuromuscular blockers infusion from day 1 to day 7 was significantly associated with the variation of cumulated abdominal thickness: $2.7 \pm 2.4$ days for the *decrease* group, $1.2 \pm 1.5$ in the *no change* group, and $0.2 \pm 0.4$ in the *increase* group ($p = 0.047$). Changes of cumulated abdominal muscle thickness were not correlated with changes of diaphragm thickness. For the 10 patients responsive to command at day 7 and able to perform the measures, there was no correlation between cumulated abdominal muscle thickness and either MEP or PCEF.

**Table 1 (abstract 000341)** Muscle thickness, in mm

| | Day 1 | Day 7 |
|---|---|---|
| Cumulated abdominal muscle | 17.9 [15.5–21.8] | 18.8 [14.9–21] |
| Rectus abdominis | 7.3 [6–8.2] | 7.6 [5.9–8.4] |
| External oblique | 3.6 [2.9–4.8] | 4.2 [3–5] |
| Internal oblique | 4.7 [3.4–6.2] | 4.5 [3.7–5.4] |
| Transversus abdominis | 2.4 [2–3.1] | 2.4 [2–3] |
| Diaphragm | 2.1 [1.6–2.6] | 2 [1.6–2.4] |

**Conclusions:** Abdominal muscle atrophy occurred in 19% of patients at day 7 of mechanical ventilation. The previous duration of neuromuscular blockers infusion was associated with decrease of abdominal muscle thickness.

**Topic:** Acute respiratory failure and mechanical ventilation

## 000345

### Artificial intelligence-derived optimal vasopressin initiation rule in patients with septic shock: a reinforcement learning study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000345

**Introduction:** The Surviving Sepsis Campaign codifies the treatment of sepsis and septic shock. If the mean arterial pressure target fails to be reached with fluid resuscitation, norepinephrine (NE) is the first-line vasopressor agent and vasopressin is the second-line agent when the dose of NE is equal to or greater than 0.25–0.5 mcg/kg/min. However the optimal timing of vasopressin initiation remains unknown. Reinforcement learning (RL) is a form of machine learning that aims at identifying the optimal set of actions to take in a given environment to maximize the notion of cumulative reward.
**Objectives:** The goal of this study was to use RL to derive and validate an optimal vasopressin initiation rule to minimize mortality in adult patients treated in the ICU for septic shock.
**Methods:** To train and internally validate the algorithm, we used de-identified data from UCSF. We included patients meeting the criteria for septic shock per Sepsis 3.0 definition. The dataset was divided into training, testing, and internal validation sets (70/15/15 random splitting). To externally validate the RL algorithm, we used two publicly available databases, MIMIC-IV and eICU-CRD. Patient trajectories were discretized into hourly bins starting 1 h after shock onset and truncated either at shock recovery (cessation of vasopressors), discharge (dead or alive), or at $t = 120$ h.
Our RL algorithm considered one binary action per hour: "do not start vasopressin" or "start vasopressin" and evaluated its impact on a reward combining death/alive status, arterial lactate, mean arterial pressure, SOFA score, and NE dose. The goal was to identify the sequence of actions that maximizes the reward. To fit the RL algorithm, we employed the Fitted-Q Iteration technique. To assess the impact on ICU-mortality of accurately following the RL policy vs. not, we looked at NE doses at the time of vasopressin initiation by the clinician vs. the algorithm: Group 1 (adherent group) the clinician and the RL algorithm introduced vasopressin for the same NE dose; Group 2 (moderate discrepancy) clinicians started vasopressin for a higher NE dose (up to + 0.1 mcg/kg/min higher); Group 3 (major discrepancy) the NE dose was ≥0.1 mcg/kg/min higher at time of vasopressin initiation by the clinician compared to the algorithm. Group 4 (lower doses) the clinician administered vasopressin at a lower NE doses than the algorithm.
**Results:** 12,026 patients with septic shock were included in the analysis: UCSF (4777 patients), MIMIC-IV (4179 patients), and eICU-CRD (3070 patients). Vasopressin was initiated in 29% of the patients in the UCSF internal validation set, 35% in MIMIC-IV, and 31% in eICU. The RL algorithm recommended initiating vasopressin in 97% of the patients in the UCSF internal validation set, 92% in MIMIC-IV, and 95% in eICU. The observed dose of norepinephrine at vasopressin initiation was 0.15[0.7–0.25] mcg/kg/min in the UCSF internal validation set, 0.25[0.12–0.41] in MIMIC-IV, and 0.24[0.14–0.41] in eICU. The dose of norepinephrine at the time vasopressin initiation as recommended by the algorithm was 0.06 [0.03–0.13] mcg/kg/min in the UCSF internal validation set, 0.12[0.06–0.22] in MIMIC-IV, and 0.10 [0.05–0.22] in eICU. The most important variables driving the RL policy were the time since the shock onset, SOFA score, and norepinephrine dose.
Relative to Group 1, Group 2 was associated with an increased risk of ICU mortality [risk differences 0.10 (95%CI 0.01–0.21), 0.04 (0.01–0.08), and 0.05 (0.01–0.10) in the UCSF, MIMIC-IV, and eICU-CRD test sets, respectively]. Group 3 was associated with a significant increase in ICU mortality compared to Group 1 [RD 0.13 (0.03–0.24), 0.13 (0.10–0.17), 0.13 (0.08–0.18)]. Group 4 was also associated with an increased ICU mortality (RD 0.21 (0.03–0.40), 0.16 (0.11–0.23), 0.10 (0.02–0.18)) (Figure 1).
**Conclusions:** In patients with septic shock, a reinforcement learning-based optimal rule resulted in earlier initiation of vasopressin compared to the clinician rule. Deviation from the optimal rule was associated with increased ICU mortality.

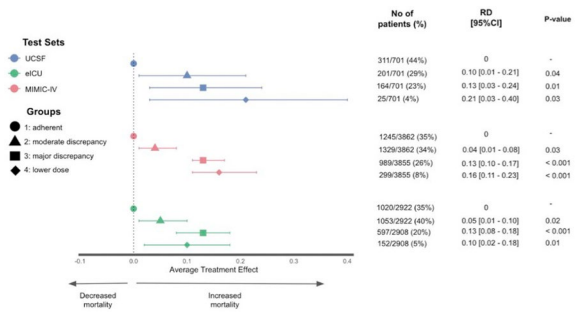


**Fig. 1 (abstract 000345)** Risk of ICU mortality when the clinician's vasopressin initiation rule diverges from the RL optimal rule

**Topic:** Sepsis

## 000346

### Melatonin secretion rhythm and associated factors of ICU patients: a prospective cohort study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000346

**Introduction:** Melatonin rhythm disturbance is common in intensive care unit (ICU) patients. It may influence contributes to an array of poor prognosis. The aim of the study was to evaluate melatonin secretion rhythm in critically ill patients and to identify factors influencing the melatonin secretion rhythm.
**Methods:** A prospective cohort study observing begin within the first day of ICU admission in surgical ICU of a tertiary teaching hospital. The study was conducted from February 2022 to December 2022. Patients who were conscious, greater than 18 years, expected ICU stay longer than 24 h, and postoperative were enroll. Light, noise, nighttime interruptions, feeding, medications, surgery, and disease information were measured. Serum melatonin was collected at 3:00, 8:00, and 16:00 on the first three days after ICU admission.
**Results:** We defined melatonin rhythmicity by calculating melatonin acrophase and amplitude. We studied 190 critically ill patients. Melatonin acrophase was delayed and abnormal in 100(52.63%) patients. Use of analgesic ($P = 0.033$), pain score ($P = 0.025$), and average nighttime interruption ($P = 0.004$) were independently related to melatonin acrophase. Melatonin amplitude was associated with age and average nighttime interruption ($P = 0.018$ and 0.048, respectively).
**Conclusions:** Age, use of analgesic, pain score, and average nighttime interruption were the risk factors contributing to the disturbance of melatonin rhythm. Clinical staff should control pain and decrease the nighttime interruption to help ICU patients maintain melatonin rhythm.

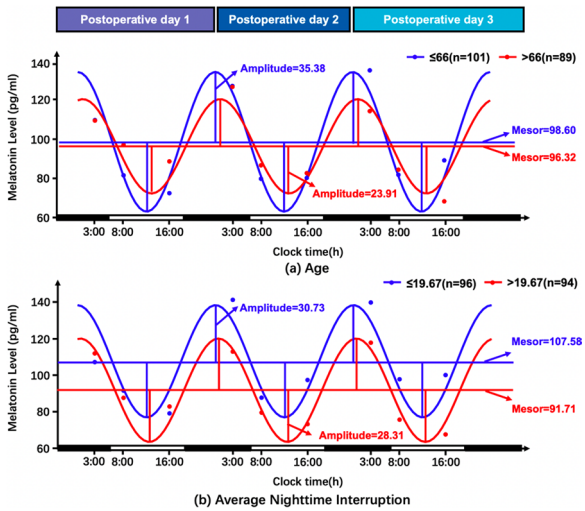


**Fig. 1 (abstract 000346)** Melatonin rhythm in different subgroups (abstract 000346) **(a)** shows the melatonin rhythm in different age group and **(b)** average nighttime interruption. The dots are the average melatonin rhythm at each time point. Data were shown as mean. As the data do not conform to the normal distribution, we divided group depend on median of patients' age and average nighttime interruption

**Reference(s)**

1. Shanghai hospital development center diagnosis and treatment technology promotion project (SHDC22022220)
2. National Natural Science Youth Foundation (72204052)
3. Zhongshan Hospital Clinical Research Project (ZSLCYJ202361, ZSLCYJ202355)

**Topic:** Perioperative care

## 000349

### Clinical course and outcomes of critically ill patients with COVID-19 infection in Malaysia

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000349

**Introduction:** Coronavirus disease (COVID 19) represented majority of admissions to Intensive Care Unit (ICU) during peak of its pandemic in 2020 and 2021. Management of critically ill COVID 19 patients was challenging.
**Objectives:** This study aimed to describe the clinical course and outcomes of critically ill COVID 19 patients in Malaysia.
**Methods:** Registry-based observational study describing outcomes in patients admitted to the ICU for COVID-19, using a validated test. Participants were critically ill patients admitted to ICU with a primary diagnosis of COVID-19 infection in Malaysia Registry of Intensive Care (MRIC) 2021.
**Results:** A total of 15,255 patients included. Average age was 52 years with male predominant (53.8%). More than 50% had only one or without organ failure. Respiratory failure (35.4%), neurological failure (19.8%), and cardiovascular failure (16.1%) were the top three main organ failure on ICU admission. Mean score for SOFA was 4.7 (median 3) and for SAPS II was 36.2 (median 33). Life-sustaining interventions that the patients received throughout their ICU stay include invasive mechanical ventilation (66.2%) and renal replacement therapy (13.9%). Average length of ICU was 8.9 days (median 6.6), while average hospital stay was 14.8 days (median 10.6). ICU mortality was 31.2%, hospital mortality was 38%, and standardised mortality ratio (SMR) was 1.32 (0.95–1.80). Factors associated with mortality were age (OR 1.016, 95% CI 1.006–1.025, $P=0.002$), respiratory failure (OR 1.732, 95% CI 1.292–2.321, $P<0.001$), invasive mechanical ventilation (OR 12.97, 95% CI 7.295–23.063, $P<0.001$), continuous renal replacement therapy (OR 2.495, 95% CI 1.893–3.289, $P<0.0011$), and high SAP II score (OR 1.021, 95% CI 1.010–1.032, $P<0.001$).
**Conclusions:** This study included approximately 15,255 patients demonstrated that COVID-19 infection in critically ill patients was associated with necessity for life-sustaining interventions, high mortality, and prolonged length of ICU and hospital stay.

**Topic:** Sepsis

## 000350

### Impaired anti-viral and type 3 immune responses in crush injury patients with earthquake related-trauma

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000350

**Introduction:** Infections are common in critically ill patients in intensive care unit (ICU) due to crush injuries and often lead to poor clinical outcomes. Molecular mechanisms of this immune depression is unknown.
**Objectives:** In this study, we aimed to investigate the contribution of damage-associated molecular patterns and alarmins to inflammation and their relationship to disease progression in patients diagnosed with crush injury due to earthquake.
**Methods:** The study included patients ($n=17$) who suffered from crush injuries and required ICU following the Kahramanmaras earthquake on 6 February 2023 and healthy controls (HC, $n=17$). Blood samples were taken on the 7th and 21th day of hospitalization. Peripheral blood mononuclear cells (PBMC) and blood plasma samples were isolated and frozen. Cytokines were quantified by multiplex ELISA to assess immune system dysfunction.
**Results:** The patients had significantly reduced interleukin (IL)-33 alarmin as well as reduced IFN-α2 in the plasma at 7th day of crush injury. IFN-γ, TNF-α, and IL-1β levels also showed a reduced trend at 21st day of crush injury. Importantly, levels of type 3 immune response-associated cytokines IL-23 and IL-17A were significantly reduced in the crush injury patients at 21st day of crush injury (Figure 1).
**Conclusions:** These result argue that the plasma levels of cytokines critical in anti-viral, anti-fungal, and -extracellular bacteria immunity are suppressed following crush injury which may help explain the poor outcome of these patients and succumbing to infections post-trauma.

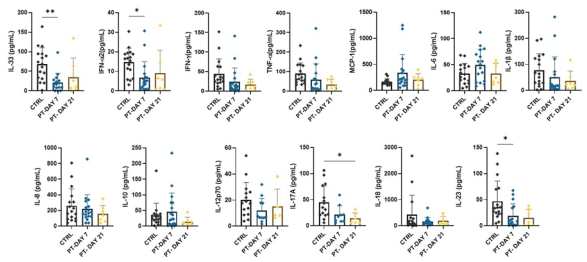

**Fig. (abstract 000350)** Cytokine levels in the peripheral blood plasma

**Reference(s)**

1. Mil Med Res. 2021;8(1):37. https://doi.org/10.1186/s40779-021-00333-4
2. This study was supported by Erciyes University Scientific Research Projects Unit (TSA-2024-13353).

**Topic:** Infections and prevention

## 000351

### Machine learning can predict post-induction hypotension in a general surgical population with excellent performance

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000351

**Introduction:** Hypotension is a common event during surgery, with reported incidences varying from 5 to 99% [1], and is associated with postoperative adverse outcomes, including acute kidney injury, myocardial injury, and mortality [2]. About a third of all hypotensive events develop right after anesthetic induction, i.e., post-induction hypotension (PIH). The risk of developing PIH is largely determined by baseline patient characteristics and anesthetic management [3]. Preventing hypotension opposed to treating it prevents the physiological disturbances associated with reduced perfusion pressure. A method to predict PIH could serve as clinical decision support for altering the induction strategy, hemodynamic monitoring and/or vasopressive support. Machine learning is a technique that can make such predictions based on large amounts of data.
**Objectives:** This research aims to develop a good-performing and generalizable machine learning model to predict the occurrence of PIH, to ultimately prevent it.
**Methods:** A database consisting anonymized anesthesia records from 2004 till 2020 of the hospital Medisch Spectrum Twente, Enschede, The Netherlands was used to train the model. Only adult patients undergoing general anesthesia with sufficient valid data points were included. Features consisted of patient demographics, medication history, induction medication, and hemodynamic data before induction. PIH was defined as a drop in systolic blood pressure of at least 30% within the first 15 min after induction. The data were split into training and test set using tenfold cross-validation including hyperparameter tuning with grid search. The XGBoost algorithm, an ensemble learning technique based on decision trees, was used to classify the records.
**Results:** A total of 40,191 anesthesia records of patients undergoing general anesthesia were included in this study, of which 65.8% experienced PIH. The XGBoost model achieved an area under the receiver-operating characteristic curve of 0.83 ± 0.0; see Figure 1. For a predicted probability threshold of 0.5, the test accuracy was 77.9% ± 0.4%, sensitivity 88.1% ± 0.4%, and positive predictive value 80.2% ± 0.3%. The most important features for classification of PIH were age, administration of a muscle relaxant, and pre-operative blood pressure.
**Conclusions:** Using a large heterogeneous dataset, it is possible to train a machine learning model with excellent performance in predicting PIH. The feature importance analysis gives clinical insight in combinations of risk factors and induction strategies that are more prone to result in PIH. The model could serve as a clinical decision support system for the anesthesiologist, thereby preventing PIH in the future.

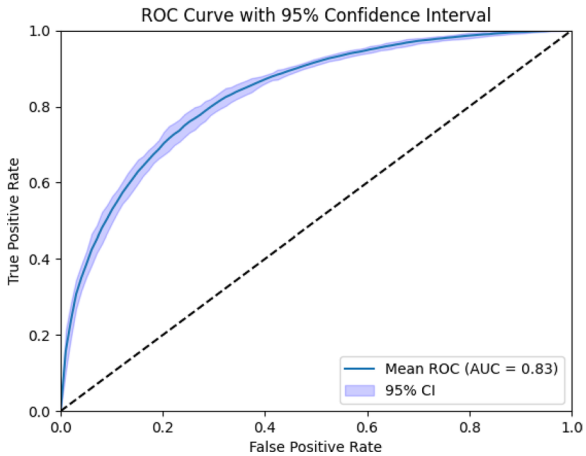


**Fig. 1 (abstract 000351)** Receiver-operating characteristic curve for predicting post-induction hypotension

**Reference(s)**

1. [3] Südfeld S et al. Post-induction hypotension and early intraoperative hypotension associated with general anaesthesia. British Journal of Anaesthesia. 2017; 119(1): 57–64. ISSN: 0007–0912. https://doi.org/10.1093/BJA/AEX127.
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**Topic:** Information systems and data science

## 000354

### A retrospective analysis of the microorganisms isolated in kidney transplant patients on tacrolimus with *sepsis* in the intensive care unit

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000354

**Introduction:** Sepsis remains one of the main causes of morbidity and mortality in solid organ transplant recipients [1,2]. Infections are predominantly bacterial and studies have shown that those related to Gram-negative bacilli are increasing [2]. In addition, bacteraemia with resistant organisms are more frequent in the transplant population [3]. Considering this, we aimed to investigate the epidemiology

of microorganisms isolated in this patient cohort, admitted to our ICU with sepsis.

**Methods:** We conducted a retrospective study in kidney and Gram-negative transplant patients admitted to the ICU with sepsis in 2022 and compared this to our general (i.e., non-kidney transplant) ICU patients. All transplant patients were on tacrolimus either as a single immunosuppressive agent or in combination. The inclusion criteria for sepsis were: septic shock as the reason for ICU admission, biochemical evidence of infection and microbiology-proven cases.

**Results:** 49 patients with kidney or kidney–pancreas transplants were in the ICU with sepsis in 2022, with a total of 70 independent episodes of sepsis. Of these, bacterial infections predominated, causing 66% (46/70) of all infections. Positive blood cultures were only noted in 17% (12/70) of episodes, of which 33% (4/12) were E*nterococcus* spp and 25% (3/12) isolated Enterobacteriaceae with *Klebsiella* spp, *Escherichia coli* and *Enterobacter* spp. Similarly in all ICU non-kidney transplant patients, *Enterococcus* spp and Enterobacteriaceae were predominantly seen in blood cultures at 21% (32/152) and 29% (44/152), respectively. This was followed by *Staphylococcus aureus* at 18% (28/152). In addition, 9% (14/152) of all ICU patients had candidaemia, which was not isolated in the transplant cohort. Vancomycin-resistant *Enterococcus* (VRE) was identified in 8% (1/12) of the transplant cohort in comparison to 5% of VRE and methicillin-resistant *S. aureus* in other ICU patients.

In our transplant cohort, around 50% (37/70) were positive respiratory samples and 16% (11/70) were urinary. The most common organisms causing respiratory tract infections were Enterobacteriaceae and *Pseudomonas aeruginosa* at 22% (8/37) and 14% (5/37), respectively, whilst in the urine, it was *Enterococcus* at 45% (5/11) and Enterobacteriaceae at 27% (3/11). There were 9 COVID-19 infections, of which 78% (7/9) required treatment.

In kidney transplant patients, 16% (11/70) were opportunistic infections, of which over half were due to *Pneumocystis jirovecii* and 36% from *Aspergillus fumigatus*. There was 1 case of CMV viraemia with encephalitis. All patients had discontinued *Pneumocystis* and CMV prophylaxis at the time.

**Conclusions:** Our data demonstrate that *Enterococcus* spp, Enterobacteriaceae and *Pseudomonas aeruginosa* were the most common organisms isolated in kidney and kidney–pancreas transplant patients, whilst there was also a significant incidence of opportunistic infections. These data will help guide antimicrobial management in this vulnerable patient cohort presenting to ICU with sepsis.

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**Topic:** Sepsis.

## 000355

### A novel index for the assessment of the inflammatory response and the risk of sepsis

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000355

**Introduction:** Sepsis continues to be a huge societal problem. In 2017, sepsis accounted for nearly 20% of all global deaths [1]. In Spain, the average cost per patient with septic shock is €11,359 [2]. Sepsis is defined as a life-threatening organ dysfunction caused by a dysregulated host response to infection. Septic shock should be considered a subset of sepsis in which underlying circulatory, cellular, and metabolic abnormalities contribute to a greater risk of mortality than that posed by sepsis alone. Sepsis involves an inflammatory response to infection, commonly evaluated through biomarkers to gauge the patient's condition or for its early detection [3]; however, these methods are invasive and can take hours before offering results: recent studies show that the inflammatory response could be monitored with non-invasive methods such as Heart Rate Variability (HRV) [4,5].

**Objectives:** The primary objectives of this study were to develop an index capable of accurately assessing the inflammatory response and identifying the risk of sepsis in patients. Essential criteria for this index included non-invasiveness, rapid result generation, and predicting the severity of the inflammatory response.

**Methods:** To develop this index, data were collected from patients at Hospital Quirón Salud in Barcelona (Spain) and Clínica Interhospital in Guayaquil (Ecuador), both approved by their local ethics committee, utilizing the Coresys One monitor capable of recording two EEG channels and one ECG channel synchronously. The dataset comprised 54 patients undergoing surgeries of varying durations (ranging from 45 min to 5 h), 5 healthy volunteers, and 4 septic cases.

Subsequently, segments of the data were categorized into eight levels of inflammation using a combination of HRV analysis and insights from collaborating medical professionals. Healthy volunteers were designated a value of 1, while patients in the surgical group were assigned values ranging from 2 to 5, and those in the septic group were allocated values from 6 to 8.

Following data preprocessing and segmentation, the index was trained using an Adaptive Neuro Fuzzy Inference System (ANFIS). Inputs to the ANFIS model included heart rate, the root mean square of successive differences (RMSSD) representing time-domain HRV parameters, the ratio between low- and high-frequency components of HRV (LF/HF), and the brain activity index (BA) a consciousness index. HRV parameters were calculated every 3 min with 20-s increments from the recorded data. The resulting index, the Risk of Sepsis and Inflammation (RSI), offers real-time data of the patient's inflammatory status, facilitating prompt clinical decision-making.

The RSI index indicates that values from 0 to 25 indicate a normal state, 25 to 50 suggest a mild inflammatory response, 50 to 75 denote a strong inflammatory response and risk of sepsis, and 75 to 100 indicate a severe inflammatory response and risk of sepsis and septic shock.

**Results:** In the analysis of the trained data, the RSI index exhibited a Pk value of 0.956, accompanied by a standard error of 0.0011 and an $R^2$ Pearson correlation coefficient of 0.897.

Figure 1 illustrates the distribution of values assigned by the RSI index across the categorized inflammatory levels.

Figure 2 presents a boxplot depicting the distribution of RSI values among healthy volunteers, surgical cases, and septic cases. This visualization highlights the distinct RSI profiles across these patient groups, demonstrating the index's capacity to differentiate between different inflammatory states and patient populations.

**Conclusions:** In conclusion, the Risk of Sepsis and Inflammation (RSI) index shows promise in differentiating cases of severe inflammation and monitoring the progress of the inflammatory response. Its non-invasiveness and ability to provide rapid results in minutes make it a valuable tool for clinical decision-making.

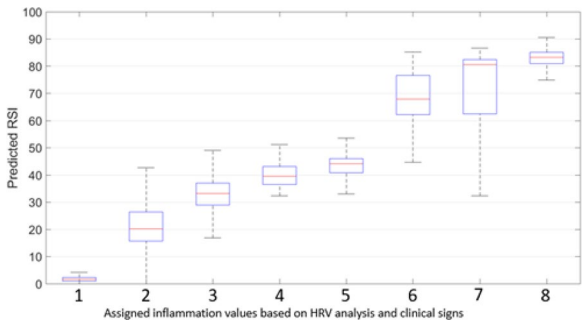


**Fig. (abstract 000355)** Distribution of values assigned by the RSI index across the categorized inflammatory levels

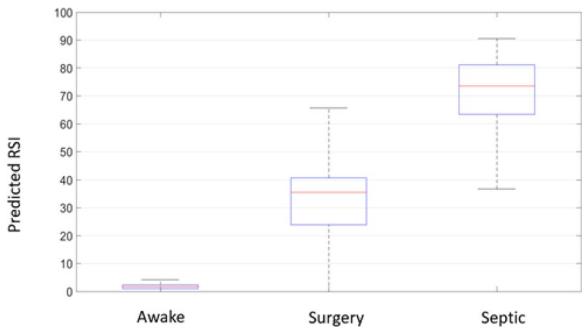


**Fig. (abstract 000355)** Distribution of RSI values among healthy volunteers, surgical cases, and septic cases

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**Topic:** Sepsis

## 000356

### Cardiomyocyte-specific conditional apelin receptor (APJ) expression knock-down and sepsis-induced myocardial dysfunction in mice: sex-dependent metabol(om)ic-function relationship

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000356

AQ9 **Introduction:** During the acute phase of septic shock, dysfunctional hearts are prevalent with unclear preferences for energetic fuels. This cardiovascular impairment is usually supported by catecholamine infusions. Amongst alternative candidates to catecholamines, apelin agonists—apelinergics—and the apelin/APJ receptors efficiently reverse myocardial contractile dysfunction in experimental sepsis and purport to be mitotropes, energy protectors, and regulators of metabolic homeostasis.
**Objectives:** In a mice model of cecal ligation puncture, to establish the impact of apelin receptor (APJ) specific conditional knock-down (k-d) in cardiomyocytes (CMs) on heart systolic function; mitochondrial respiration, and heart & blood-related metabolomic profiles.
**Methods:** CM-specific invalidation of APJ was achieved using the tamoxifen-inducible Cre recombinase (MerCreMer) expressed under the cardiomyocyte-specific alpha-myosin heavy chain promoter (αMHC or alpha-MHC; Myh6), and double transgenic mice obtained by crossing those with APJ floxed (APJfl/fl) mice. Sepsis-Induced Myocardial Dysfunction (SIMD) was induced by Cecal Ligation and Puncture (CLP) for 18 h. Transthoracic echocardiography was performed with the Vevo 3100 echography system (FUJIFILM VisualSonics Inc.). Short-axis Fractional Shortening (FS) was used as a reference for contractile function in non-challenging conditions and Cardiac Index (CI) with long-axis calculations preferred in challenging conditions. Blood and heart tissues were then preserved for Metabolomic profiling, as well as fresh heart fibers for real-time mitochondrial respirometry (Oroboros) at the endpoint ($n = 3$–10/ group).
**Results:** APJ k-d significantly affected CI in sham female mice ($p < 0.01$). CLP decreased CI in both sexes (−35% in males & −67% in females, $p < 0.05$ and 0.01, respectively) and FS in males (−17%, $p < 0.05$). APJ k-d further amplified CI drop in both sexes ($p < 0.001$ in males, $p < 0.05$ in females) and FS in females ($p < 0.05$). Ventricular muscle fibers in septic mice lacking APJ exhibited a significant reduction in oxidative phosphorylation (OXPHOS), largely mediated by reductions in complex I-driven respiration, in males only. In contrast, the APJ k-d in females resulted in an increase in respiration, essentially mediated by an increase in complex I-driven respiration. OXPHOS reduction was associated with CI drop in males, but independent of left ventricle bioenergetics in females. In CLP heart tissues: citrate (downstream TCA metabolite & inhibitor of fatty acid oxidation) has an APJ-independent twofold increased concentration in females ($p < 0.05$), beta-OH butyrate (main ketone body) exhibited an APJ-independent sixfold elevation in males ($p < 0.01$), and alpha-OH butyrate (marker of mitochondrial dysfunction and insulin resistance) displayed a huge—15–20-fold—APJ-dependent increase in females ($p < 0.001$). In bloodstream: CLP induced a significant increase of alpha-keto-butyrate and beta-OH butyrate in males ($p < 0.01$) and a tenfold APJ-dependent and a retrieved increase of alpha- and beta-OH butyrate in females ($p < 0.001$).
**Conclusions:** CLP-induced SIMD in mice is associated with important metabolic and functional impairments in both heart and bloodstream, which are differentially translated depending on sex and (apelin receptor) APJ knock-down.

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2. Canadian Institutes of Health Research (CIHR)—Project Grants (376770, 389979, and 399567), Sepsis Canada CIHR-CMDO structuring project 2022-24, Dépt de Médecine, FMSS, CHU Sherbrooke.

**Topic:** Sepsis

## 000357

### Outcomes of ward patients with heart failure who required rapid response team activation and the clinical value of the shock index

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AQ10 **Introduction:** Patients with heart failure (HF) may deteriorate in hospital wards and have increased hospital mortality. We evaluated the outcomes of patients with HF who deteriorated in the ward and assessed the ability of the shock index (SI), the ratio of heart rate to systolic blood pressure (BP), to predict outcomes.
**Methods:** We retrospectively studied patients with HF in the wards of a tertiary-care hospital in Riyadh, Saudi Arabia who had activation of the Critical Care Response Team (CCRT) for clinical deterioration between 01/01/2019 and 31/12/2019. We calculated SI at the time of activation for all patients. We compared patients with preserved and reduced left-ventricular ejection fraction (EF). We performed stepwise multivariable logistic regression analysis to evaluate the risk factors for hospital mortality and receiver-operating characteristic (ROC) curve analysis to assess if SI can predict ICU admission, vasopressor therapy, and hospital mortality.
**Results:** During the study period, 276 patients with HF had CCRT activation (age 73 ± 12 years, males 56.5%, preserved EF in 67.4% [EF = 49 ± 7%] and reduced in 22.6% [EF = 27 ± 6%]). Patients with reduced EF had similar age but were more likely to be males with higher prevalence of ischemic heart disease and mitral regurgitation compared to those with preserved EF. Reasons for CCRT activation were similar (cardiovascular deterioration 38.9% vs. 33.9% and respiratory deterioration 33.3% vs. 38.2% for reduced and preserved EF groups, respectively). Patients with reduced EF had lower systolic BP (108 ± 38 vs. 121 ± 29 mmHg) but similar heart rate. SI was 0.9 ± 0.3 in patient with reduced EF compared with 0.8 ± 0.3 ($p = 0.09$) for those with preserved EF. At CCRT activation, 141 patients (51.3%) were suspected to have sepsis. 91 patients (33.0%) needed ICU admission with no difference between the reduced and preserved EF groups (32.2% vs. 33.3%, respectively; $p = 0.85$). The use of vasopressor therapy, invasive mechanical ventilation, and renal replacement therapy was similar in both EF groups. Hospital mortality was 33.0% with no difference between the reduced and preserved EF groups (36.7% vs. 31.2% respectively; $p = 0.36$). On multivariable logistic regression analysis, lower systolic BP (odds ratio [OR] 0.98, 95% confidence interval [CI] 0.97–0.99) and GCS (OR 0.86, 95% CI 0.78–0.95), interstitial lung disease (OR 18.1, 95% CI 1.74–187.85), and bacterial growth from any culture source (OR 3.40, 95% CI, 1.65–7.00), but not EF nor SI, were associated with hospital mortality. On ROC curve analysis, SI did not predict the need for ICU admission (area under the curve [AUC] 0.53, 95% CI 0.46–0.60), use of vasopressor therapy (AUC 0.6, 95% CI: 0.51–0.70), and hospital mortality (AUC 0.56, 95% CI 0.49–0.63).
**Conclusions:** Patients with HF who deteriorated in the ward requiring CCRT activation had high hospital mortality (33.0%). EF and SI did not predict outcomes.

**Topic:** Health services research and outcome

## 000359

## Improving documentation of videolaryngoscopy-assisted tracheal intubation in a tertiary centre intensive care unit in London

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000359

**Introduction:** Using videolaryngoscopy (VL) to guide tracheal intubation has become increasingly common in recent years, with evidence demonstrating that it is safer than direct laryngoscopy (1). There is no standardised documentation tool to communicate tracheal intubation using VL. The Cormack and Lehane score for direct laryngoscopy is often incorrectly used for VL in the absence of an alternative tool. The 'Video Classification of Intubation' (VCI) score (2) has been developed to succinctly convey information about key elements of tracheal intubation using VL—(1) VL blade shape, (2) percentage of glottic opening to the nearest quartile during the intubation attempt, and (3) a comment about tracheal tube delivery (figure). The VCI score is reproducible in patients, which has been adopted by several anaesthetic communities. However, it is not well recognised within the critical care setting where the use of VL is becoming more prevalent.
**Objectives:** The aim of this project was to evaluate the documentation of tracheal intubation using VL in an Intensive Care Unit (ICU) of a tertiary centre in London and implement the use of the VCI score.
**Methods:** We conducted a retrospective study to assess documentation of tracheal intubation using VL over a 2-month period in 2023 in a single ICU. Anonymous data were extracted from electronic patient records. The project was registered locally as an audit.
**Results:** We collected data on 78 patients admitted to the ICU between September and October 2023. Of those patients, 19 were intubated and of those, 13 were intubated using VL. Of the 13 patients intubated using VL, the Cormack Lehane score was incorrectly used to communicate the intubation in 4 patients. For the other 9 patients, various sporadic details were documented which did not allow a clear understanding of how exactly the tracheal intubation using VL was achieved. Following this, to improve our ICU's documentation of tracheal intubation using VL, we undertook a multidisciplinary education programme about the VCI score and devised a new proforma for documenting tracheal intubations, including a specific section that required completion of the VCI score for when VL is used.
**Conclusions:** This single centre audit identified that documentation of tracheal intubation using VL does not consistently describe the process with sufficient detail to allow understanding of what equipment was used and if any difficulty was encountered. This information may prove critical in the event of an accidental extubation or subsequent deterioration and need for re-intubation. We have undertaken a teaching programme to educate airway practitioners about the importance of documenting a minimum dataset and have developed a new proforma detailing the VCI score to improve our documentation of tracheal intubation using VL.

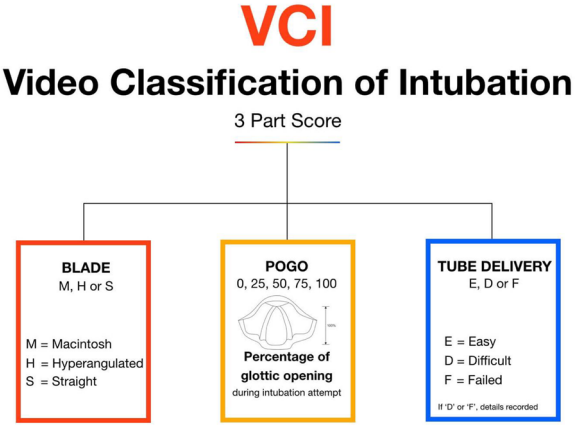


**Fig. (abstract 000359)** The video classification of intubation score infogram

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Cochrane Database of Systematic Reviews 2022, Issue 4. Art. No.: CD011136. https://doi.org/10.1002/14651858.CD011136.pub3.

**Topic:** Perioperative care

## 000360

### Effectiveness and safety of the external holding system for temporary pacing active fixation: TEMPACE—preliminary results (NCT05351658)

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000360

**Introduction:** Temporary cardiac pacing (TCP) is a common procedure in urgent and elective patients, providing support during interventional cardiology procedures. TCP with active fixation leads has shown better outcomes than systems without fixation, but certified devices are lacking. KronoSafe® adapts permanent pacemakers to perform TCP with active fixation leads.

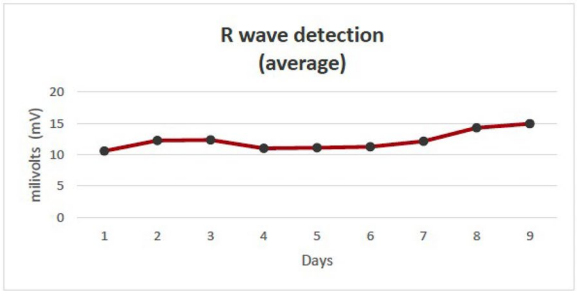
**Objectives:** To demonstrate the safety and effectiveness of TCP with active fixation leads using the KronoSafe® system.

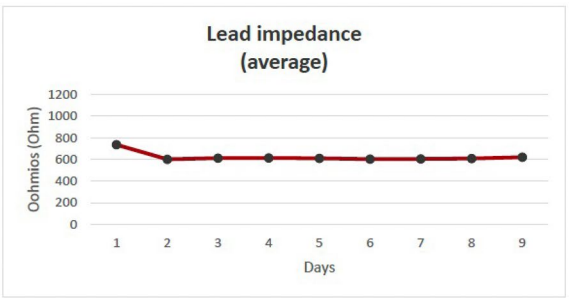
**Methods:** Multicenter clinical research of a medical device approved by the Clinical Research Ethics Committee and the Spanish Agency of Medicines and Medical Devices. Patients requiring temporary cardiac pacing for more than 48 h since January 2023 were included. An active fixation lead of 58–60 cm was implanted under echocardiographic guidance via the left or right internal jugular vein anchored to the right ventricle. Safety variables were collected: electrode impedance, R-wave detection, and stimulation threshold. Complications recorded included capture or detection failure, electrode dislocation or rupture, generator or electrode detachment, and cardiac perforation. Evolutionary variables included hours of pacing in the ICU/Cardiology Acute Care Unit and in the hospitalization ward.

**Results:** 22 patients were included from 2 centers: 8 TAVI, 7 complete AV blocks, 4 Septal Alcohol Ablations, 2 Bradycardia–Tachycardia Syndrome, and 1 Slow Atrial Fibrillation. Every 48 h, mean R-wave detections were 10.6–12.3–12.4–10.9–11.1–11.3–12.1–14.3–14.9 mV; mean impedance values were 735–600-611–614-609–602-604–606-621 Ohms, and mean thresholds were 0.6–0.5–0.5–0.5–0.4–0.6–0.6–0.5–0.4 V at 0.4 ms. One electrode dislocation due to agitation episode was recorded on day 25 without clinical repercussions. The mean duration of pacing was 7.7 days, with 73.1% of the time in the hospital ward without mobility restrictions.

**Conclusions:** 1. Temporary cardiac pacing with active fixation leads is an effective and safe therapy, allowing its use in hospitalization wards. 2. Agitation and disorientation can be risk factors for complications associated with the use of external devices. 3. The KronoSafe® system provides the necessary safety for performing this type of temporary cardiac pacing.


**Fig. (abstract 000360)** KronoSafe® system for TCP with active fixation leads



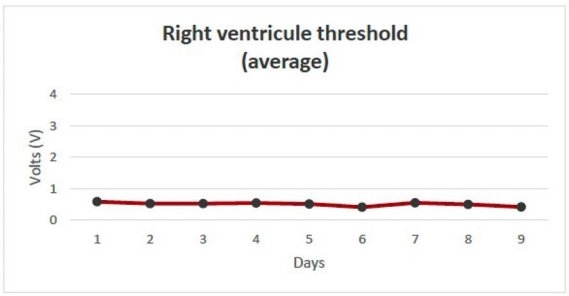




**Fig. (abstract 000360)** Average results for R-wave detection, lead impedance, and right-ventricular threshold

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4. Funded By European Institute of Technology and Innovation (EIT Health)
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**Topic:** Cardiovascular issues in ICU.

## 000361

### Monocyte distribution width during ECMO therapy

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000361

**Introduction:** Sepsis is an important complication in patients receiving extracorporeal membrane oxygenation (ECMO). Its early diagnosis is challenging and represents a crucial aspect for treatment optimization.
Traditional biomarkers have low diagnostic accuracy to diagnose infection on ECMO. Monocyte Distribution Width (MDW) is a novel sepsis biomarker that reflects a change in the volume of monocytes in response to infectious organisms.
**Objectives:** The objectives were to analyse the relationship between MDW, ECMO therapy, and infection; to analyse the MDW during VV-ECMO vs. VA-ECMO therapy.
**Methods:** Retrospective observational cohort study of patients under ECMO support from a single centre since 2019. Statistical analysis. Descriptive: percentages (95%CI). Quantitative: mean (SD) or median (IQR). Normality distribution was analysed using the Shapiro–Wilk test. Univariate analysis: paired *t* test.
**Results:** N = 134. Males: 76.9% (95%CI 68.8–83.7). Age: 53.2 (SD 12.5) years. VV-ECMO: 67.9% (95%CI 59.3–75.7). VA-ECMO: 32.1% (95%CI 24.3–40.7). SARS-COV-2 infection: 52.2% (95%CI 39–56.6). Respiratory infection: 72.4% (95%CI 64–80). Positive blood culture: 34.3% (95%CI 26.3–43). ECMO: 12.5 (IQR 25) days. IMV: 24.5 (IQR 37) days. ICU length of stay: 30.2 (IQR 39.3) days. Alive at ICU discharge: 53.6% (95%CI 44.9–62.6).
MDW 2 days before ECMO implementation vs. MDW at ECMO implementation: 23.8 (SD 4) vs. 26.5 (SD 5.9); ($p = 0.001$). MDW 2 days before ECMO withdrawal *vs.* MDW at ECMO withdrawal: 24.5 (SD 6.2) vs. 25.7 (SD 6.9); ($p = 0.04$). MDW 2 days before respiratory infection *vs.* MDW at respiratory infection: 24 (SD 5.6) vs. 27 (SD 9.4); ($p = 0.02$). MDW 2 days before positive blood culture *vs.* MDW at positive blood culture: 23.4 (SD 3.4) vs. 26.7 (SD 9.5); ($p = 0.02$).
MDW VV-ECMO *vs.* VA-ECMO. MDW at ECMO implementation: 27.2 vs. 27 ($p = 0.9$). MDW at ECMO withdrawal: 25.2 vs. 28.5 ($p = 0.02$). MDW at respiratory infection: 26.9–27.3 (pNS). MDW at positive blood culture: 27.7 vs. 32.7 ($p = 0.04$).
**Conclusions:** MDW increased at ECMO implementation and withdrawal, and when respiratory or blood cultures were positive. MDW tended to be higher during VA-ECMO than during VV-ECMO therapy.

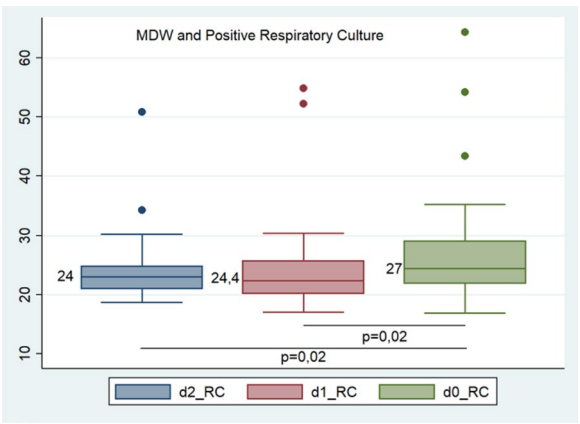


**Fig. (abstract 000361)** MDW 2 days before respiratory infection *vs.* MDW at respiratory infection: 24 (SD 5.6) vs. 27 (SD 9.4); ($p = 0.02$)

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**Topic:** Sepsis.

## 000362

## Analysis of peso-derived variables during spontaneous breathing effort in patients with acute respiratory failure

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AQ12 **Introduction:** In patients with acute respiratory failure (ARF) under invasive mechanical ventilation (IMV), excessive respiratory effort may induce patient self-inflicted lung injury (P-SILI) by significantly increasing the total pressure applied to the lungs. Furthermore, vigorous diaphragmatic contractions may lead to diaphragmatic myotrauma. Observational studies have linked these effects with longer duration of IMV, increased mortality, and poor long-term outcomes in survivors (1,2).

**Objectives:** To analyze the proportion of time spent within the safe range of physiological respiratory effort variables (Pmus [5–15 cm H2O], ΔPeso [5–10 cm H2O], ΔPdi [3–12 cm H2O]) (3,4) during the first 7 days of IMV with active breathing and its correlation with patient survival.

**Methods:** Peso and Pga signals were continuously recorded during at least 7 days after the onset of spontaneous breathing in patients with ARF under IMV. Respiratory system (RS) mechanics, mechanical ventilation variables, and arterial blood gas (ABG) analyses were recorded on the first day under IMV in passive conditions. The onset of patient effort was identified using a specific software, and defined as the presence of inspiratory negative swings in the Peso signal, regardless of the applied ventilatory mode. As the number of cycles analyzed for each patient varied, the analysis of all physiological variables during respiratory effort was weighted according to each patient's representation within the total sample (number of patient's respiratory cycles analyzed/total number of patients' respiratory cycles analyzed).

**Results:** We analyzed 1.483.515 cycles from 26 patients, comprising 19 ICU survivors and 7 ICU non-survivors. No significant differences in demographics, comorbidities, or severity at admission were observed between the two groups. Regarding respiratory variables in passive conditions on day 1, plateau pressure was higher in ICU non-survivors compared to ICU survivors (31 [30–32] vs 28 [26–30], $p = 0.041$) without differences in other RS mechanics and ABG analyses. Table 1 illustrates the median values of physiological respiratory variables between the groups during the 7 days following the onset of respiratory effort. Figure 1 presents the proportion of time that each group spent in different ranges (high, safe, and low) of the respiratory effort variables during the 7 days after the onset of respiratory effort.

**Table 1 (abstract 000362)** Physiological respiratory variables during respiratory effort. Weighted analysis

| | Survivors n.19 | Non-survivors n.7 | *p* value |
|---|---|---|---|
| Vt/PBW (ml/kg) | 7.1 (5.5–7.2) | 7.2 (5.3–8.0) | 0.564 |
| RR (bpm) | 25 (23–26) | 27 (25–32) | **0.000** |
| PS (cm_H2O) | 12 (11–16) | 16 (8–17) | 0.389 |
| PEEP (cm_H2O) | 7 (6–12) | 10 (5–16) | 0.816 |
| Total cycle length (s) | 2.40 (2.30–2.72) | 2.22 (1.87–2.39) | **0.000** |
| Mech. inspiratory length(s) | 0.89 (0.70–0.99) | 0.83 (0.63–0.85) | **0.001** |
| Patient inspiratory length (s) | 0.92 (0.61–0.95) | 0.93 (0.59–1.07) | 0.518 |
| ΔPLdn (cm_H2O) | 18.9 (13.3–21.3) | 21.8 (13.8–34.6) | **0.026** |
| ExpPL (cm_H2O) | 0.2 (−0.8–3.4) | 3.4 (−0.04–5.5) | **0.010** |
| CLdyn (ml/cm_H2O) | 28.4 (19.4–40.3) | 20.9 (20.9–29.9) | 0.102 |
| RRSdyn (cm H2O s $L^{-1}$) | 8.4 (6.6–15.4) | 9.9 (1.2–13.1) | 0.073 |
| ΔPes (cm H2O) | 8.2 (4.1–9.2) | 7.1 (6.4–29.5) | 0.113 |
| Pmus (cm H2O) | 11.3 (7.2–11.8) | 10.3 (8.3–32.9) | 0.171 |
| ΔPdi (cm H2O) | 8.9 (2.7–9.2) | 6.9 (4.5–29.5) | 0.266 |
| Patient WOB (J $min^{-1}$) | 0.21 (0.14–0.40) | 0.09 (0.05–1.36) | 0.660 |
| PTPes minute(cm H2O$min^{-1}$) | 125.7(55.7–175.1) | 121.6(55.1–312.9) | 0.384 |
| InspVol/ΔPes (ml/cm H2O) | 59.7(42.9–146.9) | 88.4 (21.8–92.6) | 0.093 |
| PEEPi (cm H2O) | 0.9 (0.8–1.4) | 0.9 (0.9–1.2) | 0.485 |
| RSBI (breaths/min/L) | 55.7 (50.1–77.3) | 60.6 (40.6–101.2) | 0.717 |

**Conclusions:** During the active breathing phase, ICU survivors spend more time within a defined safe range of physiological effort variables.

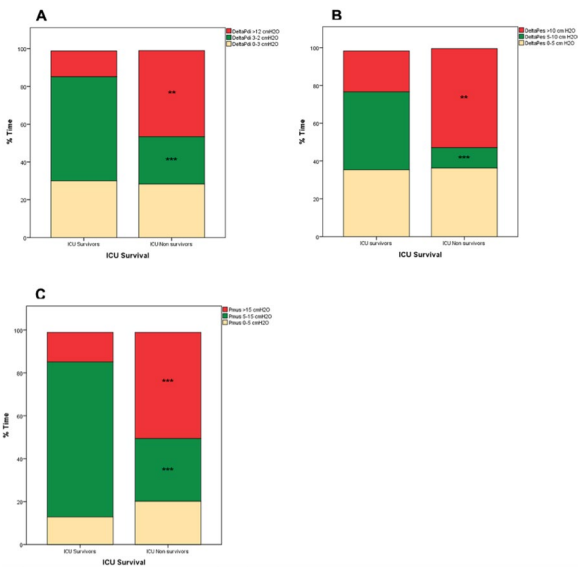


**Fig. (abstract 000362)** Stacked bar graphs represent the proportion of time that each group spent in the authors' defined different ranges

(high [red], safe [green], and low [pale yellow]) of the respiratory effort variables during the 7 days following the onset of respiratory effort (weighted analysis): transdiaphragmatic pressure (Pdi) (A), esophageal pressure (Pes) (B), and respiratory muscle pressure (Pmus) (C) ** $p \leq 0.01$, *** $p \leq 0.001$ vs ICU survivors' group

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5. This research did not receive financial support from any grants.


**Topic:** Acute respiratory failure and mechanical ventilation

## 000363

### Improving patient outcomes in cardiac surgery: the effectiveness of a nurse-led clinical pathway for postoperative hypotension management


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000363



**Introduction:** Hypotension after cardiac surgery is a common occurrence that can lead to various complications. Addressing hypotension effectively is crucial for improving patient outcomes. This study focuses on the impact of implementing a specific clinical pathway to manage postoperative hypotension at our Cardiovascular Intensive Care Unit (CVICU).
**Objectives:** The primary objective was to evaluate the effectiveness of the nurse-led clinical pathway in reducing the frequency, duration, and severity of intraoperative hypotension. Secondary objectives included assessing the impact on postoperative outcomes, such as acute kidney injury (AKI), ventilation hours, length of stay (LOS), readmission rates, and direct costs.
**Methods:** A retrospective analysis was conducted comparing data from 90 days before (baseline) and after (implementation) the introduction of the clinical pathway. The control group consisted of 43 patients, while the intervention group comprised 50 patients. Metrics analyzed included mean arterial pressure (MAP), cardiac index (CI), systemic vascular resistance (SVR), stroke volume (SV), pressor usage, time in target range, frequency of hypotension, duration of hypotension, severity of hypotension, and patient outcomes.
**Results:** The implementation of the nurse-led clinical pathway led to improvements in several metrics including the average time in hypotension per patient (83.5 min to 51 min), and total duration of hypotension (3549 min to 2526 min) with AUT 376 ± 386, 214 ± 232, TWA of AUT, 0.4 ± 0.43, 0.22 ± 0.25. There was a reduction in the percentage of patients experiencing hypotension after the implementation (93% to 88%) $p$ value 0.417 and pressors usage (37% to 30%) $p$ value 0.477 as well. Postoperative outcomes also improved, with reductions in AKI incidence (9% to 6%) $p$ value 0.27425, mean postoperative ventilation hours (7. to 6.3) p value 0.591, LOS (7.28 days to 6.36 days) $p$ value 0.286, 30-day readmission rates (14% to 8%) p value 0.176, and direct costs per case ($32,677.44 to $27,871.86).
**Conclusions:** The implementation of a clinical pathway for managing postoperative hypotension in the CVICU at our center has resulted in improved incidence and duration of hypotension, as well as enhanced postoperative outcomes. However, the small sample size limits our ability to demonstrate statistical significance. These findings suggest that structured clinical pathways can be an effective tool in enhancing patient care and reducing healthcare costs in the context of cardiac surgery.


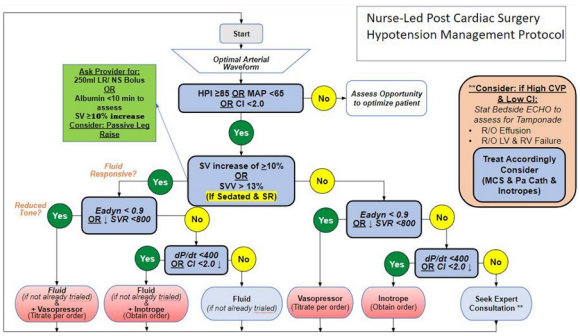


**Fig. (abstract 000363)** 1-Clinical pathway for postoperative hypotension management

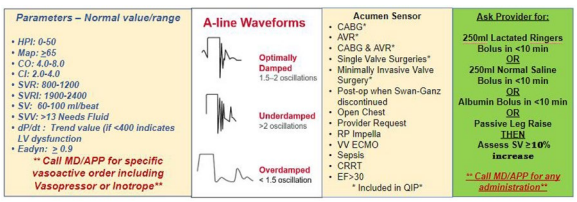


**Fig. (abstract 000363)** 2-Supplemental protocol aid for nurses

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6. None

**Topic:** Perioperative care

## 000364 Does gene expression explain the enigmatic "diabetes paradox" in critically ill patients? A prospective cohort study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000364

**Introduction:** Chronic hyperglycemia may generate a protective cellular conditioning against damage mediated by acute stress-induced hyperglycemia [1]. This cellular conditioning mechanism would consist of the downregulation of the glucose transporter-1 (GLUT-1) and the glucose transporter-4 (GLUT-4), leading to a disturbed insulin signaling [2].
**Objectives:** This study explored the association between diabetes mellitus (DM) and stress-induced hyperglycemia with skeletal muscle expression of key genes related to glucose transport.
**Methods:** This is a prospective cohort study. Skeletal muscle biopsies were taken from the left vastus muscle of critically ill adult patients and the expression of the genes of interest, namely insulin receptor substrate 1 (*IRS1*), insulin receptor substrate 2 (*IRS2*), solute carrier family 2 member 1 (*SLC2A1*), and solute carrier family 2 member 4 (*SLC2A4*), were analyzed using qPCR. The primary analysis planned was to compare the gene expression pattern between patients with and without DM. The secondary analyses planned were the comparison of gene expression in subgroups of patients with different levels of glycemia, glycemic variability, and glycemic gap.
**Results:** A total of 50 patients were included from April 2018 to September 2018. No differences in gene expression were found between patients with or without DM (Table 1). Individuals with hyperglycemia > 200 mg/dL exhibited a downregulation of *IRS1* compared to those without (0.4 [0.1–0.8] vs. 1.1 [0.3–2.2], $p = 0.04$). Similarly, patients with a glycemic gap ≥ 80 mg/dL exhibited a downregulation of *IRS1* compared to those with a glycemic gap < 80 mg/dL (0.3 [0.1–0.7] vs. 1 [0.4–2] $p = 0.04$). .

**Table 1 (abstract 000364)** Gene expression in skeletal muscle biopsies from patients with or without diabetes mellitus. Values are expressed in n-fold changes (ΔΔCq method) and described as median and interquartile range

| Gene | Patients with DM ($n = 15$) | Patients without DM ($n = 35$) | *p* |
|---|---|---|---|
| *SLC2A1* | 0.7 (0.3–1.5) | 0.6 (0.3–1.2) | 0.87 |
| *SLC2A4* | 0.9 (0.5–2.1) | 1 (0.5–1.6) | 0.88 |
| *IRS1* | 0.6 (0.4–1.8) | 0.9 (0.3–2) | 0.72 |
| *IRS2* | 0.9 (0.8–1.1) | 1 (0.6–1.8) | 0.58 |

**Conclusions:** No significant changes were found in skeletal muscle expression of *IRS1*, *IRS2*, *SLC2A1*, and *SLC2A4* in critically ill patients with or without DM. However, *IRS1* was downregulated in patients with stress-induced hyperglycemia.

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2. This work was supported by the Financiamento e Incentivo à Pesquisa (FIPE/HCPA), Hospital de Clínicas de Porto Alegre (project number 2017-0386), the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq—process number 420323/2018-0), and PROEX-CAPES.
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**Topic:** Metabolism, endocrinology, liver failure, and nutrition.

## 000365 Risk factors associated with disability in patients with subarachnoid hemorrhage in a neurotraumatic ICU: a 10-year study

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**Introduction:** About 35% of patients die after the first aneurysmal subarachnoid hemorrhage (SAH). Among those who survive, neurological damage is common, even when treatment is optimal. It is important to know the risk factors for disability and to identify those that can be prevented to reduce them.
**Objectives:** To evaluate risk factors for disability in patients with subarachnoid hemorrhage (SAH) admitted to a neurotraumatic ICU.
**Methods:** Prospectively collected data from patients admitted from October 2013 to December 2023 in a 10-bed Neurotrauma ICU. We analyzed: main diagnosis on admission; demographics, including sex and race; neurological data (clinical examination, pupil reactivity and size, and Glasgow Coma Score (GCS); aneurysm location and size; presence of intracranial hematoma (ICH); presence and volume of intraventricular hemorrhage; days to develop vasospasm; development of acute cerebral ischemia (ACI) and delayed cerebral ischemia (DCI); Fisher scale, modified Fisher scale, Hunt and Hess scale, World Federation of Neurosurgeons (WFNS) scale; presence of vasospasm on Doppler or arteriography; delayed ICU admission; treatment of the aneurysm; complications, including infections; Glasgow Outcome Scale (GOS) at ICU discharge and 6 months after ICU discharge and several other risk factors. Disability was defined as GOS ≤ 3.To identify those factors that maintained an independent association with disability, multivariate logistic regression analysis was performed. It was considered significant if $p \leq 0.05$.To determine the discriminatory ability of the Score, a receiver-operating characteristic (ROC) analysis was performed. The diagnostic ability of the Score was assessed by the area under the ROC curve, which was estimated using a 95% confidence interval. For the chosen cut-off point, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated.
**Results:** Among the 278 patients admitted for SAH, 99 (35,61%) had a GOS ≤ 3. DCI was not significantly different between the groups studied. Fifty-five patients died (19.8%), 38 within ICU. Decompressive craniectomy was performed in 13 (4.7%) patients with SAH, and 12 (12.1%) had a GOS ≤ 3 (Table 1a and 1b). Independent risk factors associated with disability were: mechanical ventilation (MV) > 7 days OR: 6.787 (3.113; 14.8). ACI OR: 5.141 (1.409; 18.75); Hunt and Hess score OR: 1.439 (1.108; 1.869) and Apache II on ICU admission per unit OR: 1.167 (1.094; 1.24) (Table 2).
The following score was derived from the logistic model: $0.155 \times \text{Apache II} + 1.915 \times \text{MV} > 7 \text{ days} + 1.637 \times \text{ACI} + 0.364 \times \text{Hunt}$ and Hess score.
Here, MV > 7 days = 1/0 according to MV > 7 days or not.
The area under the curve (AUC) was 0.919 IC 95% IC (0.884; 0.954) (Figure 1). Cut-off point: 0.2334; specificity: 82.2 [75.5; 87.5]; sensitivity 91.9 [84.7; 96.4]; NPV 94.7 [89.8; 97.7]; PPV: 74.6 [65.9; 82.0].

**Conclusions:** In our study, 35.61% of SAH patients had severe disability at ICU discharge In SAH patients admitted to a neurotraumatic ICU, the risk factors that were independently associated with disability were: score: MV > 7 days, ACI, Hunt and Hess score and Apache II at ICU admission per unit. A predictive score was obtained.

**Table 1a (Abstract 000365)** Univariate analysis of SAH disability GOS $\leq 3$

| Tabla 1.a | SAH patients N = 278 | No N = 176 | Yes N = 99 | P |
|---|---|---|---|---|
| Age (years) | 56.0 ± 14.6 | 54.2 ± 13.8 | 59.3 ± 15.6 | 0.006 |
| Sex female | 185 (66.5) | 119 (66.5) | 66 (66.7) | 0.975 |
| Apache-II at admission | 13.9 ± 7.6 | 10.4 ± 5.6 | 20.2 ± 6.7 | < .001 |
| SOFA ICU at admission | 2 (0 - 6) | 1 (0 - 3) | 7 (4 - 9) | < .001 |
| Death | 55 (19.8) | 3 (1.7) | 52 (52.5) | < .001 |
| Death at ICU discharge | 38 (13.7) | 0 | 38 (38.4) | < .001 |
| Hospital death | 16 (5.8) | 3 (1.7) | 13 (13.1) | < .001 |
| Arterial hypertension | 124 (44.6) | 67 (37.4) | 57 (57.6) | 0.001 |
| Diabetes | 27 (9.7) | 12 (6.7) | 15 (15.2) | 0.023 |
| Dyslipemia | 64 (23.0) | 37 (20.7) | 27 (27.3) | 0.211 |
| Smoker | 117 (42.1) | 74 (41.3) | 43 (43.4) | 0.735 |
| Platelet inhibitors | 24 (8.6) | 12 (6.7) | 12 (12.1) | 0.124 |
| Emergency surgery at admission | 46 (16.6) | 21 (11.7) | 25 (25.2) | 0.004 |
| Oriented | 145 (52.4) | 124 (69.7) | 21 (21.2) | < .001 |
| Alert | 156 (56.1) | 127 (71.0) | 29 (29.3) | < .001 |
| Confused | 42 (15.1) | 22 (12.3) | 20 (20.2) | 0.078 |
| Stuporous | 66 (23.7) | 24 (13.4) | 42 (42.4) | < .001 |
| Bilateral mydriasis | 10 (3.6) | 1 (0.6) | 9 (9.1) | < .001 |
| Anisochoric pupils | 30 (10.8) | 12 (6.7) | 18 (18.2) | 0.003 |
| Isochoric pupils | 241 (86.7) | 165 (92.2) | 76 (76.8) | < .001 |
| Bilateral aneurysm | 244 (87.8) | 167 (93.3) | 77 (77.8) | < .001 |
| No reactive pupil | 16 (5.8) | 4 (2.2) | 12 (12.1) | < .001 |
| Bilateral aneurysm | 17 (6.1) | 15 (8.4) | 2 (2.0) | 0.034 |
| Anterior communicating artery aneurysm | 81 (29.1) | 46 (25.7) | 35 (35.4) | 0.09 |
| Posterior inferior communicating artery aneurysm | 10 (3.6) | 4 (2.2) | 6 (6.1) | 0.175 |
| Aneurysm clipping | 53 (19.1) | 25 (14.0) | 28 (28.3) | 0.004 |
| Intravetricular thrombolysis | 4 (1.4) | 1 (0.6) | 3 (3.0) | 0.131 |
| Embolization of the aneurysm | 161 (57.9) | 106 (59.2) | 55 (55.6) | 0.554 |
| Decompressive craniectomy | 13 (4.7) | 1 (0.6) | 12 (12.1) | < .001 |
| Intraoperative aneurysm rupture | 18 (6.5) | 11 (6.2) | 7 (7.1) | 0.764 |
| Died after treatment | 6 (2.2) | 0 | 6 (6.1) | 0.002 |
| External ventricular device | 135 (48.6) | 56 (31.3) | 79 (79.8) | < .001 |

Datos son medias ± DS, medians (RIQ) y frecuencias (%)Values are frequencies (%), means ± SD and medians (IQR

**Table 1b (abstract 000365)** SAH disability

| Table 1b | SAHPatients N = 278 | GOS > 3 N = 176 | GOS ≤ 3 N =99 | P |
|---|---|---|---|---|
| Stroke | 80 (28.8) | 32 (17.9) | 48 (48.5) | < .001 |
| Hydrocephalus | 111 (39.9) | 45 (25.1) | 66 (66.7) | < .001 |
| *MV > 7 days* | 88 (31.6) | 18 (10.1) | 70 (70.7) | < .001 |
| ICH | 73 (26.3) | 30 (16.8) | 43 (43.4) | < .001 |
| Frontal ICH | 46 (16.6) | 13 (7.3) | 33 (33.3) | < .001 |
| Temporal ICH | 34 (12.2) | 16 (8.9) | 18 (18.2) | 0.024 |
| Vasospasm (Doppler) | 60 (24.9) | 41 (26.1) | 19 (22.6) | 0.55 |
| Vasospasm (Arteriographgy) | 58 (22.1) | 36 (20.9) | 22 (24.2) | 0.546 |
| Acute cerebral isquemia | 22 (7.9) | 6 (3.4) | 16 (16.2) | < .001 |
| DCI | 64 (23.0) | 33 (18.4) | 31 (31.3) | 0.015 |
| Rebleeding 72 hours | 12 (4.3) | 2 (1.1) | 10 (10.1) | < .001 |
| Ventricilitis | 23 (8.3) | 11 (6.2) | 12 (12.1) | 0.083 |
| Fisher scale | 4 (3 - 4) | 3 (2 - 4) | 4 (4 - 4) | < .001 |
| Fisher modified scale | 4 (3 - 4) | 3 (2 - 4) | 4 (4 - 4) | < .001 |
| Hunt and Hess scale | 2 (1 - 4) | 1 (1 - 2) | 4 (2 - 5) | < .001 |
| WFNS scale | 2 (1 - 4) | 1 (1 - 2) | 4 (2 - 5) | < .001 |
| APACHE at vasospasm | 14 (8 - 18) | 12 (8 - 16) | 18 (16 - 23) | < .001 |
| SOFA at vasospasm | 4 (2 - 6) | 2 (1 - 4) | 6 (4 - 8) | < .001 |
| Delayed ICU re-admission | 10 (2 - 24) | 9 (2 - 24) | 12 (3 - 24) | 0.652 |
| GCS on site | 15 (12 - 15) | 15 (14 - 15) | 13 (6 - 15) | < .001 |
| GCS in emergency room | 14 (10 - 15) | 15 (14 - 15) | 9 (6 - 14) | < .001 |
| GCS at ICU admission | 14 (5 - 15) | 15 (13 - 15) | 5 (3 - 10) | < .001 |

Datos son medias ± DS, medians (RIQ) y frecuencias (%)Values are frequencies (%), means ± SD and medians (IQR). MV: mechanical ventilation, ICH: intracerebral hematoma, DCI: delayed cerebral ischemia, GOS: Glasgow outcome score, WFNS: World Federation Neurosurgical Societies

**Table 2 (Abstract 000365)** Multivariate logistic regression SAH disability GOS $\leq 3$ at ICU discharge

| | P | Odds-Ratio (95% IC) |
|---|---|---|
| Apache-II at iat ICU admission (per unit) | < 0.001 | 1.167 (1.094; 1.24) |
| Mechanical Ventilation> 7 days | < 0.001 | 6.787 (3.113; 14.8) |
| Acute cerebral isquemia | 0.011 | 5.141 (1.409; 18.75) |
| Hunt y Hess scale | 0.007 | 1.439 (1.108; 1.869) |

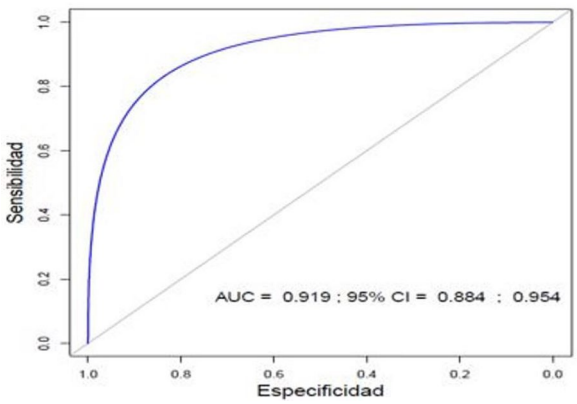


**Fig. 1 (Abstract 000365)** ROC curve SAH and disability 10 years

**Topic:** Neurointensive care

## 000366

### Efficacy and hospital safety of the use of cefiderocol in a series of 21 patients with severe Gram-negative bacilli infections with limited treatment options, in an ICU with selective digestive decontamination of a university and tertiary hospital

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000366

**Introduction:** Current antibiotic combinations do not cover all of multidrug-resistant Gram-negative bacteria or some of their resistance mechanisms, or have significant safety issues (e.g., nephrotoxicity). Cefiderocol has demonstrated potent activity against a wide range of multidrug-resistant Gram-negative bacteria in adults with limited treatment options.
**Objectives:** To analyze the efficacy and safety of the use of cefiderocol in a series of patients with severe Gram-negative bacilli (GNB) infections with limited treatment options in an ICU with selective digestive decontamination (SDD).
**Methods:** We conducted a retrospective study of patients over 18 years of age admitted to our ICU with severe Gram-negative bacilli infections from November 1, 2021 to October 31, 2023. We used DDS since October 1, 2011 in our ICU. A standard dose of cefiderocol 2 g iv/8 h as extended perfusion of 3 h was administered. Two g iv/6 h was used in case of creatinine clearance > 120 ml/h, or ECMO use with normal renal function. The dose was adjusted at 24 h according to renal function. Cefiderocol was also used in patients with *Acinetobacter baumannii*. The absence of important data or death within 48 h was exclusion criterion.
The reason of admission, severity of the patient at admission, risk factors for infection, as well as microbiological criteria, infection markers, clinical criteria at -3, 0, and 7 days after starting treatment were described. The day of microbiological and clinical negativization was evaluated. Also, antibiotic treatment 14 days before starting cefiderocol, as well as concomitant treatment with it, duration of treatment and mortality at 28 days after starting treatment with cefiderocol. Categorical variables were summarized as frequencies and numerical variables as means and standard deviation or medians and interquartile ranges (IQR).
**Results:** Twenty-one patients were treated with cefiderocol during the study period in our ICU. All used SDD. Mean age was 58.76 ± 12.9 and 61.9% (13/21) were male (see Table 1). The treated infection was ICU-acquired in 90.5% (19/21) of the patients. Three of the 21 patients had transplantation. The most frequent infection was ventilator-associated pneumonia in 11/21, 34.3%, and 6/21 of other respiratory diagnoses. In total, (17/21) 81% were of respiratory origin. Mechanical ventilation was used in 90.5% of patients (19/21). The most frequent germ was multidrug-resistant *Pseudomonas aeruginosa*. Two patients had *Acinetobacter baumannii* with clinical and microbiological cure, were alive 28 days after starting treatment and at hospital discharge. Four patients required ECMO and needed renal replacement techniques. At 7 days of treatment germ eradication was 42.85 (9/21), and clinical cure was 33.3% (7/21). Mortality at 28 days was 34.3%. Clinical cure at the end of treatment was 61.9% (13/21) with a microbiological eradication at discharge of 52.38% (11/21) (Figure 1) There were no resistant co-infections or adverse effects attributable to cefiderocol administration.
**Conclusions:** In our ICU, the use of cefiderocol in patients with severe GNB infections obtained a clinical cure at the end of treatment of 61.9%, with a microbiological eradication at discharge of 52.38%. Mortality at 28 days was 34.3%. There were no adverse effects to cefiderocol administration.

**Table 1 (abstract 000366)** Patients characteristsics treated with cefiderocol

| | N= 21 |
|---|---|
| Age | 58.76 ± 12.9 |
| APACHE II admission | 17 (8;32) |
| APACHE II infection | 19 (12;27.5) |
| SDD | 21(100.0) |
| Sex male | 13(61.9) |
| SOFA infection | 8 (7;11) |
| Charlson Index | 3 (1,5: 5.5) |
| Coronary artery disease | 2 (9.5) |
| Urgent surgery | 17(81.0) |
| Immunosuppression | 3 (14.3) |
| Neutropenia | 2 (9.5) |
| Immunosuppression | 3 (14.3) |
| Parenteral nutrition | 7 (33.3) |
| Malnutrition | 8(38.1) |
| Diabetes | 3(14.3) |
| COVID 19 | 4 (19.0) |
| Renal replacement therapy | 15 (71.4) |
| ECMO | 4 (19.0) |
| Transplantation | 3(14.3) |
| VAP | 11 (34.3) |
| MV tracheobronchitis | 5 36.2) |
| Secondary bacteremia | 1(4.8) |
| Discharge from ICU | 6(31.7) |
| Exitus at 28 days | 11 (34.3) |
| Hospital discharge | 11 (34.3) |
| *Acinetobacter baumannii* | 2 (9.5) |
| *Stenotrophomonas malthaphilia* | 2 (9.5) |
| *Klebsiella pneumoniae* | 4 (19.0) |
| *Pseudomonas aeruginosa* MR | 10 (47.6) |
| *Pseudomonas putida* | 3 (14.3) |
| Duration of treatment with cefiderocol | 10 (7.5;13) |
| Cefiderocol in monotherapy | 16 (76.2) |
| Type of patient | |
| Medical | 19 (90,5) |
| Scheduled surgery | 0 |
| Urgent surgery | 2(9.5) |
| Inflammatory response admission | |
| Sepsis | 14 (66.7) |
| Septic shock | 7 (33.3) |
| Septic shock day 0 (infection) | 10 (47, 6) |
| ICU stay, days | 58,33 ± 35,71 |

The data are number and frequency, mean + standard deviation or median with interquartile range. SDD: Selective Digestive Decontamination; VAP: ventilator-associated pneumonia; MV: mechanical ventilation.

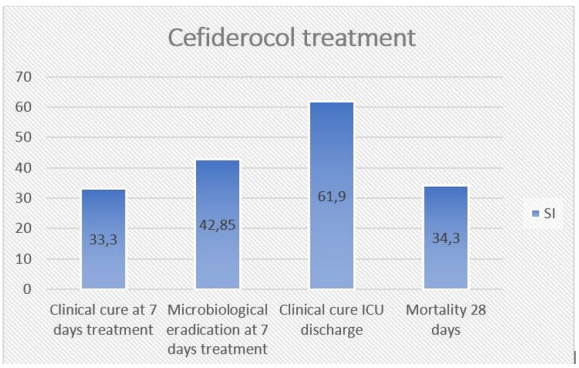


**Fig. 1 (abstract 000366)** Cefiderocol treatment results

**Topic:** Sepsis.

## 000367

### Prolonged inhaled sedation with isoflurane: experience in a tertiary hospital

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000367

**Introduction:** In Intensive Care Units (ICUs), the use of inhaled sedation (IS) with isoflurane is rising due to its benefits over intravenous sedation (IVS). However, there is a gap in research on IS durations beyond 72 h despite increasing experience in managing critically ill patients.
**Objectives:** Describe patients receiving IS from ICU admission for over 72 h, assessing its effectiveness.

- Describe delirium occurrence rate and duration.
- Document identified adverse effects.

**Methods:** Prospective, observational single-center study from May 2022 to July 2023, collecting sociodemographic data, sedation levels, adverse effects, isoflurane doses, need for other sedatives, and delirium details. Additionally, evaluates awakening time to RASS 0, opioid and neuromuscular relaxant use, and SF-12 questionnaire at 6 months post-ICU discharge for quality-of-life assessment. Patients receiving IS for over 72 h are included, excluding minors, prior IVS patients, and deceased individuals. Qualitative variables presented as percentages, and quantitative variables as means ± standard deviation using R software for analysis.
**Results:** Out of 68 patients receiving IS, 20 received it continuously for more than 72 h. The mean age was 46 ± 13 years, with males making up 80% of the participants. Severity and comorbidity scores at admission were: APACHE II 26.2 ± 5.4, SAPS II 61.0 ± 10.7, SOFA 6.9 ± 3.7, and CHARLSON 1.5 ± 1.2.
Respiratory issues, including ARDS and status asthmaticus, led to 70% of admissions, often requiring deep sedation. Patients stayed in the ICU for an average of 23 ± 11 days, with mechanical ventilation needed for approximately 19 ± 11 days. IS was administered for an average of 11 ± 7 days, with mean doses of 3.7 ± 1.8 ml.
The target RASS value was achieved in all cases without requiring additional sedatives. During the weaning phase, a switch to mild IVS was made, achieving RASS 0 in 3 ± 2 days.
Delirium affected 25% of cases, lasting 3 ± 1.9 days on average. No significant adverse effects were noted, including no increased vasoactive support, QTc interval prolongation, or hepatic/renal function changes. While bilateral mydriasis is notable in our experience, none occurred in this cohort. However, one case of hyperthermia required inhaled sedation withdrawal. Opioid consumption decreased by about 50% due to inhaled sedation's potentiation effect. Likewise, neuromuscular relaxant (NMR) usage decreased due to both potentiation and train-of-four (TOF) monitoring. Quality-of-life evaluation at 6 months post-ICU discharge, especially in mental aspects (MCS12), showed higher scores than reported in literature.
**Conclusions:** Prolonged inhaled sedation is effective and safe in our population sample, with faster awakening and lower delirium rates compared to IVS. SF-12 scores at 6 months post-ICU discharge, especially in mental aspects, are higher than in similar populations. Further validation studies are needed.

**Topic:** Sedation, analgesia, and delirium

## 000368

### Inhaled sedation for periods exceeding 21 days: a descriptive study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000368

**Introduction:** Inhaled sedation (IS) using isoflurane is increasingly being adopted in Intensive Care Units (ICUs).

**Compared to conventional intravenous sedation (IVS), inhaled sedation (IS) with isoflurane may offer benefits, such as reduced opioid consumption, increased number of days free from mechanical ventilation (MV), or shorter awakening periods. However, most bibliographic references to date have not examined inhaled sedation (IS) periods longer than 72 h.**
**Objectives:** To evaluate the effectiveness of IS for a period greater than 21 days.

- To analyse adverse effects associated with IS.
- To assess the awakening process and the incidence of delirium.

**Methods:** We conducted a descriptive, observational, prospective, single-centre study from May 2022 to July 2023. The study included patients who received inhaled sedation (IS) from ICU admission and for more than 21 days. We analysed sociodemographic characteristics, reasons for ICU admission, duration of mechanical ventilation (MV), administered doses of isoflurane, effectiveness of IS using the RASS objective scale and BIS system over time, as well as the awakening process. Additionally, we monitored the presence of delirium and potential related adverse effects.
**Results:** The three patients were males aged 44, 56, and 63 years, admitted to the ICU for acute respiratory failure. The reasons for admission included asthmatic status (67%) and severe chest trauma (33%). They required deep sedation and long-term neuromuscular blockade due to infectious complications. Total MV days were 31 days in two patients and 43 days in the third, with corresponding ICU stays of 35, 38, and 45 days, respectively. Inhaled sedation (IS) was initiated upon admission, successfully achieving the target RASS and BIS values in 100% of cases without the need for additional intravenous sedation (IVS). The average administered doses of isoflurane ranged from 4 to 6 ml/h. Total IS days were 23, 23, and 24 days respectively. Subsequently, weaning was performed with light sedation, achieving RASS 0 within the following 24–96 h. Hyperactive delirium, diagnosed through the CAM-ICU scale, was detected in one out of the three patients (33%). Regarding adverse effects, we did not observe increased need for vasopressor support or alterations in hepatic, renal, or QTc complex function. Although bilateral unreactive mydriasis is not uncommon in our experience, it was not detected in any of these three cases.
**Conclusions:** In our case series of patients receiving IS for more than 21 days, we observed that IS remained effective over time without the need for additional intravenous sedatives. The weaning process was conducted using light sedation, achieving a RASS score of 0 in less than 4 days. The incidence of delirium was 33%. Additionally, no adverse effects were detected during IS administration.

**Topic:** Sedation, analgesia, and delirium

**000369**

## The effect of hospital-acquired infections on mortality in polytrauma patients followed in intensive care unit

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000369

AQ15 **Introduction:** Polytrauma is a life-threatening condition. 10% of deaths in trauma patients occur due to sepsis. Infection risks in trauma patients include damage to mechanical barriers secondary to trauma, exogenous bacterial contamination, local wound factors, and invasive diagnostic and/or therapeutic interventions. In addition, weakening of the patient's immune system; damage to the host defense, which impairs both humoral and cell-mediated responses, is another risk factor.

**Objectives:** The primary aim of this study is to determine the infectious agents in polytrauma patients followed in intensive care unit (ICU) and to find out the effect of these factors on mortality. Secondary purpose is to identify antibiotic agents that are sensitive and resistant to infectious agents and to determine other clinical and laboratory parameters that may affect mortality.

**Methods:** Adult patients aged ≥ 18 years who were followed in ICU between March 2019 and November 2023. The patients had the polytrauma criteria were included in the study. Definition of polytrauma by Pape et al. and ISS classification was used for trauma severity. Demographic characteristics of the patients, type of trauma, injured body part, body part where surgery was performed, type of culture sample, isolated microorganisms, required and duration of MV, length of stay in ICU, and mortality rates were recorded.

**Results:** Of a total of 304 polytrauma patients, the most common type of trauma was road traffic accident (61.2%), the most common injured body part was the thorax (83.6%), and the most common was extremity surgery (40.8%). According to the ISS grouping, 55.3% of the patients have an ISS score between 0 and 20. A total of 428 ICU patients' samples were examined. The most frequently reported sample type was tracheal aspirates (33%). Surviving and deceased patient groups were compared; the rate of patients with higher ISS scores was higher in the deceased group and there was statistical significance between the roups ($p = 0.000$). Abdominal surgery was performed more frequently in the deceased group and limb surgery was performed more frequently in the survived group, and these parameters were significantly different between the two groups ($p$ values 0.04; 0.000, respectively) (Table 1). All patients who died required MV. The most frequently detected microorganisms in all culture results in all patients were *Staphylococcus epidermidis* (15.1%), *Acinetobacter baumannii* (11.5%), *Pseudomonas aeruginosa* (7.6%), and *Klebsiellapneumoniae* (5.6%), respectively. When the culture results of samples taken from surviving and deceased patients were compared, there was no difference between the microorganisms isolated. In the comparison after the isolated of mycoorganisms, *Klebsiella pneumoniae* was found to be significantly higher in the group that deceased, and *Proteus mirabilis* was found to be significantly higher in the group that survived (p values; 0.007 and 0.045, respectively). In this study, mortality rate was found 17.4% (Table 2). According to the results of logistic regression analysis, age ($p = 0.008$), duration of MV ($p = 0.038$), duration of hospitalization ($p = 0.010$), APACHE II score ($p = 0.000$), ISS score ($p = 0.000$), and intracranial trauma ($p = 0.000$) had a statistically significant effect on mortality. In multilogistic regression analysis, age ($p = 0.036$), length of stay in hospital ($p = 0.010$), APACHE II score ($p = 0.038$), and ISS score ($p = 0.000$) had a statistically significant effect on mortality.

**Conclusions:** According to these results, in our opinion that ISS values will be guiding in determining the prognosis of multitrauma patients in ICU. In addition, older age, higher APACHE II score, anatomical localization of trauma, and therefore damaged organs and causative pathogens have an impact on mortality.

**Table 1 (abstract 000369)** Demographic characteristics, type of trauma, and other clinical characteristics of survived and deceased patients

| | | Survived (n=251) | | Deceased (n=53) | | Total (n=304) | | p |
|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | |
| Gender | Female | 72 | 28.7 | 11 | 20.8 | 83 | 27.3 | 0.314 |
| | Male | 179 | 71.3 | 42 | 79.2 | 221 | 72.7 | |
| ISS groups | 0-20 | 163 | 64.9 | 5 | 9.4 | 168 | 55.3 | **0.000** |
| | 21-30 | 70 | 27.9 | 11 | 20.8 | 81 | 26.6 | |
| | 31-40 | 12 | 4.8 | 13 | 24.5 | 25 | 8.2 | |
| | 41-50 | 6 | 2.4 | 24 | 45.3 | 30 | 9.9 | |
| Travma types | Fall from height | 13 | 5.2 | 1 | 1.9 | 14 | 4.6 | 0.351 |
| | Traffic accident outside vehicle | 74 | 29.5 | 20 | 37.7 | 94 | 30.9 | |
| | Traffic accident inside vehicle | 157 | 62.5 | 29 | 54.7 | 186 | 61.2 | |
| | Motorbike/ATV accident | 6 | 2.4 | 3 | 5.7 | 9 | 3.0 | |
| | Other | 1 | 0.4 | 0 | 0.0 | 1 | 0.3 | |
| Injured bodypart | Intracranial trauma | 133 | 53.0 | 36 | 67.9 | 169 | 55.6 | 0.066 |
| | Maxillofacial trauma | 108 | 43.0 | 21 | 39.6 | 129 | 42.4 | 0.762 |
| | Thorax | 208 | 82.9 | 46 | 86.8 | 254 | 83.6 | 0.620 |
| | Abdominal trauma | 113 | 45.0 | 24 | 45.3 | 137 | 45.1 | 0.999 |
| | Retroperitoneal trauma | 37 | 14.7 | 6 | 11.3 | 43 | 14.1 | 0.665 |
| | Upper limb trauma | 70 | 27.9 | 15 | 28.3 | 85 | 28.0 | 0.999 |
| | Lower limb trauma | 114 | 45.4 | 27 | 50.9 | 141 | 46.4 | 0.561 |
| | Pelvic trauma | 76 | 30.3 | 17 | 32.1 | 93 | 30.6 | 0.925 |
| Surgery | Cranial surgery | 12 | 4.8 | 4 | 7.5 | 16 | 5.3 | 0.494 |
| | Thorax surgery | 20 | 8.0 | 3 | 5.7 | 23 | 7.6 | 0.777 |
| | Abdominal surgery | 15 | 6.0 | 8 | 15.1 | 23 | 7.6 | **0.040** |
| | Pelvikc surgery | 29 | 11.6 | 2 | 3.8 | 31 | 10.2 | 0.147 |
| | Limb surgery | 115 | 45.8 | 9 | 17.0 | 124 | 40.8 | **0.000** |
| Requirement of MV | | 75 | 29.9 | 53 | 100.0 | 128 | 42.1 | **0.000** |
| Frequency of isolated microorganisms | | 75 | 29.9 | 20 | 37.7 | 95 | 31.3 | 0.338 |

**Table 2 (abstract 000369)** Comparison of microorganisms between survived and deceased groups

| | | Survived (n=297) | | Deceased (n=131) | | Total (n=428) | | p |
|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | |
| Bacteria | Gram positive cocs | 107 | 36.0 | 28 | 21.4 | 135 | 31.5 | **0.005** |
| | Gram negative basil | 159 | 53.5 | 91 | 69.5 | 250 | 58.4 | |
| | Gram positive diphtheriod basil | 12 | 4.0 | 8 | 6.1 | 20 | 4.7 | |
| | Fungus | 7 | 2.4 | 0 | 0.0 | 7 | 1.6 | |
| | Others | 12 | 4.0 | 4 | 3.1 | 16 | 3.7 | |
| Microorganisms | Acinetobacter baumannii | 43 | 14.5 | 23 | 17.6 | 66 | 15.4 | 0.504 |
| | Burkholderia (p.) cepacia | 1 | 0.3 | 0 | 0.0 | 1 | 0.2 | 0.999 |
| | Corynebacterium striatum | 18 | 6.1 | 11 | 8.4 | 29 | 6.8 | 0.498 |
| | Enterobacter aerogenes | 4 | 1.3 | 0 | 0.0 | 4 | 0.9 | 0.318 |
| | Enterobacter cloacae | 6 | 2.0 | 1 | 0.8 | 7 | 1.6 | 0.681 |
| | Enterococcus faecalis | 6 | 2.0 | 2 | 1.5 | 8 | 1.9 | 0.999 |
| | Enterococcus faecium | 6 | 2.0 | 2 | 1.5 | 8 | 1.9 | 0.999 |
| | Escherichia coli | 12 | 4.0 | 4 | 3.1 | 16 | 3.7 | 0.785 |
| | Klebsiella pneumoniae | 31 | 10.4 | 27 | 20.6 | 58 | 13.6 | **0.007** |
| | Proteus mirabilis | 14 | 4.7 | 1 | 0.8 | 15 | 3.5 | **0.045** |
| | Providencia stuartii | 3 | 1.0 | 0 | 0.0 | 3 | 0.7 | 0.556 |
| | Pseudomonas aeruginosa | 35 | 11.8 | 19 | 14.5 | 54 | 12.6 | 0.533 |
| | Pseudomonas fluorescens/putida | 1 | 0.3 | 0 | 0.0 | 1 | 0.2 | 0.999 |
| | Serratia marcescens | 3 | 1.0 | 2 | 1.5 | 5 | 1.2 | 0.644 |
| | Staphylococcus aureus | 19 | 6.4 | 6 | 4.6 | 25 | 5.8 | 0.606 |
| | Staphylococcus epidermidis | 51 | 17.2 | 18 | 13.7 | 69 | 16.1 | 0.455 |
| | Staphylococcus haemolyticus | 11 | 3.7 | 4 | 3.1 | 15 | 3.5 | 0.999 |
| | Staphylococcus hominis subsp. hominis | 18 | 6.1 | 2 | 1.5 | 20 | 4.7 | 0.072 |
| | Stenotrophomonas maltophilia | 3 | 1.0 | 2 | 1.5 | 5 | 1.2 | 0.644 |
| | Candida Albicans | 9 | 3.0 | 4 | 3.1 | 13 | 3.0 | 0.999 |
| | Candida Parapisilosis | 4 | 1.3 | 3 | 2.3 | 7 | 1.6 | 0.442 |
| | Candida Glabrata | 1 | 0.3 | 0 | 0.0 | 1 | 0.2 | 0.999 |
| | Aspergillus | 2 | 0.7 | 0 | 0.0 | 2 | 0.5 | 0.999 |

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**Topic:** Infections and prevention

### 000370

### A prognostic model of the probability of developing respiratory failure in the postoperative period after cardiovascular surgery

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000370

**Introduction:** Respiratory failure (RF) is a frequent complication of cardiac surgery. The determination of predictors would help to identify patients of risk for early prevention of respiratory failure in the postoperative period.
**Objectives:** Creation of a prognostic scale for determining the probability of developing RF in the early postoperative period.
**Methods:** 248 patients after cardiac surgery were included (1 group—SpO2 < 92%, 2 group—SpO2 ≥ 92%). SpO2 was evaluated 8–10 h after trachealextubation on breathing atmospheric air.
**Results:** To study the influence of predictor factors on the development of RF, a one-factor logistic regression was performed. The next stage was the creation of a prognostic model, depending on statistically significant factors after the first stage, using multifactorial logistic regression. The logistic function was obtained ($p < 0.001$):
$P = 1/(1 + e{-}z)$.
$z = 0.13*\text{Xhypovent} + 0.19*\text{XBMI} + 0.45*\text{XVENT} + 2.25*\text{Xsmok} + 2.84*\text{Xproced} - 9.5$, As a result of the analysis, the values of regression coefficients, the presence of hypoventilation, BMI, duration of ventilation, smoking experience of more than 15 packs/years, and simultaneous performance of three or more procedures were obtained—factors that increase the likelihood of developing RF in the early postoperative period (sensitivity—95.2%, specificity—73.9%). Cut-off points for BMI and ventilator 27.75 kg/m$^2$ (Se = 67.7%, Sp = 65.2%, 95% CI [0.56–0.79], AUC 0.68, $p < 0.001$) and 6.3 h (Se = 66.1%, Sp = 78.3%, 95% CI [0.65–0.78], AUC 0.71, $p < 0.001$) accordingly. These factors were included in regression with optimal scaling for assigning points, points are obtained by multiplying the importance coefficient by 100 (Table 1).
The final score in the sample was calculated. To determine the threshold score, ROC analysis was performed with a graph (AUC = 0.68, 95%CI 0.57–0.78, $p = 0.004$, cut-off point 46 points). Patients with threshold scores above 46 have a high probability of RF in the postoperative period after cardiac surgery (sensitivity-64.8%, -74.8%) (Fig. 1).

**Table 1 (abstract 000370)** The result of categorical regression with optimal scaling

| Predictor | Importance | Scores |
|---|---|---|
| Hypoventilation | 0,09 | 9 |
| Body mass index | 0,19 | 19 |
| Duration of ventilation | 0,44 | 44 |
| Smoking experience of more than 15 packs/years | 0,08 | 8 |
| Simultaneous performance of three or more procedures | 0,20 | 20 |

**Conclusions:** The statistical model of RF prognosis in cardiac surgery patients was developed. Identification of patients with high probability of such a formidable complication is of great importance for early initiation of preventive and therapeutic measures.

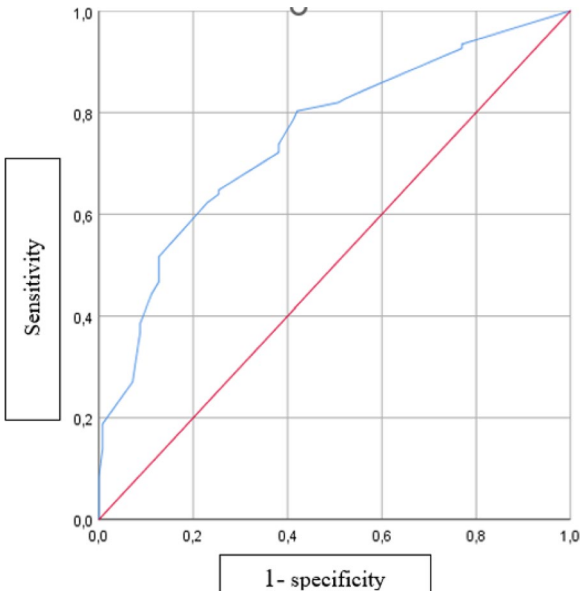


**Fig. 1 (abstract 370)** The ROC curve characterizing the dependence of the prognosis of the development of RF in the postoperative period in cardiac surgery patients

**Topic:** Acute respiratory failure and mechanical ventilation

### 000371

### TOURSS: pracTical cOconstrUcted intensive caRe patients' well-being and Safety Scale

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000371

**Introduction:** Intensive care unit (ICU) patients endure significant stress due to their critical condition and the noisy, aggressive environment. Communication difficulties contribute to feelings of frustration and stress. Despite efforts to humanize ICUs, there is a lack of real-time assessment tools for patient well-being and safety.
**Objectives:** To develop a scale assessing the feeling of well-being and safety in real time among ventilated ICU patients.
**Methods:** First, a systematic review was performed to identify study outcomes evaluating safety and well-being feeling of ICU patients. Results were used to organize focus groups, including 23 former patients and 5 relatives, and explored patients' experiences and needs

during the ICU stay, informing scale development in a co-construction framework. The scale was then developed via three-round Delphi methodology by a patient-professional expert group ($n=55$ participants). The scale was then validated through patients' interview for face validity and implementation in a multicentric cohort of 84 ICU patients. Finally, the scale was translated into English, retro-translated to French, and cross-validated.

**Results:** The systematic review initially identified 883 articles, with 136 (15%) included for analysis. Focus groups highlighted the communication challenges faced by patients and healthcare workers and the need for human support in ICUs. Scale construction emphasized simplicity and positive wording, resulting in an initial 6-item pragmatic bedside tool. Face validation showed that the constructed scale was acceptable in terms of lengths and effort required to respond and let to refining the scale changing item evaluation formats to a four-stage Likert scale. Cohort validation, comprising 305 scale administrations, indicated overall satisfaction and adequate completion rates. Psychometric analysis revealed issues with one item and residual correlation analysis suggested potential redundancy between two items, leading to the removal of two items from the scale. A simplified 4-item scale (Comfort, Safety, Information, Trust) demonstrated improved reliability and coherence, and English translation showed no issue after retro-translation.

**Conclusions:** The final scale ranges from 0 to 12 and provides a practical measure of patient well-being in ICUs and is usable in real time at the bedside.

**Reference(s)**

1. Institutional grant: appel d'offre interne, CHRU Tours, Tours, France.

**Topic:** Health services research and outcome

## 000372

## Incidence and presentation of pulmonary embolism in the intensive care unit: a retrospective analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000372

**Introduction:** Pulmonary embolism (PE) is a significant cause of in-hospital mortality, often leading to admission to the intensive care unit (ICU) due to hemodynamic instability and/or severe hypoxemia. Worldwide data suggest an increasing incidence of PE.

**Objectives:** Worldwide data suggest an increasing incidence of PE. This study aimed to analyze changes in the incidence of PE, as well as the presentation type according to severity, treatments, independent factors associated with its diagnosis, and outcomes of patients admitted to a tertiary university hospital's ICU.

**Methods:** A retrospective study was conducted using a database including all patients admitted to the ICU between 2018 and 2023. PE was confirmed using CT angiography.

Severity stratification (high, intermediate–high, intermediate–low, low) was based on 2019 clinical guideline criteria. Right-ventricular dysfunction was diagnosed by echocardiography in the presence of right-ventricular dilation (right/left area ratio > 0.6) and/or paradoxical septal motion. Demographic and relevant clinical and physiological data were collected within the ICU stay. Follow-up time was until intensive care unit discharge. Continuous variables are presented as mean (95% confidence interval) and compared using Student's t test. Categorical variables are presented as number (percentage) and compared using the Chi-square test or Fisher's exact test. Multivariable logistic regression analysis was performed to evaluate independent factors related with PE presence, including factors associated in univariate analysis and those described in the literature.

**Results:** Over the 6-year period, 3574 patients were admitted, 41% women, with at mean age of 61.7 years (61.2–62.3) and SAPS III score of 62.6 (61.9–63.4). Of these, 118 patients were diagnosed with PE, resulting in an overall incidence of 3.3%, with significant differences observed between different years: 2018 (1.7%), 2019 (2.6%), 2020 (2.2%), 2021 (5.8%), 2022 (3.5%), and 2023 (3.8%). However, the significant increase in PE diagnoses in 2021 was mainly attributed to low and intermediate–low-risk PE, while high-risk PE showed a significant increase in 2023 (Figure 1). Compared to other patients, those diagnosed with PE were older (66 [64–69] vs. 62 [61–62]; $p=0.001$), had similar severity in terms of SAPS III (59 [56–63] vs. 63 [62–64]; $p=0.125$), similar prevalence of solid cancer history (14.4% vs. 15.7%; $p=0.113$), and a higher incidence of COVID-19 (44.1% vs. 28.1%; $p<0.001$). Regarding outcomes, patients with any degree of PE required longer ICU stays (13 [10–17] vs. 9 [9–10]; $p<0.001$) and days of mechanical ventilation (13 [10–16] vs. 9 [8–9]; $p<0.001$), with similar in-ICU mortality (32.2% vs. 25.3%; $p=0.107$).

When analyzed by PE risk subgroup (Table 1), no significant differences were found in age, sex, or cancer history. Among patients with low-risk PE, a higher percentage had COVID-19 compared to other PE groups and required more days of mechanical ventilation and ICU stay. There were no significant differences in terms of mortality. PE was the reason for admission in 87% (33 out of 38) of high-risk patients, 100% (7 out of 7) of intermediate–high-risk patients, in 1 patient out of 31 intermediate–low-risk patients, and in none of those with low-risk thromboembolism.

Regarding treatments, systemic fibrinolysis was applied in 63.2% of patients with high-risk PE, mechanical thrombectomy in 13.2%, and the remaining 23.6% did not undergo fibrinolytic treatment or thrombectomy due to poor prognosis ($n=9$). Systemic fibrinolysis was not performed in any cases of intermediate–high-risk PE, and mechanical thrombectomy was only performed in two cases.

In multivariable analysis, factors independently related to PE diagnosis in our population were age with an OR of 1.025 per year (1.011–1.040; $p=0.001$) and COVID-19 diagnosis with an OR of 1.945 (1.333–2.837; $p=0.001$).

**Conclusions:** In our cohort, there is an increasing incidence of PE, primarily driven by an increase in low-risk PE diagnosis in patients admitted in the context of COVID-19. However, in 2023, there is a significant increase in ICU admissions due to high-risk PE.

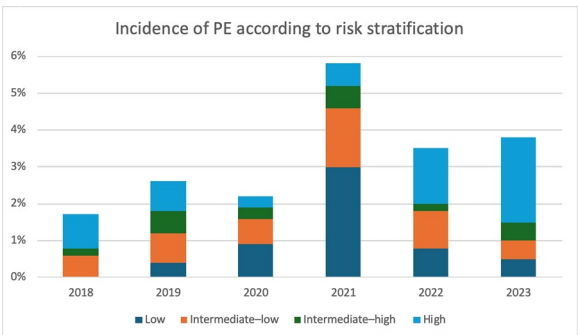


**Fig. 1 (abstract 000372)**

**Table 1 (abstract 000372)**

| | Severity stratification | | | |
|---|---|---|---|---|
| | Low n = 35 | Intermediate-low n =31 | Intermediate-high n=14 | High n = 38 |
| **Age, years** | 66 (63-69) | 70 (67-73) | 66 (59-73) | 64 (59-69) |
| **SAPS III** | 55 (49-61) | 59 (53-65) | 53 (43-63) | 67 (59-76)* |
| **Women n (%)** | 9 (25.7) | 15 (48.3) | 5 (35.7) | 14 (36.8) |
| **COVID-19 n (%)** | 29 (82.8) | 17 (54.8) | 4 (28.6)* | 2 (5.3)* |
| **Solid cancer n (%)** | 1 (2.9) | 7 (22.6) | 2 (14.3) | 7 (18.4) |
| **Systemic fibrinolysis n (%)** | 0 | 0 | 0 | 24 (63.2) |
| **Mechanical thrombectomy n (%)** | 0 | 0 | 2 (14.2) | 5 (13.2) |
| **IMV, days** | 21 (16-27) | 14 (6-22) | 9 (2-16) | 6 (3-10)* |
| **LOS in ICU, days** | 23 (18-28) | 12 (7-17)* | 8 (3-12)* | 7 (4-9)* |
| **Mortality n (%)** | 8 (22.8) | 10 (32.2) | 4 (28.5) | 16 (42.1) |
| ***p < 0,05 compared to the low-risk group. IMV, invasive mechanical ventilation; LOS, Length of stay; ICU; Intensive care unit** | | | | |

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**Topic:** Cardiovascular issues in ICU

## 000374

### Lung transplantation for pulmonary graft-versus-host disease following hematopoietic stem cell transplantation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000374

**Introduction:** Pulmonary graft-versus-host disease (GVHD) is a common late-onset non-infectious pulmonary complication post-hematopoietic stem cell transplantation (HSCT), often presenting bronchiolitis obliterans syndrome (BOS) or interstitial lung disease (ILD). Despite complexity, lung transplantation (LTx) remains a potential treatment, although rarely reported.
**Objectives:** This study aims to elucidate the clinical features and outcomes of patients who underwent LTx subsequent to HSCT, focusing on those with pulmonary GVHD.
**Methods:** A retrospective analysis was conducted on 152 consecutive LTx patients between February 2012 and December 2023. Baseline characteristics, clinical data, and short-term surgical outcomes were compared between GVHD and non-GVHD groups.
**Results:** Among 152 patients, 21 (13.8%) underwent LTx due to pulmonary GVHD after HSCT. The majority (85.7%) received bilateral sequential LTx. The GVHD group (mean age 29.7 ± 14.6 years) was significantly younger than the non-GVHD group (56.0 ± 14.7 years, $p < 0.001$). Median time from HSCT to GVHD diagnosis was 10 months (range from 2.1 month to 8.9 years) and from HSCT to LTx was 3.8 years (range from 1.3 month to 16.2 years). ECMO bridge before LTx was performed in 42.9% of GVHD patients. The GVHD group had longer ICU stays (13 days vs 10 days, $p = 0.025$), but no significant difference in 30-day mortality (9.5% vs 6.1%, $p = 0.63$), and 1-year (80.7% vs 78.1%) and 3-year survival rate (67.2% vs 65.9%, $p = 0.358$) compared to the non-GVHD group. Chronic lung allograft dysfunction occurred in 11 patients during a median 3.9-year follow-up, with one relapse of hematological malignant post-LTx.
**Conclusions:** Lung transplantation may be a valuable therapeutic option in selected patients with pulmonary GVHD post-HSCT. Further research is warranted to better understand its efficacy and long-term outcomes.

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**Topic:** Brain death, organ donation, and transplantation

## 000378

### Time-varying intensity of ventilatory efficiency and mortality in patients with acute respiratory distress syndrome

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000378

**Introduction:** Acute respiratory distress syndrome (ARDS) is a life-threatening respiratory failure characterized by hypoxemia and impaired carbon dioxide (CO2) clearance, requiring support with invasive mechanical ventilation [1–2]. Maintaining adequate oxygenation and ventilation is the core purpose of mechanical ventilation [3–4]. The association between ventilatory parameters [arterial carbon dioxide pressure (PaCO2) and ventilatory ratio (VR)] and mortality for patients with ARDS remains controversial. Furthermore, it is unknown whether the association remains persistent over time.
**Objectives:** Our primary objective was to evaluate the impact of time-varying exposure to various intensities of ventilatory efficiency (as indicated by PaCO2 and VR) on the 28-day mortality in patients with ARDS and whether the strength of the effect persisted over time. We also quantified the cumulative impact of these exposure over time.
**Methods:** We performed a secondary analysis of four randomized-controlled trials (FACTT, ALTA, EDEN, and SAILS) conducted by the ARDS Network. Involved patients were all intubated and received mechanical ventilation. Patients were excluded if they received extracorporeal life support or received mechanical ventilation less than 1 day. The primary outcome was 28-day mortality. Potential confounders were identified based on the missing value, collinearity, and directed acyclic graph. We then employed the cause-specific Cox proportional hazard models and Bayesian joint models to estimate the strength of associations over time.
**Results:** Upon reviewing the data from 3027 patients, 2851 patients were finally included in our analysis. The overall 28-day mortality rate was 21.3%. After adjusting for both time-independent and time-dependent confounders, each daily increment in PaCO2 (HR 1.008, 95% CI 0.997–1.018) was not associated with mortality while daily increment in VR (HR 1.548 95% CI 1.309–1.835) was associated with increased mortality in the joint model analysis. The lack of a significant correlation between the intensity of PaCO2 and mortality remained constant throughout the entire period of ventilation. VR significantly influenced 28-day mortality, particularly in the early to middle phases

of ARDS (roughly 0–23 days of mechanical ventilation) [Figure 1]. Additionally, each additional day of exposure to potentially injurious intensity of ventilatory efficiency reflected by VR > 2 (HR 1.088 per day, 95% CI 1.034–1.147) was related to an elevated risk of death after adjustments. We also observed its cumulative impact of exposure to higher intensities of ventilatory inefficiency (HR 1.085 per area, 95% CI 1.050–1.122).

**Conclusions:** We concluded that a time- and dose-dependent exposure to harmful intensities of ventilatory efficiency measured by VR instead of PaCO2 was associated with increased mortality in ARDS. Therefore, VR needs to be closely monitored when using invasive mechanical ventilation, especially in the early and middle courses (approximately within 23 days after ventilation). Adopting ventilation strategies that limit cumulative exposure to high VR showed potential in reducing mortality among patients with ARDS.

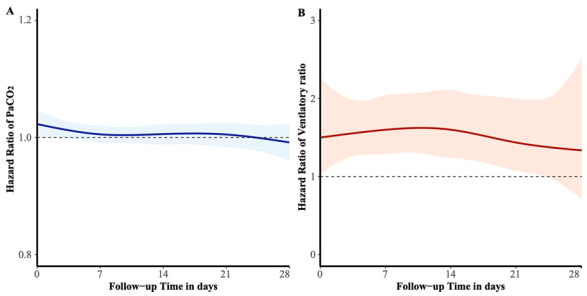


**Fig. 1 (abstract 000378)** Time-varying effect of ventilatory parameters [A. PaCO2; B. ventilatory ratio] and mortality

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5. The ARDS Network researchers

**Topic:** Acute respiratory failure and mechanical ventilation

## 000382

## Epidemiology of severe acute respiratory infection in the Republic of Korea

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000382

**Introduction:** A nationwide prospective surveillance was conducted in the Republic of Korea from 2017 to 2022 to study severe acute respiratory tract infections across all age groups. This report analyzes the characteristics and epidemiology of 47,857 patients enrolled in the study.

**Objectives:** We conducted this study to compare the epidemiology of severe acute respiratory tract infections in Republic of Korea by patient characteristics.

**Methods:** Patients were enrolled from various institutions during 2017–2022, meeting criteria of symptom onset within 10 days of hospital admission, fever ≥ 38 °C, cough symptoms, and hospitalization.

**Results:** Among patients, 52.5% (25,132) had an identifiable pathogen, with rhinovirus (11.8%), respiratory syncytial virus (9.9%), and coronavirus-19 (9.6%) predominant (Figure). Notably, pathogen distribution varied significantly by sex, region, age, and prognostic outcome. Among them, the distribution of pathogens by age was as follows. In children younger than 7 years, rhinovirus (22.8%), respiratory syncytial virus (20.5%), and mycoplasma pneumoniae (11.3%) were most common. School-aged children (8–18 years) had a higher prevalence of Mycoplasma pneumoniae (23.1%), influenza (13.1%), and rhinovirus (12.2%). Among adults (19–64 years), coronavirus-19 (21.2%), *Streptococcus pneumoniae* (6.2%), and influenza (5.4%) were prevalent. In the elderly (≥ 65 years), coronavirus-19 (13.0%), *Streptococcuspneumoniae* (7.8%), and influenza (6.0%) were the most common pathogens.

**Conclusions:** This study provides valuable insights into the epidemiology of severe acute respiratory infections in Korea and highlights the need for targeted management strategies based on age and pathogen type. It emphasizes the importance of continuous surveillance and research to adapt to the dynamic patterns of respiratory pathogens.

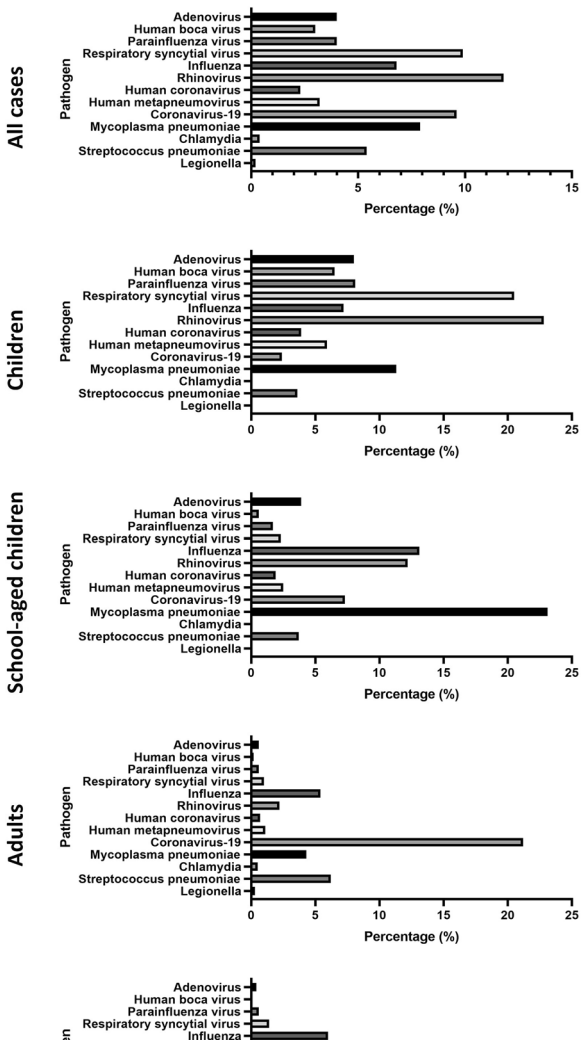


**Fig. (abstract 000378)** Respiratory pathogen according to patient age

**Topic:** Infections and prevention

## 000385

### Effects of enteral nutrition timing on one-year mortality in ARDS patients receiving prone position therapy: a retrospective analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000385

**Introduction:** Interventions like enteral nutrition (EN), conservative fluid management, and prone positioning are recognized for severe ARDS. While prone positioning's short-term benefits are studied, there are limited data on its long-term impact on mortality in ARDS patients. Nutritional catabolism is divided into early (Days 1–2) and late periods (Days 3–7), but it is unclear how caloric intake routes in these periods affect long-term mortality.
**Methods:** We conducted a retrospective study at a tertiary medical center, collecting data from January 2015 to March 2021. The inclusion criteria were ARDS patients who received prone position therapy in the first 7 days of ICU admission, aged 20 years or older, with exclusion criteria of ICU stays lasting less than 7 days.
**Results:** The study enrolled a total of 160 patients, with an average age of 60 years old and an APACHE II score of 30. The following factors were found to be associated with higher 1-year mortality in the multivariable Cox regression model: older age (HR: 1.02, 95% CI 1.00–1.04), shock with more than two vasopressors (HR: 2.03, 95% CI 1.09–3.79), more positive fluid balance status (HR: 1.08, 95% CI 1.02–1.14), and less caloric intake from enteral nutrition between days 3 and 7 (HR: 0.21, 95% CI 0.07–0.60). The ROC curve showed a cut value of average daily caloric intake from EN between Days 3–7 was 499 kcal/day. It was found that patients who were older than 65 years old, male gender, BMI > 18, CCI $\geq$ 3, had an APACHE II score higher than 26, experienced shock with more than two vasopressors, and NUTRIC score $\geq$ 5 were more likely to benefit from higher caloric intake.
**Conclusions:** The results of our study suggest that higher EN intake between days 3 and 7 may be associated with lower 1-year mortality in ARDS patients who received prone position therapy.

**Topic:** Metabolism, endocrinology, liver failure, and nutrition

## 000386

### Immunosuppressed patients with COVID-19 pneumonia in ICU: clinical characteristics and outcomes

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**Introduction:** Dysregulated inflammation contributes to COVID-19 severity, with SARS-CoV-2 triggering cytokine release and potential multi-organ failure. While immunosuppressed (IS) patients are at risk due to their compromised immunity, they might experience less harmful inflammatory responses.
**Objectives:** This study aimed to compare clinical features and outcomes between IS and non-immunosuppressed patients (nIS), examine differences among IS subgroups according to etiology of the immunosuppresison, and assess tocilizumab's impact on IS patients.
**Methods:** This observational study, part of the CIBERESUCICOVID project, analyzed COVID-19 patients in 55 Spanish ICUs. Excluding those under 18 or without confirmed SARS-CoV-2 infection or known immunocompetence status, it classified patients as IS based on specific criteria like organ transplantation, HIV, active cancer, or chronic immunosuppressive medication use. The study aimed to assess mortality risk in IS patients, using propensity score matching and a multivariable model to identify predictors of in-hospital mortality, including the effect of tocilizumab treatment.
**Results:** Table 1 displays the main features of both study groups. Both in-hospital and 90-day mortality rates were higher in IS patients compared to nIS patients. Similar rates of complications were observed, with a higher incidence of renal failure and organizing pneumonia noted in IS patients. After propensity score matching, which balanced the two groups (1:1), IS patients still had a higher risk of in-hospital and 90-day mortality (Table 2). Among the different classes of IS, after propensity score matching, only transplanted patients continued to exhibit significantly higher odds of in-hospital mortality compared to nIS patients (sHR 2.28; 95% CI 1.05–4.94)( Figure 1). IS patients who received tocilizumab had lower in-hospital mortality rate compared to IS patients who did not receive it (38% vs 45%). After adjusting for confounding factors, the administration of tocilizumab was found to be an independent protective factor for in-hospital mortality (sHR 0.61; 95% CI 0.45–0.82).
**Conclusions:** IS is a significant risk factor for mortality in ICU patients. Among them, transplanted patients have the highest mortality risk. Tocilizumab could lower the in-hospital mortality risk in IS patients.

**Table 1 (abstract 000386)** Characteristics of the study population

| | Full cohort (N = 5,824) | | |
|---|---|---|---|
| | No immunosuppressed (N = 5,135) | Immunosuppressed (N = 689) | P-value |
| Age, median (Q1; Q3), years | 63 (54; 70) | 65 (55; 71) | **0.005** |
| Male sex, n (%) | 3,677 (72) | 419 (61) | **<0.001** |
| Body mass index, median (Q1; Q3), kg/m² | 29.1 (26.1; 32.5) | 27.8 (24.9; 31.7) | **<0.001** |
| Comorbidities, n (%) | 2,157 (42) | 404 (59) | **<0.001** |
| Characteristics at ICU admission, median (Q1; Q3) | | | |
| APACHE-II score | 11 (9; 15) | 14 (10; 19) | **<0.001** |
| SOFA score | 5 (4; 8) | 5.5 (4; 8) | 0.56 |
| Arterial blood gases at ICU admission, median (Q1; Q3) | | | |
| $PaO_2/FiO_2$ ratio, mmHg | 111 (80; 163) | 116 (82; 165) | 0.44 |
| pH | 7.41 (7.34; 7.46) | 7.40 (7.34; 7.45) | 0.20 |
| Laboratory findings at ICU admission, median (Q1; Q3) | | | |
| Leucocyte count, $10^3$/L | 9.2 (6.6; 12.7) | 8.5 (5.9; 12.5) | **0.006** |
| Lymphocyte count, $10^3$/L | 0.70 (0.48; 0.99) | 0.56 (0.33; 0.90) | **<0.001** |
| Neutrophil count, $10^3$/L | 7.8 (5.4; 11.3) | 7.2 (5; 10.8) | **0.004** |
| Platelet count, $10^3$/L | 232 (178; 301) | 213 (147; 286) | **<0.001** |
| D-dimer, ng/mL | 1,030 (530; 2,556) | 1,200 (605; 3,540) | **0.012** |
| C-reactive protein, mg/L | 140 (70; 233) | 123 (57; 212) | **0.011** |
| Interleukin-6, pg/mL | 88.3 (31.7; 230.7) | 94.5 (30.6; 279.1) | 0.36 |
| Respiratory support at ICU admission, n (%) | | | **<0.001** |
| Conventional oxygen therapy | 338 (7) | 69 (10) | **0.001** |
| High-flow nasal cannula | 1,357 (27) | 209 (31) | **0.023** |
| Non-invasive mechanical ventilation | 591 (12) | 92 (13) | 0.14 |
| Invasive mechanical ventilation | 2,830 (55) | 312 (46) | **<0.001** |
| COVID-19 therapies during ICU admission, n (%) | | | |
| Tocilizumab | 2,094 (41) | 243 (36) | **0.006** |
| Corticosteroids | 4,312 (85) | 620 (91) | **<0.001** |
| Complications, n (%) | | | |
| Bacterial pneumonia | 1,423 (28) | 193 (28) | 0.82 |
| Organising pneumonia | 225 (4) | 46 (7) | **0.008** |
| Coagulation disorder | 1,603 (31) | 215 (31) | 0.99 |
| Acute renal failure | 1,652 (32) | 249 (36) | **0.037** |
| Liver dysfunction | 1,696 (33) | 193 (28) | **0.008** |
| Outcomes, n (%) | | | |
| In-hospital mortality | 1,469 (29) | 264 (38) | **<0.001** |
| 90-day mortality | 1,495 (32) | 266 (43) | **<0.001** |

ICU, intensive care unit; Q1, first quartile; Q3, third quartile; APACHE, acute physiology and chronic health evaluation; SOFA, sequential organ failure assessment; PaO2, partial pressure of arterial oxygen; FiO2, fraction of inspired oxygen.

**Table 2 (abstract 000386)** Survival models evaluating the risk of mortality in the immunosuppressed group

| | Mortality | | |
|---|---|---|---|
| | sHR or HR | 95% CI | P-value |
| In-hospital mortality | | | |
| Crude (full cohort) (N = 5,824) | 1.42 | 1.24 to 1.62 | **<0.001** |
| Propensity score matching (N = 1,058) | 1.31 | 1.05 to 1.64 | **0.019** |
| 30-day mortality | | | |
| Crude (full cohort) (N = 5,824) | 1.40 | 1.20 to 1.63 | **<0.001** |
| Propensity score matching (N = 1,058) | 1.31 | 1.01 to 1.70 | **0.039** |
| 90-day mortality | | | |
| Crude (full cohort) (N = 5,824) | 1.44 | 1.26 to 1.64 | **<0.001** |
| Propensity score matching (N = 1,058) | 1.26 | 1.01 to 1.58 | **0.040** |

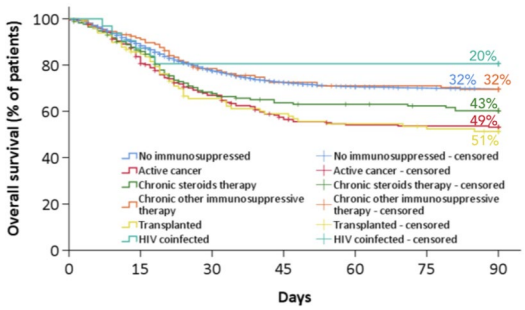


**Fig. 1 (abstract 000386)** Kaplan–Meier analysis of 90-day mortality by type of immunosuppression

**Topic:** Infections and prevention

## 000387

### Patients experiences after heart transplantation: systematic review of qualitative studies

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000387

**Introduction:** After heart transplantation, patients' health is affected by a multitude of factors, many of which may be unfamiliar to the healthcare professionals. The process surrounding heart transplantation, both during and after the procedure, is highly complex, highlighting the need for studies that delve into patient experiences. Heart transplantation significantly disrupts recipients' daily activities and exposes them to various challenges that may compromise adherence to their care plan and jeopardize the success of the transplant. Given the wealth of research documenting its impact on quality of life and lifestyle adjustments, we recognized the need to synthesize these findings.
**Objectives:** To investigate the post-heart transplantation experiences of patients, this study conducted an in-depth analysis of existing qualitative research, aiming to gain a comprehensive understanding of the diverse facets of their post-transplantation journey, with a particular focus on their quality of life.

**Methods:** We conducted a systematic search across Cumulative Index to Nursing and Allied Health Literature (CINAHL), Embase (Ovid), MEDLINE (Ovid), Social Science Citation Index (Web of Science), and Scopus databases up to September 30, 2023. We included primary studies focusing on qualitative data, encompassing designs, such as phenomenology, grounded theory, ethnography, and descriptive research. Following Sandelowsky and Barroso guidelines, our analysis involved: (a)

extracting findings, (b) editing for accessibility, (c) grouping into topical domains, and (d) abstracting findings. The Critical Assessment Skills Programme checklist was used for the quality assessment of studies.
**Results:** A total of 13 studies with 176 patients were included. Figure 1 summarizes the themes and categories that emerged as affecting patients' reports of their experiences post-transplant. The 28 codes that emerged from the abstraction process were grouped into seven categories and three themes. In the theme of 'Undergoing an emotionally charged journey,' heart transplant patients described post-transplant psychological challenges, including coping with emotional optimism. Transitioning to 'Balancing personal health and social dynamics,' they navigated transformative adjustments and perceptions, managed medications and a lifelong care plan, and confronted social challenges. In the final theme, 'Fostering existential reflection,' patients explored revised life goals and navigated interpersonal dynamics.
**Conclusions:** Patients undergoing heart transplantation navigated a spectrum of emotions, faced challenges such as adjusting habits, and often embraced new opportunities for the future. Nurses and doctors should enhance the post-heart transplant experience for patients by implementing small changes, such as prioritizing effective communication, ongoing education, and fostering collaboration among multidisciplinary teams. These initiatives were essential for ensuring the delivery of high-quality care.

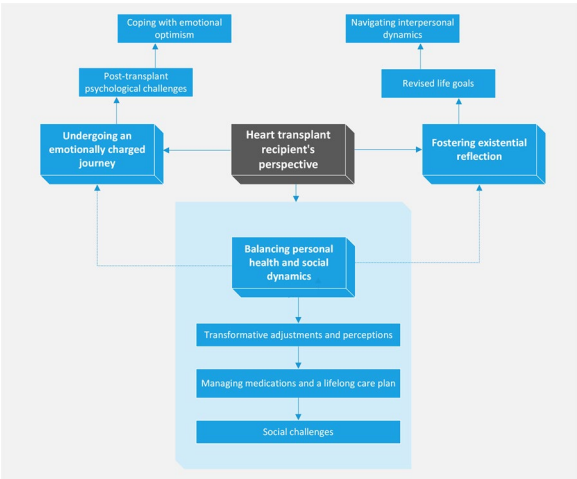


**Fig. 1 (abstract 000387)** Patients' narratives on heart transplant experiences

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**Topic:** Nursing care and physiotherapy

## 000388

## Long-term efficacy and safety of inhaled sedation in critically ill patients

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**Introduction:** The optimal management of sedation in critically ill patients is crucial for improving clinical outcomes. While intravenous sedation has been extensively studied, experience with inhaled sedation in critically ill patients during prolonged periods is less explored.
**Objectives:** To describe the characteristics of a cohort of patients with the use of inhaled sedation for more than 7 days.
**Methods:** Single-center retrospective study of patients admitted to the ICU of Vall d'Hebron Hospital from June 2020 to October 2023. Patients who required inhaled sedation for 7 days or more were included.
**Results:** 39 patients were included. The median age was 56 years, with 29 men (71.8%) and 11 women (28%). Comorbidities included hypertension in 23.1% ($n=9$), diabetes in 20.5% ($n=8$), and immunosuppression in 20.5% ($n=8$). Additionally, 48.7% ($n=19$) had chronic respiratory pathology, while 5.1% ($n=2$) had ischemic heart disease. Regarding lifestyle habits, 30.8% ($n=12$) were active smokers, 28.2% ($n=11$) consumed alcohol, 7.7% ($n=3$) had chronic opioid use, and 20.5% ($n=8$) had chronic benzodiazepine use. The median SOFA score at 24 h of admission was 7.
The main reason for ICU admission in 64.1% ($n=25$) of cases was respiratory causes, with other causes including sepsis 5.1% ($n=2$), neurological pathology 5.1% ($n=2$), and pancreatitis 17.9% ($n=7$).
Regarding duration, 22 patients were sedated for 7–10 days, 8 patients for 11–14 days, 4 patients for 15–20 days, and 5 patients required inhaled sedation for more than 20 days. The median duration was 8 days with a minimum of 1 day and a maximum of 38 days. Isoflurane was the most commonly used sedative.
Inhalation sedation was indicated for difficult sedation in 50.0% ($n=18$) of patients. In 2 cases, it was used due to side effects of IV sedatives. Twelve patients required its use as a bronchodilator, and in 4 cases, it was used to avoid accumulation effects of IV sedatives.
Twelve patients experienced side effects, with 10 showing pupil changes and 2 experiencing hypotension. Reported pupil changes were mainly mydriasis and anisocoria, related primarily to dose and duration of therapy. Pupil changes led to imaging tests in 6 patients, with structural pathology due to intraocular infection found in 1 case. All other events reversed after discontinuation of the sedative when the patient met sedation cessation criteria. No other adverse effects were reported.
**Conclusions:** The use of inhaled sedation for periods exceeding 7 days does not present significant adverse effects and emerges as a safe alternative. The importance of considering potential pupil alterations is emphasized.

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**Topic:** Sedation, analgesia and delirium

### 000389

## Validation of the prognostic value of gray–white matter ratio measured by brain magnetic resonance imaging-based computed tomography structures compared to conventional measures in adult comatose patients after cardiac arrest

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000389

**Introduction:** Post-cardiac arrest care advancements have improved resuscitation outcomes, but many survivors still face severe neurological deficits or death from brain injury. Accurate prognosis prediction is crucial for guiding treatment decisions, including withdrawal of life-sustaining treatment. Various methods exist, including brain computed tomography (CT), which assesses cerebral edema, a marker of poor outcome. However, subjectivity of the measurer and difficulties in selecting the measurement area in patients with severe cerebral edema limit its usefulness for prognosis in clinical practice.

**Objectives:** Herein, we propose a consistent and unbiased prognosis prediction approach using magnetic resonance imaging (MRI) to analyze anatomical regions represented by the gray and white matter, and subsequently apply it on CT to calculate the gray–white matter ratio (GWR). We compared this novel method with traditional measures to validate its ability to predict the prognosis of patients resuscitated after cardiac arrest.

**Methods:** This retrospective study was conducted at two tertiary university hospitals in South Korea between January 2018 and December 2022. Data were collected from adult cardiac arrest survivors treated with therapeutic target temperature management. Patients underwent brain CT within 2 h and brain MRI within 3 days of return of spontaneous circulation. Exclusions comprised individuals with brain parenchymal abnormalities or unsuitable CT images, along with those with pre-arrest cerebral performance category (CPC) scores of 3 or 4. Data collected encompassed demographic characteristics, pre-arrest cerebral performance category (CPC), emergency medical services (EMS) records, initial electrocardiogram (ECG) rhythms, Glasgow Coma Scale (GCS), Mean Arterial Pressure (MAP) after ROSC, target temperature during TTM, Sequential Organ Failure Assessment (SOFA) scores, and resuscitation process timing. GWR in the basal ganglia region was calculated by structuring the caudate nucleus, putamen, posterior limb of the internal capsule, and corpus callosum on MRI using MIM software and then applying it to CT using 3D slicer software to measure HU. The outcome was the neurological status at discharge. Statistical analyses included receiver-operating characteristic curve analysis and determining cut-off values to predict poor neurological outcomes.

**Results:** Overall, 51 of the 421 adult comatose cardiac arrest survivors examined met the inclusion criteria. Among these, 33 and 18 exhibited good and poor neurological outcomes, respectively. Demographic and cardiac arrest characteristics were compared between the two groups, revealing significant differences. Analyses of gray and white matter attenuation and GWR measurements highlighted significant differences between the good and poor outcome groups. MRI-based measurements generally outperformed traditional methods in predicting poor outcomes, with PU/PIC demonstrating the highest sensitivity at 100% specificity. Overall, GWRs measured by MRI-based CT showed superior predictive performance for poor neurological outcomes compared to traditional methods, with PU/PIC exhibiting the highest area under the ROC curve.

**Conclusions:** Our study introduces a novel method for measuring GWR using MRI-based brain CT, demonstrating the superior prognostic accuracy in predicting neurological outcomes in patients with post-cardiac arrest syndrome compared to traditional methods:

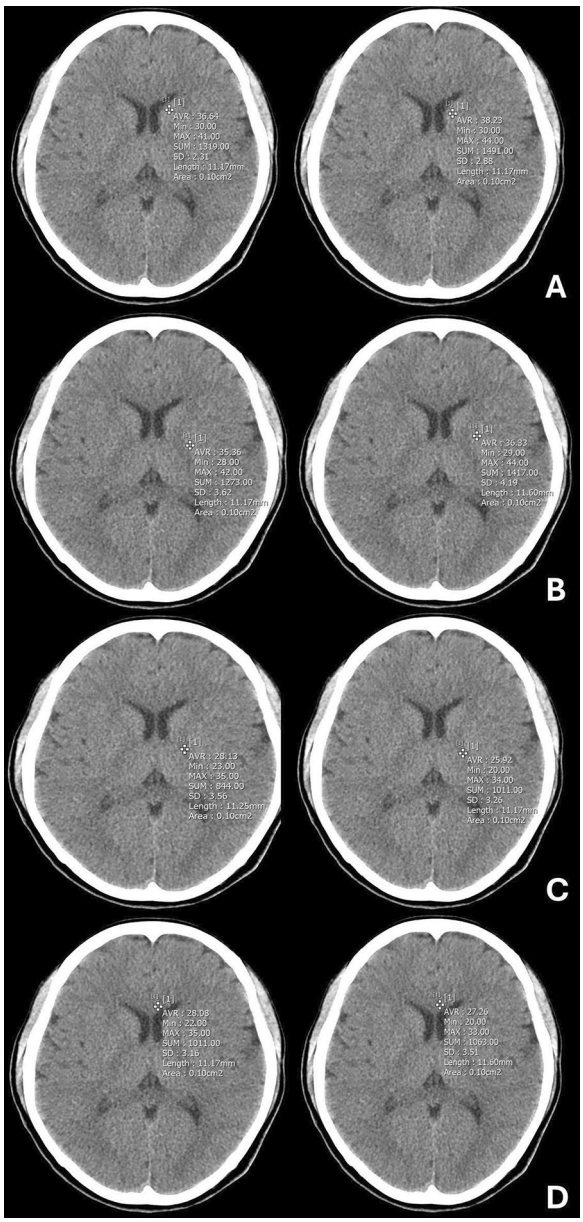


**Fig. 1 (abstract 000389)** With conventional measurement methods, differences in HU due to different measurement locations at the same anatomical site (A and B are HU measured in the caudate nucleus and

putamen, which are grey matter, and C and D are HU measured in the posterior limb of internal capsule and corpus callosum, which are white matter)

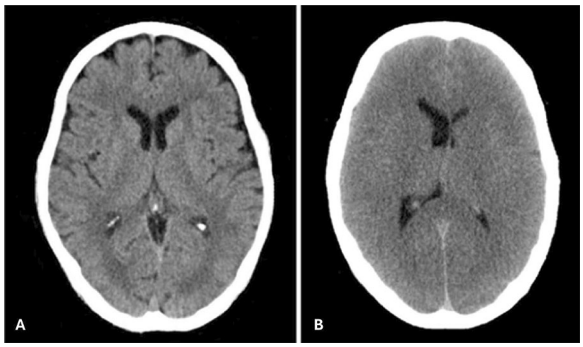


**Fig. 2 (abstract 000389)** CT of two patients, which resuscitation after cardiac arrest. It is possible in patients with clearly described anatomical structures such as A, but in patients with B with severe brain edema, subjective intervention by the measurer is inevitable, because the distinction of anatomical areas is not clear

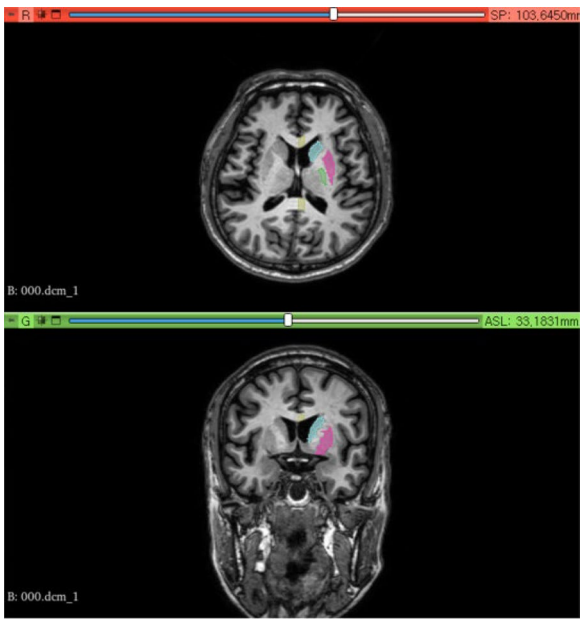


**Fig. 3 (abstract 000389)** Using 3D Slicer software (https://www.slicer.org/), patient brain MRI data were imported, and four regions of interest (ROIs) for measuring GWR-BG were delineated. These included the gray matter regions of the caudate nucleus and putamen, as well as the white matter regions of the corpus callosum and the posterior limb of the internal capsule

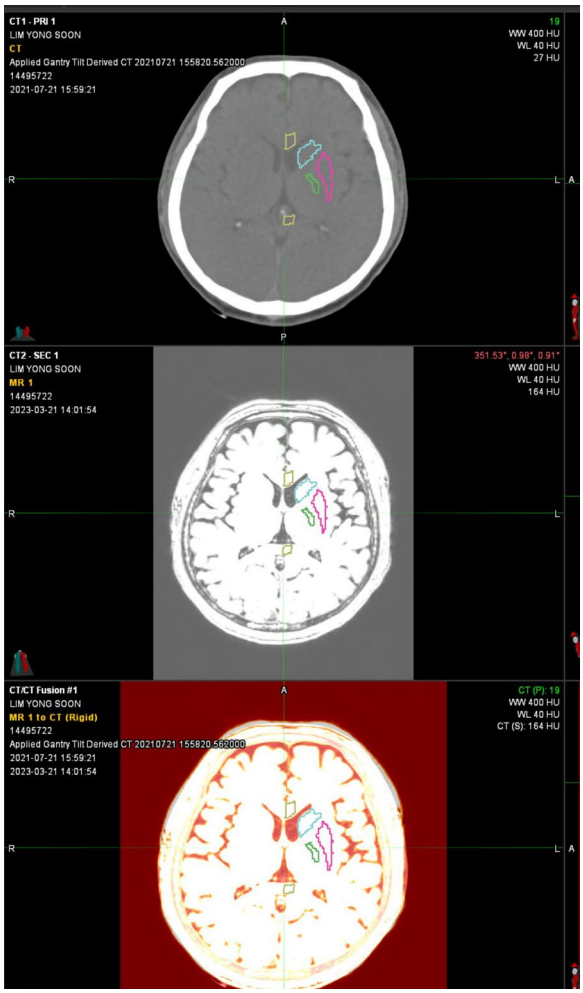


**Fig. 4 (abstract 000389)** The acquired MRI with segmentation was used to perform anatomical segmentation on CT of the same patient using the MRI-to-CT registration function of the MIM software (MIM Inc., Cleveland, OH, USA)

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**Topic:** Cardiac arrest.

## 000392

## Norepinephrine dose scaling to total body weight: a systematic bias


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000392



**Introduction:** Norepinephrine (NE) is considered a first-line vasopressor in septic shock. Nevertheless, concerns about the heterogeneity of both its formulation and use have been raised. While NE is titrated to achieve hemodynamic goals, the dose itself has been used as a proxy of severity and trigger for rescue therapies. However, considering the relationship between the drugs' clearance, plasma concentration, and body weight, scaling it to total body weight (TBW) could prove inaccurate and may lead to systematic bias in over/underweight patients. We hypothesized that TBW NE dosing would lose its mortality-predictive capacity at higher body mass index (BMI) ranges.

**Objectives:** To evaluate the predictive capacity of TBW NE dosing strategy in obese patients with septic shock.

**Methods:** We analyzed the MIMIC-IV v2.2 database, an open-access dataset of de-identified EHRs from BIDMC in Boston, Massachusetts. Patients fulfilling septic shock criteria according to Sepsis-3 consensus and with available height and weight data were included for analysis. ROC curves were constructed to assess the prognostic value of NE dose at diagnosis and maximum NE dose at 24 h for 28-day mortality, presented as AUROC [95% CI], in obese (BMI $\geq$ 30) and non-obese patients. The DeLong test was used to compare AUROC, a $p$ value < 0.05 was considered significant.

**Results:** 4123 septic shock patients (age 68 [57–78] years, BMI 27.7 [23.8–32.2]) were identified (obese: 35.6%). Charlson Comorbidity Index was 6 [4–8] and SOFA score at diagnosis was 7.8 ($\pm$2.96). 83.8% of patients were on invasive mechanical ventilation. ICU length of stay was 4.8 [2.5–9.7] days and 28-day mortality was 39.3%. Median TBW NE dose at diagnosis was 0.1 [0.05–0.2] mcg/kg/min and maximum 24 h TBW NE dose was 0.25 [0.12–0.42] mcg/kg/min.

The relationship between TBW NE dose and absolute NE dose for different BMIs of a single hypothetical 1.70m individual shows an increasing gap in absolute NE dose administered for different BMIs, especially at progressively higher doses (Fig. 1).

When comparing ROC curves of obese patients, a significant decrease in the mortality-predictive capacity of TBW diagnosis NE dose at higher doses ($\geq$ 0.3 mcg/kg/min) was observed (0.60 [0.56–0.63] and 0.50 [0.43–0.57], p = 0.021)(Fig. 2A). In contrast, this phenomenon was not observed in non-obese patients (0.56 [0.54–0.59] and 0.55 [0.50–0.60], $p$ = 0.7) (Fig. 2B). Also, at high TBW NE doses, a significant difference was observed when comparing the mortality-predictive capacity of the maximum NE dose in the first 24 h since diagnosis between obese and nonobese patients (0.56 [0.51–0.61] and 0.63 [0.60–0.66], $p$ = 0.01).

**Conclusions:** TBW NE dosing strategy loses its predictive capacity for mortality at higher doses in obese patients with septic shock, supporting the theoretical gap described in administered dose by BMI. Other dosing strategies may provide more accurate prognostic information and guide clinical decision-making in this population.


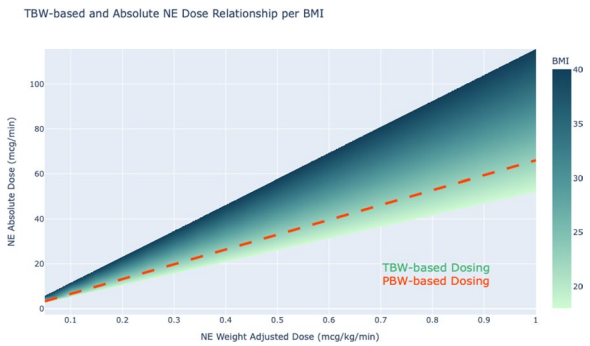


**Fig. 1 (abstract 000392)** Absolute norepinephrine dose administered at increasing total body weight-based norepinephrine dosing in a single hypothetical 1.70 m subject. The relationship was computed for different BMI values, depicting large gap in administered dose by changing the subject's weight

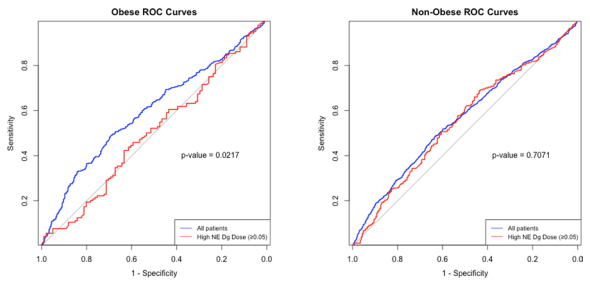


**Fig. 2A (000392)** (Left) ROC curves comparison for predictive capacity of high norepinephrine dose at diagnosis in obese patients. Figure 2B. (Right) ROC curves' comparison for predictive capacity of high norepinephrine dose at diagnosis in non-obese patients

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**Topic:** Cardiovascular issues in ICU

## 000393

### Factors associated with family satisfaction among relatives of ICU patients: an exploratory secondary data analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000393

**Introduction:** The patient's admission to an intensive care unit (ICU) can be a stressful event for their relatives (1). In this scenario, family satisfaction (FS) is defined as a quality indicator of ICU performance that measures salient aspects of relatives' experience, such as quality of patient care, communication, and decision-making (2). Despite its relevance, evidence on factors related to FS is limited with few variables being consistently reported as associated with FS (3).
**Objectives:** To explore factors associated with family satisfaction among relatives of ICU patients.
**Methods:** This is a secondary analysis of an ongoing longitudinal exploratory study exploring the incidence and related factors of post-intensive care syndrome family in a public hospital in Santiago, Chile. Relatives of ICU patients with 3–7 days of ICU stay and with respiratory support are been enrolled. Relatives provided sociodemographic data and completed 6 validated questionnaires to measure family satisfaction (FS ICU-24), anxiety/depressive symptoms (PHQ-4), vitality/fatigue (SF-36 Vt), cognitive function (MEFO test), resilience (BRCS), and perceived social support (mMOS-SSS). Spearman's correlation and Mann–Whitney *U* tests were utilized to explore potential associations and differences between constructs and FS levels. The original study was approved by the Health Sciences Ethics and Scientific Committee at Pontificia Universidad Catolica de Chile (ID: 220,318,015).
**Results:** Within the 108 relatives included in this study, clinically significant symptoms (CSS) of anxiety, depression, and fatigue accounted for 72.2%, 44.4%, and 39.8% of the sample respectively. Median perceived social support was 4.65 (IQR = 1.25) and low resilience was observed in 13.9% of family members. 11.1% of relatives were classified as at risk of mild cognitive impairment.
Bivariate analysis showed a negative association between FS and anxiety ($r = -0.227$, $p = 0.018$) and depressive symptoms ($r = -0.196$, $p = 0.042$). Conversely, a positive association between FS and vitality ($r = 0.309$, $p = 0.001$), resilience ($r = -0.306$, $p = 0.001$), and perceived social support ($r = 0.212$, $p = 0.028$). No signification association was found between FS and relatives' cognitive function or sociodemographic features ($p > 0.05$).
Then, significantly lower FS scores were observed among relatives with CSS of anxiety (*Mdn* = 76.6 v/s 84.3, $p = 0.016$), depression (*Mdn* = 73.9 v/s 81.5, $p = 0.044$), and fatigue (*Mdn* = 72.9 v/s 79.3, $p = 0.005$). Similarly, inferior FS scores but without statistical significance were observed among relatives with low resilience (*Mdn* = 73.8 v/s 80.4, $p = 0.053$) and mild cognitive impairment (73.4 v/s 78.4, $p = 0.284$).
**Conclusions:** Positive and negative psychosocial factors may influence FS levels among ICU relatives. The modifiable nature of the identified factors could assist ICU healthcare providers in their efforts to improve the quality of support and care to ICU relatives. Further studies exploring the role of relatives' psychological stressors and buffers on FS are warranted.

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**Topic:** Nursing care and physiotherapy

## 000399

### Diffuse parenchymal lung diseases in patients who met the diagnostic criteria for ARDS before the emergence of COVID-19

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000399

**Introduction:** Patients with various acute pulmonary conditions meet the diagnostic criteria for ARDS, although the conceptual model of "classic ARDS" is thought to be caused by insults, such as pneumonia, sepsis, and trauma. Guidelines published by the Society of Critical Care Medicine (SCCM) in 2024 suggest the administration of corticosteroids to adult hospitalized patients with ARDS.
**Objectives:** The aims of the present study were to investigate the proportion of patients who can be diagnosed with diffuse parenchymal lung diseases (DPLDs) by specialists in patients with acute respiratory failure who met the diagnostic criteria for ARDS prior to the emergence of COVID-19 in Japan and to investigate the associations of diagnosis with mortality and corticosteroid use.
**Methods:** This is a multicenter retrospective cohort study analyzing the electronic medical records of patients admitted to intensive care units (ICUs) across 10 hospitals in Japan between December 2017 and December 2019. We included patients who were endotracheally intubated due to acute respiratory failure and met the Berlin criteria for ARDS. We constituted an extensive database for DPLDs by extracting from the medical record as much as possible of the patient's information to be reviewed by DPLD specialists, such as basic demographics, occupation, past medical and family history, medication history, symptoms, physical findings, chest images, echocardiography, and lab results during and before hospitalization. Clinical diagnoses (initial clinical diagnosis by intensivists) and pulmonology diagnosis made based on the database by the DPLD specialists were classified into three categories, (1) Classic ARDS which was triggered by a clinical insult, (2) DPLDs other than IPF, and (3) IPF. DPLD specialists were blinded to the clinical diagnoses. The associations between diagnosis and mortality and those between corticosteroid use and mortality in each group were analyzed using the cox regression model.

**Results:** In total, 3641 patients who were on mechanical ventilation in 10 ICUs were screened, and 272 patients were included. 25.4% and 7.7% of the patients who met the diagnostic criteria of ARDS were diagnosed with DPLDs and IPF, respectively, by DPLD specialists. In addition, 13.2% of the patients clinically diagnosed with classic ARDS for whom the possibility of DPLDs was not mentioned were diagnosed with possible DPLDs by the specialists. Diagnoses of classic ARDS and IPF made by DPLD specialists were associated with increased mortality compared with DPLDs, with an unadjusted HR of 1.57 (95% CI 1.06 to 2.31, $p=0.023$) for classic ARDS and 1.71 (95% CI 1.06 to 2.75, $p=0.027$) for IPF. Corticosteroid use within 72 h after admission to the ICU was associated with higher mortality in patients with classic ARDS than in those with DPLDs (HR 5.19: 95% CI 1.69 to 15.9, $p=0.004$).
**Conclusions:** This study showed that a substantial number of patients who met the diagnostic criteria of ARDS had possible DPLDs and that individualization of patients based on diagnosis may be important in deciding whether to administer corticosteroids to patients with ARDS.

**Reference(s)**

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**Topic:** Acute respiratory failure and mechanical ventilation.

## 000400

### Dexmedetomidine is not associated with hyperthermia after cardiac surgery: post hoc analysis of a randomized trial

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**Introduction:** Postoperative hyperthermia is common and associated with neurocognitive impairment after cardiac surgery. Dexmedetomidine was reported to be associated with hyperthermia and is frequently used during and after cardiac surgery. A potential mechanism by which administration of dexmedetomidine results in hyperthermia is sparing propofol which impairs thermoregulation. We therefore performed a post hoc analysis of the DECADE trial aiming to test the hypothesis that dexmedetomidine administration increases the incidence of postoperative hyperthermia during the initial 24 h after cardiac surgery, and whether this effect is mediated by propofol dose.
**Methods:** We conducted a post hoc analysis of the DECADE trial in which patients were randomized to placebo or dexmedetomidine. Dexmedetomidine infusion was started before surgery at a rate of 0.1, was increased to 0.2 at the end of bypass, and was increased to 0.4 µg/kg/h postoperatively which was maintained until 24 h after the infusion started. DECADE tested the primary hypothesis that dexmedetomidine reduces atrial fibrillation and delirium after cardiac surgery (it did neither). For the current analysis, we primarily compared the fraction of patients having a postoperative body temperature $\geq$ 38 °C during the first 24 h after surgery in patients given dexmedetomidine or placebo using a generalized linear model for binomial distribution to estimate the relative risk (RR). Secondarily, we performed the same analysis restricted to patients with continued propofol administration within the first 24 h after surgery and with a threshold in postoperative body temperature of $\geq$ 37.5 °C, and planned to test for effect mediation by propofol dose. We adjusted for confounding in all analyses with inverse probability of treatment weighting for age, sex, race, body mass index, ASA status, and type and duration of surgery.
**Results:** We included 501 patients, 248 of whom were assigned to dexmedetomidine. After inverse propensity weighting, standardized mean differences were < 0.03 for all potential confounders. There was no significant difference in the incidence of postoperative body temperature $\geq$ 38 °C during the first 24 h after surgery (dexmedetomidine: 27%, placebo: 21%; RR: 1.2 [95%CI 0.9, 1.7], $p=0.25$). Similarly, there was no statistically significant difference in the incidence of postoperative body temperature $\geq$ 37.5 °C during postoperative propofol infusion (dexmedetomidine: 26%, placebo: 21%; RR: 1.2 [95%CI 0.8, 1.8], $p=0.32$) which precluded testing for mediation by propofol dose. Exploratory analyses for different thresholds for postoperative hyperthermia did not reveal any statistically significant difference (Table 1). A post hoc power analysis revealed that our sample size would have enabled us to detect a 52% increase in the risk for postoperative hyperthermia with a power of 80% and a type I error of 0.05.
**Conclusions:** Dexmedetomidine administration in patients having cardiac surgery did not significantly increase the incidence of postoperative hyperthermia. Our study was powered to detect increases in relative risk for postoperative hyperthermia exceeding 52%. Further studies are thus needed to exclude smaller effect sizes.

**Table 1 (abstract 000400)** Summary of the incidences of postoperative hyperthermia with different thresholds

| | Dexmedetomidine | Placebo | p-value |
|---|---|---|---|
| **During the first 24 hours after surgery (N = 501)** | | | |
| | **(N = 248)** | **(N = 253)** | |
| *Ever had postoperative core temperature ≥ 37.5 °C* | 116 (46.8) | 110 (43.5) | 0.46 [a] |
| *Ever had postoperative core temperature ≥ 38 °C* | 66 (26.6) | 52 (20.6) | 0.11 [a] |
| *Ever had postoperative core temperature ≥ 38.5 °C* | 21 (8.5) | 15 (5.9) | 0.27 [a] |
| *Ever had postoperative core temperature ≥ 39 °C* | 2 (0.81) | 3 (1.2) | 0.99 [b] |
| **During the propofol infusion period within the postoperative 24 hours (N = 320)** | | | |
| | **(N = 152)** | **(N = 168)** | |
| *Ever had postoperative core temperature ≥ 37.5 °C* | 40 (26.3) | 36 (21.4) | 0.30 [a] |
| *Ever had postoperative core temperature ≥ 38 °C* | 19 (12.5) | 23 (13.7) | 0.75 [a] |
| *Ever had postoperative core temperature ≥ 38.5 °C* | 10 (6.6) | 12 (7.1) | 0.84 [a] |
| *Ever had postoperative core temperature ≥ 39 °C* | 1 (0.66) | 3 (1.8) | 0.62 [b] |

Table was summarized using raw data. Summary statistics presented as N (column %). *P* value was estimated using [a] Pearson's chi-square test and [b] Fisher's Exact test.

**Reference(s)**

1. Lukas M. Müller-Wirtz received funding from the German Research Foundation to perform a research fellowship at the Outcomes Research Consortium, Department of Anesthesiology, Cleveland Clinic (reference number: MU4688-1-1).

**Topic:** Sedation, analgesia, and delirium

## 000401

### Intraoperative mechanical power is associated with impaired postoperative oxygenation: post hoc analysis of a single-center multiple crossover factorial cluster trial

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**Introduction:** Mechanical power quantifies the intensity of mechanical ventilation, considering the energy transferred from the ventilator to the respiratory system per time. Mechanical power is associated with lung edema, inflammation, postoperative pulmonary complications, and even with mortality in critically ill patients. However, data on the significance of mechanical power in surgical populations other than abdominal or thoracic surgeries remain sparse. Therefore, we conducted a post hoc analysis of our previous trial in which the effects of tidal volume and positive end expiratory pressure (PEEP) on postoperative oxygenation and pulmonary complications were investigated in patients having orthopedic surgery (1). We tested the hypothesis that the intraoperatively applied mechanical power normalized to predicted body weight (MP-PBW) is associated with impaired postoperative oxygenation in the postoperative anesthesia care unit (PACU).

**Methods:** We conducted a post hoc analysis of our recently published trial on intraoperative mechanical ventilation in patients having orthopedic surgery (1). The sequential factorial allocation of weekly clusters of patients to tidal volumes of 6 versus 10 ml/kg predicted bodyweight and a PEEP of 5 versus 8 cmH2O within the underlying trial provided a wide range of exposure to mechanical power. We calculated the MP-PBW for each patient included in the underlying trial and evaluated the association with the time-weighted average SpO2/FiO2 ratio over the first hour of PACU stay (SF-TWA) using a multivariable linear mixed model, accounting for the repeated surgeries per patient. We adjusted for the intervention treatment group in the underlying trial and demographic and intraoperative characteristics in all models.
**Results:** A total of 2,860 surgeries in 2,582 patients were included. Patients were on average 63 years (SD 14), 53% female, 83% Caucasian, had a mean BMI of 31 kg/m2 (SD: 7), and were mainly ASA III (72%). Mean MP-PBW was 0.20 J/min/kg (SD 0.06) and mean SF-TWA was 353% (SD 47). An increase in MP-PBW by 0.1 J/min/kg was associated with a reduction in SF-TWA by 11% (coefficient from multivariable linear mixed model: -11% [95%CI −14, −8], $p < 0.001$; Tab. 2). SF-TWA of patients with lower versus higher than the median MP-PBW (< 0.186 versus > 0.186 J/min/kg) were on average 8% higher (adjusted mean difference: 8%, [95%CI 4, 11], $p < 0.001$; Tab. 2).
**Conclusions:** Exposure to high intraoperative mechanical power is associated with impaired postoperative oxygenation in patients having orthopedic surgery. This supports the concept of mechanical power as a potential clinical target to optimize intraoperative ventilatory settings even in low-risk populations.

**Table 1 (abstract 000401)** Patient characteristics and surgery information by MP-PBW groups (dichotomized by median = 0.186)

| | Overall (N=2,860) | | MP-PBW low (N=1,430) | | MP-PBW high (N=1,430) | | |
|---|---|---|---|---|---|---|---|
| **Factor** | **N** | **Statistics** | **N** | **Statistics** | **N** | **Statistics** | **p-value** |
| Age (yr) | 2,860 | 63.3 ± 14.4 | 1,430 | 65.1 ± 15.2 | 1,430 | 61.4 ± 13.3 | ***<0.001***[a2] |
| Female (%) | 2,860 | 1,504 (52.6) | 1,430 | 743 (52.0) | 1,430 | 761 (53.2) | 0.50[c] |
| Race (%) | 2,818 | | 1,415 | | 1,403 | | 0.99[c] |
| Caucasian | | 2,344 (83.2) | | 1,176 (83.1) | | 1,168 (83.3) | |
| African American | | 409 (14.5) | | 206 (14.6) | | 203 (14.5) | |
| Other | | 65 (2.3) | | 33 (2.3) | | 32 (2.3) | |
| Body mass index (kg/m2) | 2,852 | 31.0 ± 7.3 | 1,425 | 27.7 ± 5.4 | 1,427 | 34.2 ± 7.6 | ***<0.001***[a2] |
| ASA Physical Status (%) | 2,860 | | 1,430 | | 1,430 | | ***0.034***[b] |
| I | | 56 (2.0) | | 37 (2.6) | | 19 (1.3) | |
| II | | 505 (17.7) | | 270 (18.9) | | 235 (16.4) | |
| III | | 2,071 (72.4) | | 1,009 (70.6) | | 1,062 (74.3) | |
| IV or V | | 228 (8.0) | | 114 (8.0) | | 114 (8.0) | |
| Charlson score | 2,860 | 1.00 [0.00, 2.0] | 1,430 | 1.00 [0.00, 2.0] | 1,430 | 1.00 [0.00, 2.0] | 0.26[b] |
| Smoking (%) | 2,820 | 1,460 (51.8) | 1,414 | 726 (51.3) | 1,406 | 734 (52.2) | 0.65[c] |
| COPD (%) | 2,860 | 377 (13.2) | 1,430 | 167 (11.7) | 1,430 | 210 (14.7) | ***0.017***[c] |
| Obstructive sleep apnea (%) | 2,860 | 694 (24.3) | 1,430 | 234 (16.4) | 1,430 | 460 (32.2) | ***<0.001***[c] |
| Asthma (%) | 2,860 | 483 (16.9) | 1,430 | 212 (14.8) | 1,430 | 271 (19.0) | ***0.003***[c] |
| Anesthesia type (%) | 2,860 | | 1,430 | | 1,430 | | ***0.004***[c] |
| General | | 1,450 (50.7) | | 763 (53.4) | | 687 (48.0) | |
| G+R | | 1,410 (49.3) | | 667 (46.6) | | 743 (52.0) | |
| Surgery type (%) | 2,860 | | 1,430 | | 1,430 | | 0.33[c] |
| Arthroplasty | | 1,522 (53.2) | | 748 (52.3) | | 774 (54.1) | |
| Other | | 1,338 (46.8) | | 682 (47.7) | | 656 (45.9) | |
| Surgery duration (min) | 2,860 | 215.3 ± 82.5 | 1,430 | 205.5 ± 76.1 | 1,430 | 225.1 ± 87.3 | ***<0.001***[a2] |
| Blood transfusion (%) | 2,860 | 223 (7.8) | 1,430 | 106 (7.4) | 1,430 | 117 (8.2) | 0.44[c] |
| Estimated blood loss (ml) | 2,860 | 150.0 [50.0, 300.0] | 1,430 | 150.0 [50.0, 250.0] | 1,430 | 200.0 [50.0, 300.0] | ***0.003***[b] |
| Crystalloids (L) | 2,860 | 1722.7 ± 832.8 | 1,430 | 1659.2 ± 775.3 | 1,430 | 1786.2 ± 882.3 | ***<0.001***[a2] |
| Intraoperative use of rocuronium (mg) | 2,805 | 70.0 [50.0, 90.0] | 1,403 | 60.0 [50.0, 85.0] | 1,402 | 70.0 [50.0, 100.0] | ***<0.001***[b] |
| Intraoperative use of other muscle relaxation meds (%) | 2,860 | 32 (1.1) | 1,430 | 17 (1.2) | 1,430 | 15 (1.05) | 0.72[c] |
| Treatment | 2,860 | | 1,430 | | 1,430 | | ***<0.001***[c] |
| 1 | | 727 (25.4) | | 508 (35.5) | | 219 (15.3) | |
| 2 | | 635 (22.2) | | 344 (24.1) | | 291 (20.3) | |
| 3 | | 799 (27.9) | | 356 (24.9) | | 443 (31.0) | |
| 4 | | 699 (24.4) | | 222 (15.5) | | 477 (33.4) | |

Statistics presented as Mean ± SD, Median [P25, P75], N (column %).
p-values: a1=t-test, a2=Satterthwaite t-test, b=Wilcoxon Rank Sum test, c=Pearson's chi-square test.

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2. Lukas M. Müller-Wirtz received funding from the German Research Foundation to perform a research fellowship at the Outcomes Research Consortium, Department of Anesthesiology, Cleveland Clinic (reference number: MU4688-1-1).

**Topic:** Acute respiratory failure and mechanical ventilation

## 000403

### Experience with resuscitation: Ringer's lactate vs albumin 4% in post-prolonged cardiac surgery patients (CEC > 120)—admitted to the ICU

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**Introduction:** Restoration of intravascular volume in the ICU after cardiac surgery improves tissue perfusion of organs previously ischemic by prolonged extracorporeal circulation (CPB) (1,2). The strategy of fluid replacement with albumin reduces endothelial damage, improves the role of coagulation, and expands the intravascular volume with a smaller amount of fluid administered, avoiding kidney damage due to overload. Achieving greater clinical benefit and lower morbidity and mortality (3,4).
**Objectives:** To assess whether 4% albumin solution in postoperative resuscitation in patients undergoing cardiac surgery shows better results compared to Ringer's lactate by reducing the incidence of postoperative complications.
**Methods:** Prospective observational cohort study, at a High Specialty Regional Hospital, level III in Northeast Mexico, during 2022–2023. Ages > 18 years were included, all with CPB > 120 min, they were observed in 2 groups: resuscitation with 4% albumin and resuscitation with lactated Ringer's during the first 48 h at 1 ml/kg/hr; the objective: perfusion, TAM > 70 mmHg, diuresis > 0.5 ml/Kg/min, lactate delta. We evaluated mortality, fluid accumulation, acute renal failure, lactate, coagulopathy, ventilation hours, and prolonged stay. We evaluated continuous variables with means ± SD, and categorical variables with proportions, using Chi(X2) and Mann–Whitney U, respectively.
**Results:** We analyzed 100 patients for 2 years, age 56.5 ± 10.8 (30–76), male 64%, hypertension 68%, DM2 58%, and dyslipidemia 33%. They were divided into 2 groups: albumin 54% vs ringer's lactate 46%. Days of ICU stay 4.48 ± 2.0 (1–14) and mortality 6% (Figure 1).

**Table (abstract 000403)**

**Outcomes**

| Variable | Albumina ($n = 54$) | Ringer ($n = 46$) | $p$ value < 0.05 |
|---|---|---|---|
| EUROSCORE | 3.80 | 3.64 | 0.434 |
| Age (years) | 55.7 | 57.4 | 0.531 |
| BMI (Kg/m$^2$) | 32.7 | 29.0 | 0.045 |
| LVEF (%) | 54 | 49 | 0.048 |
| Extracorporeal circulation time | 146 | 139 | 0.338 |
| Urine ml/h | 1.37 | 1.16 | 0.19 |
| Platelets 48 h | 253 | 209 | 0.090 |
| Days of inotropic | 1.52 | 1.54 | 0.965 |
| ICU days | 4.33 | 4.57 | 0.054 |
| Bleeding ml/48 h | 510 | 814 | 0.001 |
| Balance h 48 h/ml | 327 + | 734 + | 0.043 |
| Lactate (mmo/L) 48 h | 2.49 | 2.71 | 0.640 |
| Extubation time (h) | 8.31 | 9.7 | 0.002 |

**Conclusions:** Intravascular volume resuscitation 48 h after cardiac surgery with prolonged CPB based on 4% albumin presents balances with a tendency towards neutrality with respect to resuscitation with Ringer's lactate, as well as lower lactate levels, higher urinary volume, higher platelet count, and lower extubation time compared to intravenous use of lactated ringer's, showing similar results for days in the ICU and days of use inotrope.

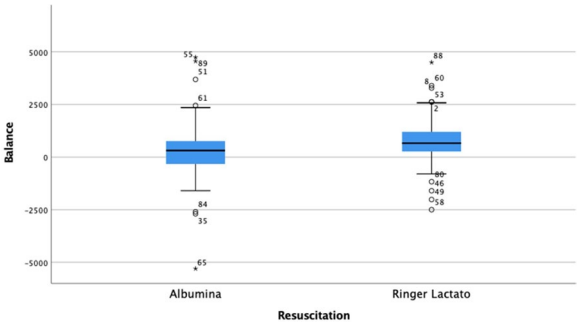


**Fig. 1 (abstract 000403)** Box plot of resuscitation balance

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**Topic:** Perioperative care

## 000404

### An exploration of the lived communication experience between nonverbal patients and healthcare professionals in Saudi intensive care units

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**Introduction:** Patients in intensive care units (ICUs) are frequently mechanically ventilated, leaving them nonverbal. This impacts their interactions with healthcare professionals (HCPs), causing frustration, anxiety, and increased burden of care. In Saudi Arabia, healthcare system is multicultural, indicating potential communication issues between HCPs and patients. However, little is known about the communication experience of nurses working with nonverbal patients in ICU, and the experiences of patients and other HCPs remain unexplored.
**Objectives:** To explore the lived communication experience between nonverbal patients and HCPs in Saudi intensive care units.
**Methods:** This qualitative study employed interpretive phenomenology. Using purposive sampling, interviews were conducted with five previously nonverbal patients and six HCPs from eight ICUs in two hospitals in Riyadh. Data were interpreted following a hermeneutic cycle and thematic analysis. Data of patients and HCPs were analysed separately but synthesised collectively to provide a comprehensive understanding of the communication dynamics between the two groups.

**Results:** Patients' experiences highlighted communication dynamics through balancing requirements and care, with two subthemes: individual experience against ICU care and elements of proper communication. HCPs' experiences showed language complexity and relevance, with three subthemes: cognition, emotions, and behaviours; individual and procedural effects; and language interference in patient-HCP communication. Findings from both groups showed that language barrier plays a vital role in enhancing or impeding effective mutual communication. Sedation was reported to delay the process of extubation and, consequently, mutual communication. Pain was regarded as the most important topic to communicate, with HCPs needing to find better ways to understand patients' pain. Communication through physical contact, lip reading, and signals was challenging due to the patients' condition and cultural and linguistic barriers. Text-based communication via mobile and communication boards was recognised as both lacking and desirable. Some HCPs reported neglecting communication, but others tried to understand their patients and learn new communication.
**Methods:** Patients indicated a need for training and learning English to understand non-Arabic-speaking HCPs. Unsuccessful communication caused negative emotions in both patients and HCPs, leading to discontinued interactions. Supportive communication from HCPs showed to improve patients' mental health and recovery, but it may be limited by a lack of tools and the language barrier.
**Conclusions:** Language barrier constitutes a central aspect that affects or is affected by other factors, including the patient's physical and psychological status, tool availability, and HCPs' attitudes. A simple communication tool customised to the ICU and the multicultural and multilingual Saudi healthcare system is suggested.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000407

### The role of inflammation during high-dose corticosteroid therapy and its effect on mortality in COVID-19-related ARDS: a causal mediation analysis

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**Introduction:** Coronavirus disease 2019 (COVID-19) patients with acute respiratory distress syndrome (ARDS) without clinical improvement after standard of care low-dose dexamethasone [1] might benefit from treatment with high-dose corticosteroids (HDS) [2, 3]. The evaluation of the mediation effect of inflammatory biomarkers on

the association between HDS and mortality could provide valuable insights to evaluate whether a patient benefits from the treatment [4].
**Objectives:** The aim of this study is to investigate which biomarkers of inflammation mediate the effect of HDS on mortality in ICU patients with COVID-ARDS.
**Methods:** In this retrospective cohort study, patients presenting with COVID-19 caused ARSD admitted to the ICU of an academic hospital in the Netherlands, between March 2020 and June 2022 were included. HDS was defined as administration of > 6 mg of dexamethasone per day or an equivalent corticosteroid. Biomarkers evaluated were C-reactive protein (CRP), D-dimer, ferritin, leukocyte count, interleukin-6 (IL-6), lactate dehydrogenase (LDH), neutrophil-to-lymphocyte ratio (NLR) and procalcitonin (PCT). Causal mediation analysis was conducted to estimate the mediating effect of each individual biomarker on the association between HDS and all-cause in-hospital mortality. Indication bias of receiving HDS was corrected for using inverse probability of treatment weights. In addition, we performed an analysis to understand the level of inflammation over time increasing the risk of mortality, during HDS therapy.
**Results:** We included 327 patients, of whom 122 (37%) were treated with HDS and 87 (26.6%) died during hospital stay. P/F ratio, gender, SOFA-score, and date of admission were used to correct for treatment indication bias with IPTW. NLR, CRP, IL-6, and LDH were significantly mediating the effect between HDS and all-cause mortality, and the average mediation effects were 0.047 (95% CI 0.015, 0.086) for NLR, -0.030 (95% CI −0.050, −0.011) for CRP, -0.025 (95% CI −0.046, −0.009) for IL-6, and -0.013 (95% CI −0.028, −0.003) for LDH. NLR mediated 25.1% of the total effect of HDS on all-cause mortality, while decreasing CRP, IL-6, and LDH mediated 16.4%, 13.6%, and 7.2%, respectively (Figure 1). NLR exhibited an association with mortality on the majority of days after HDS. CRP demonstrated a significant association with mortality only at days 6 and 7 following HDS, while IL-6 exhibited significance only at day 7. LDH showed a significant association with mortality exclusively at day 6 after HDS (Figure 2).
**Conclusions:** Biomarkers NLR, CRP, IL-6, and LDH significantly mediated the association between HDS and all-cause mortality. The levels of inflammation posing an increased risk of mortality are most pronounced on days 6 and 7 after initiating HDS. These findings may represent an initial step towards a more personalized approach to the treatment of COVID-19-ARDS patients, but even non-COVID ARDS patients.

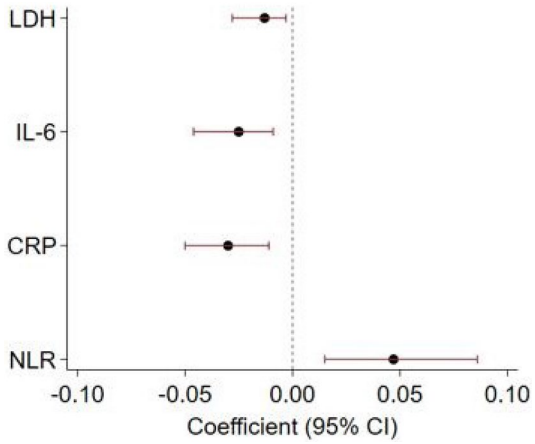


**Fig. 1 (abstract 000407)** Mediationg effect if biomarkers LDH, IL-6, CRP and NLR. In this figure, the mediation effects of biomarkers LDH, IL-6, CRP, and NLR are visualised of the association between HDS and all-cause mortality in COVID-19 ARDS patients in the ICU. Abbreviations: LDH, lactate dehydrogenase; IL-6, interleukin-6; CRP, C-reactive protein; NLR, neutrophil-to-lymphocyte ratio

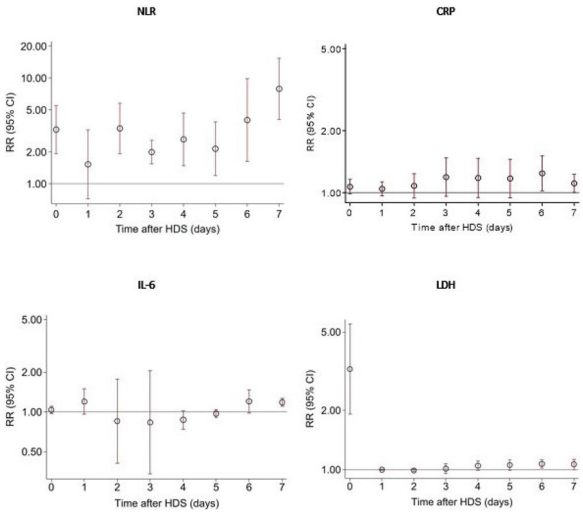


**Fig. 2 (abstract 000407)** Inflammation over time increasing the risk of mortality during high-dose corticosteroids. In this figure, the level of inflammation over time increasing the risk of mortality during HDS therapy was visualized. Abbreviations: RR, relative risk; HDS; high-dose corticosteroids; NLR, neutrophil-to-lymphocyte ratio; CRP, C-reactive protein; IL-6, interleukin-6; LDH, lactate dehydrogenase

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000408

### Use of supplemental melatonin for treating adults in intensive care with sepsis or septic shock: a systematic review and meta-analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000408

**Introduction:** Sepsis (defined as organ dysfunction due to a dysregulated host response to infection) is a leading cause of death in the Intensive Care Unit (ICU). Despite early initiation of antimicrobials and crystalloid resuscitation, mortality remains high (> 10% for sepsis, rising to > 40% for septic shock) [1]. Effective pharmacotherapy is urgently needed. Melatonin's antioxidant, anti-inflammatory, and mitochondrial-protective properties make it a promising candidate [2, 3].

**Objectives:** Systematically review and analyse randomised and quasi-controlled trials for melatonin in sepsis and septic shock in the ICU.
**Methods:** The systematic review was registered on PROSPERO (CRD42023473436) and a search strategy devised. MEDLINE, Embase, CINAHL, and PubMed databases were searched, alongside Cochrane Register of Controlled Trials, Clinical Trials, and ISRCTN Registers from conception until 01/11/2023. The inclusion criteria were randomised or quasi-controlled trials, administering oral/enteral/intravenous supplemental melatonin in an adult ICU population (≥ 18 years), with sepsis or septic shock. Risk of bias and quality of evidence were assessed using RoB-2 (Cochrane Risk-of-bias 2) and GRADE (Grading of Recommendations, Assessment, Development and Evaluations) tools. Where appropriate, quantitative meta-analysis was performed using a random-effects model on Revman Web.
**Results:** Initial searches resulted in 306 publications. After title, abstract, and full-text screening, 5 eligible studies (total of 322 participants met all inclusion criteria. No studies were classed as 'low risk' with regards to risk-of-bias (RoB-2). Melatonin significantly reduced SOFA score from baseline (mean difference −2.22 [CI −2.63, −1.82], very low certainty, 2 studies $n=65$), and reduced all-cause mortality (odds ratio of 0.61 [CI 0.29, 1.29], very low certainty, 4 studies $n=161$) compared to placebo. Sufficient data for vasopressor-free days, ventilator-free days, and both hospital/ICU length of stay were only reported by a single study (all favoured melatonin).
**Conclusions:** Low-certainty evidence suggests melatonin (dose range 20–60 mg) appears to improve SOFA score and all-cause mortality in adults admitted to ICUs with sepsis or septic shock. Although, the findings should be interpreted with caution because of the low number of (mainly small) studies. Adequately powered clinical effectiveness trials are needed to confirm these findings.

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4. No funding was received for this review.

**Topic:** Sepsis

## 000409
## Ultrasound-guided vena jugularis internal catheterization lateral approach short-axis in-plane technique

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000409

**Introduction:** The cannulation of the internal jugular vein (VJI) is a frequent procedure in critically ill patients. As per current guidelines, real-time ultrasound navigation is employed for its execution. Our non-inferiority study compared the novel lateral in-plane short-axis approach for internal jugular vein cannulation with the conventional short-axis out-of-plane approach. The positioning of the ultrasound probe and the needle puncture direction for the novel approach are presented in Figure 1.
**Objectives:** The primary objective of the study was to prove that the first-attempt success rate in the novel approach is non-inferior to the first-attempt success rate in the conventional approach. The secondary objectives were to demonstrate that the complication rate and the functional duration of the catheter in the novel approach are not inferior to those in the conventional approach.
**Methods:** Patients eligible for VJI cannulation were randomly assigned to either the novel approach (Group A) or the conventional approach (Group B) with the use of computer algorithm. The procedure duration and the number of attempts required were documented. The functional duration of the catheter was monitored until either its extraction or malfunction. Incidences of complications were documented throughout the procedure and until catheter removal. Standard descriptive statistical methods were employed for the analysis.
**Results:** A total of 200 subjects were equally divided between the novel (Group A) and conventional (Group B) approaches for VJI cannulation. For the primary outcome, there was no significant difference in first attempt success rate (Group A: 79, Group B: 77, $p=0.434$). Secondary outcomes, including complication incidence and catheter functional time, did not differ significantly between the groups. However, the novel approach demonstrated a significantly faster procedure time (Group A: 315 s, Group B: 330 s, $p=0.016$). Notably, the novel approach was linked with significantly larger VJI diameter measured during the procedure (Group A: 18.2 mm, Group B: 12.1 mm, $p<0.001$).
**Conclusions:** The novel lateral in-plane short-axis approach for internal jugular vein (VJI) cannulation could be a potential alternative to the conventional approach.

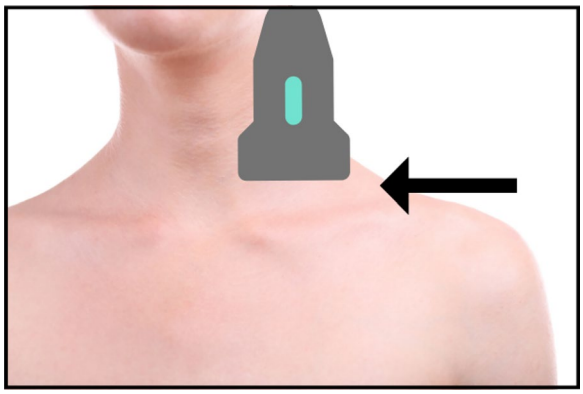

**Fig. 1 (abstract 000409)** Ultrasound probe positioning and needle direction (the arrow) for the novel approach

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4. This study was supported by internal grant of Masaryk Hospital in Ústí nad Labem o.z. [IGA-KZ-2022-1-9]

**Topic:** Perioperative care

## 000410 How changes in mean flow index (Mxa) components affect its results in critically ill septic patients? A pilot study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000410

AQ19 **Introduction:** The calculation of the mean flow index (Mxa) is widely used for assessing dynamic cerebral autoregulation in different clinical populations [1]. This calculation is based on defined characteristics, including blocks, overlap periods, and epochs of the whole recordings [2].
**Objectives:** To investigate the reproducibility of different Mxa calculations, using variable blocks, overlap periods, and epochs.
**Methods:** In this pilot study, we analyzed 40 recordings previously collected from critically ill septic patients. The Mxa was computed using a classic approach (e.g., block of 10 s, overlap of 50% among blocks and epoch of 300 s, called 10–50-300) and then seven additional approaches, including overlapping blocks of 5 or 10 s, overlaps ranging from 20 to 50% and 80%, and epochs of 180 or 300 s (respectively, called 10–20-180, 10–50-180, 10–80–180, 10–20–300, 10–80–300, 5–50–180, and 5–50–300). We compared all calculated Mxa using a mixed model procedure with three within-factor analyses for repeated measurements, intraclass correlation coefficients (ICC), and Bland–Altman plots. We considered values of ICC below 0.5 as poor reliability, from 0.5 to 0.75 as moderate, those between 0.75 and 0.9 as good, and when exceeding 0.90 as excellent reliability.
**Results:** Using the classic approach, mean Mxa was 0.44 (±0.33). In the mixed model analysis, we observed no significant differences among different Mxa values. Analysis of intraclass correlation coefficients revealed excellent agreement among approaches utilizing the same epoch (180 or 300 s), with ICC values of [0.947 (0.916–0.969)] and [0.940 (0.905–0.965)], respectively. Nevertheless, when comparing approaches employing different epochs, agreement levels were lower, ranging from moderate to good. Notably, the comparison between 10–50–180 and 10–50–300 yielded an ICC of [0.782 (0.621–0.880)]. This discrepancy was further evidenced by Bland–Altman plots, which depicted wider limits of agreement between the two approaches.
**Conclusions:** No significant differences emerged among different combination of blocks, overlap, and epoch combination to calculate Mxa in septic patients. However, the impact of epoch duration should be further evaluated.

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**Topic:** Neurointensive care

## 000412

### Prevalence/Incidence and microbiological characterization of multidrug-resistant Gram-negative bacteria in Spanish ICUs: MURAN-UCI project

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000412

**Introduction:** Multidrug-resistant Gram-negative bacteria are one of the main challenges in ICUs, mainly ESBL- *Klebsiella pneumoniae* (EKP), carbapenemase-producing Enterobacterales (CPE), and *Pseudomonas aeruginosa* (PACR) and Acinetobacter spp. carbapenem-resistant (ABCR).
**Objectives:** The objectives of the study were to determine the prevalence and incidence of colonization/infection by these bacteria in ICUs in Spain, their antimicrobial sensitivity, resistome, and phylogeny.
**Methods:** This is an observational and prospective study. There were evaluated all patients admitted to the ICUs of seven large Spanish university hospitals from February 15 to March 30 of 2023. Colonization was determined in rectal and oropharyngeal exudates upon admission and the first and second week after admission. Infections caused by these bacteria were studied up to 60 days from admission. Antimicrobial susceptibility was determined by microdilution. Whole-genome sequencing (WGS) was performed by Illumina platform to analyze resistome and phylogeny (cgMLST).
**Results:** 767 patients were included during the study period. The prevalence of colonization upon admission was 2.9% (23/767) [interhospital range 0.5–10.3%]: 11 patients carried *Klebsiella pneumoniae*-ESBL (1.4%), six PARC (0.8%), five CPE (0.6%), and one ABCR (0.1%). The incidence of acquired colonization during the first and second week was 0.5 (11/1967) [interhospital range 0–1.9] and 1.3 (11/847) [interhospital range 0–4.1] per 100 patients /day, respectively, with PACR colonization being the most frequent ($n=14$). A total of 21 cases of infection by these bacteria were detected, with 14 of them being previously ($n=8$) and simultaneous ($n=6$) colonized by the same microorganism; the majority were PACR (12/21). 83 isolates (44 patients) were analyzed by WGS. Two different species were detected in sequential isolates from three colonized patients. In the rest, sequential isolates from the same patient corresponded to the same ST, being the majority identical by cgMLST. The range of allelic differences in paired comparisons in isolates from the same patient was 1–32 in *K. pneumoniae* and 1–21 in *Pseudomonas aeruginosa*. The STs and resistance mechanisms detected are shown in Table 1. Colistin, cefiderocol, and meropenem–vaborbactam were the most active antibiotics (100–97.8%) in Enterobacterales; while, in PARC, they were amikacin, colistin, cefiderocol, ceftolozane–tazobactam, ceftazidime–avibactam, and imipenem–relebactam (92–100%).
**Conclusions:** The prevalence/incidence of colonization/infection by multi-resistant Gram-negative bacteria analyzed in the participating ICUs in this study is low, but with important variations between the different hospitals. Carbapenem-resistant *Pseudomonas aeruginosa* was the most common bacteria identified. The resistance mechanisms and clones detected are mostly the same ones that circulate nationally.

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5. This research was funded by the Intramural Call for Research Projects CIBERINFEC-2022 (Centro de Investigación Biomédica En Red, CIBER in Infectious Diseases)

**Topic:** Infections and prevention.

## 000413

### Survey of laboratory abnormalities preceding spontaneous hypoglycemia in ICU patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000413

**Introduction:** Although hypoglycemia in the ICU is frequently secondary to insulin administration, spontaneous hypoglycemia (SH) can also occur. The primary cause of SH is insufficient hepatic gluconeogenesis [1,2,3]. The potential role of preceding liver test abnormalities as early risk factors for impending SH remains uncertain.
**Objectives:** The aim of this study was to explore the changes in routine clinical chemistry laboratory measurements before and after SH in the ICU.
**Methods:** A retrospective cohort study was conducted, including all adult patients admitted to the ICU of the UMC Groningen between 2008 and 2021. Hypoglycemia was defined as a glucose level < 3.5 mmol/L at the ICU [3] and in case of multiple hypoglycemias, the lowest glucose level was selected for further analysis. SH was defined as hypoglycemia without any insulin administration in the preceding 6 h. Data of 41 routine clinical chemistry parameters from 10 days before the SH were compared with ICU patients who sustained insulin-associated hypoglycemia (IAHG). Daily medians (IQR) were compared using the Mann–Whitney U test; a $P < 0.05$ was considered statistically significant.
**Results:** In 35,000 patients admitted to the ICU, a total of 332 patients with SH were compared with 692 patients with IAHG. In the SH group, the liver enzymes ASAT (aspartate amino transferase) and ALAT (alanine amino transferase) were significantly higher from 3 days before the hypoglycemia, compared to the IAHG group. Lactate was already significantly higher 10 days before hypoglycemia (day -10) in the SH group. Additionally, the SH group also had a significant increase in both direct and total bilirubin 9 days before the event. The coagulation tests differed significantly as early as 5 days before hypoglycemia.
The largest differences (median with IQR; all with $P < 0.001$) between the SH and the IAHG group were as follows:

Day-5: Direct bilirubin 22 (4–88) vs 4 (1–15) µmol/L.
Day-4: INR (international normalized ratio)1.8 (1.3–2.3) vs 1.2 (1.1–1.5).
Day 0: ALAT 98 (25–556) vs 38 (20–89) U/L.

ASAT 237 (49–1550) vs 47 (27–102)U/L,
lactate 5.5 (1.7–8.9) vs 1.2 (0.9–1.7) mmol/L,
total bilirubin 18 (9–41) vs 8 (5–15) µmol/L,
aPTT 50.8 (35.1–78.1) vs 35(29–46.6) s.
PT 19.2 (15.1–28.4) vs 14 (11.9–18.5) s.

**Conclusions:** Our study demonstrates that spontaneous hypoglycemia due to failing gluconeogenesis in critically ill patients is preceded by changes in liver enzymes, coagulation, and bilirubin. This may facilitate prevention of hypoglycemia with timely initiation of glucose administration.

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4. None.

**Topic:** Metabolism, endocrinology, liver failure, and nutrition

## 000414

### Factors related to mortality in patients with acute respiratory distress syndrome (ARDS) in a lower middle-income country: a retrospective observational study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000414

**Introduction:** Acute respiratory distress syndrome (ARDS) is associated with high mortality, especially in low- and middle-income countries (LMICs). While many factors associated with acute illness can predict mortality, the disease prognosis for patients with ARDS in LMICs remains incompletely understood.
**Objectives:** This study aimed to investigate the mortality rate and associated factors from ARDS in Vietnam.
**Methods:** We performed a retrospective observational study that included all patients with ARDS admitted to a central hospital in Hanoi, Vietnam, between August 2015 and August 2023. We collected data on the prehospital care, characteristics, management, and outcomes of patients with ARDS and compared these data between survival and death in the hospital. We assessed factors associated with hospital mortality using logistic regression analysis.
**Results:** Of the 353 eligible patients, 68.0% were male, the median age was 55.0 years (Q1-Q3: 39.0–66.0), and 61.5% died in the hospital. Most patients were transferred from local hospitals (86.4%; 305/353). Among these patients, 80.6% (253/314) had previously received non-invasive or invasive mechanical ventilation (MV) at the referring hospital. During transportation, only 60.1% (116/201) of patients had an endotracheal tube (ET), and only 25.6% (41/160) received non-invasive or invasive MV during transport. The primary etiology of ARDS was pneumonia (98.2%, 222/226), with the predominant pathogen being influenza A(H1N1)pdm09 virus (12.8%, 29/227). On admission, the mean PaO2/FiO2 ratio was 110.04 mmHg (SD: 57.72), with the PaO2/FiO2 ratio of ≤ 100 mmHg that was most commonly observed (56.0%, 196/350), and the median Sequential Organ Failure Assessment (SOFA) score was 10.0 (Q1–Q3: 7.0–12.0). Most patients (93.4%; 211/226) received invasive MV on the first day of admission. A majority of patients (100%; 138/138) received renal replacement therapy (RRT), and 36.7% (73/199) underwent cytokine adsorption therapy during the ICU stay. Common complications included hospital-acquired pneumonia (58.9%; 208/353) and sepsis and septic shock (47.0%; 166/353). In contrast to the SOFA score of ≥ 9.50 (adjusted OR: 14.819; 95% CI 1.410–155.760; $p = 0.025$), ET during transportation (adjusted OR: 0.057; 95% CI 0.004–0.887; $p = 0.041$) was independently associated with decreased risk of hospital mortality.

**Conclusions:** In this study, we investigated a selected cohort of patients with a high mortality rate admitted to a central hospital in Hanoi, Vietnam. Most of these patients had been transferred from local hospitals, where the rates of ET and MV during transportation were low. Interestingly, ET during transportation emerged as a protective factor associated with reduced mortality risk. Enhancements in local human, medical, and sociological resources are likely to play a crucial role in mitigating the mortality of ARDS in Vietnam.

**Reference(s)**

1. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

**Topic:** Acute respiratory failure and mechanical ventilation

## 000415

## Inspiratory effort and respiratory muscles activation during different breathing conditions in difficult to wean (DTW) patients: an explorative study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000415

**Introduction:** A recent randomized-controlled trial surprisingly indicated that DTW patients achieved similar improvements in respiratory muscle strength after both low-intensity (control group) and high-intensity (intervention group) inspiratory muscle training (IMT) [1]. This suggests that performing fast and deep inspirations against both low and high external IMT loads provided these patients with a training stimulus. However, the relationship between the external IMT load, as reflected by changes in airway pressure swings (ΔPaw), and total inspiratory effort, as assessed by esophageal pressure swings (ΔPes), remains unexplored in DTW patients. It is also unclear how ΔPes and ΔPaw are associated with activation of inspiratory muscles (EMGs).
**Objectives:** To compare ΔPes and ΔPaw and their relationship with the activation of extradiaphragmatic inspiratory muscles in DTW patients during different breathing conditions.
**Methods:** ΔPes, activation of scalene (EMGsca), sternocleidomastoid (EMGscm), and parasternal intercostal (EMGpi) muscles were recorded during 1) mechanical ventilation (MV), 2) unsupported spontaneous breathing (SB), low-load IMT (load < 10% maximal inspiratory pressure, PImax = 3cmH2O) executed with 3) slow (LLs-IMT) and 4) fast (LLf-IMT) deep inspirations, and 5) high-load IMT (load ~ 30%PImax = 11 ± 2cmH2O) executed with fast and deep inspirations (HL-IMT). ΔPaw (Paw changes from end-expiration to end-inspiration), inspiratory tidal volume (VT) and peak inspiratory flow (PIF) were recorded during conditions 2–5. Measured variables were compared across the breathing conditions with mixed model analysis. Spearman's r correlation was calculated to assess the relationship between EMGs and both ΔPes and ΔPaw [2].
**Results:** N = 5 patients (age: 68 ± 1y; 20%male; PImax:37 ± 7cmH2O; forced vital capacity: 0.66 ± 0.16L) were included. ΔPes was three-to-four times larger than ΔPaw during SB and IMT conditions (Fig. 1). ΔPaw differed significantly across conditions except between LLs- and LLf-IMT (Fig. 1). ΔPes, EMGs, VT, and PIF differed significantly across conditions except between LLf- and HL-IMT (Figs. 1–3). ΔPaw was weakly-to-moderately correlated to the EMGs, while the correlation between ΔPes and EMGs was moderate to strong (Table 1) [2].

**Table 1 (abstract 000415)** Correlations of ΔPes and ΔPaw with EMGs

| | %EMGsca,max | %EMGscm,max | %EMGpi,max |
|---|---|---|---|
| %ΔPaw,max | 0.35(0.23–0.46) | 0.55(0.45–0.64) | 0.53(0.43–0.63) |
| %ΔPes,max | 0.55(0.47–0.62) | 0.68(0.62–0.74) | 0.73(0.67–0.78) |

Values are expressed as Spearman's r correlation (95%CI). ΔPaw, ΔPes, and RMS amplitude of the EMGs were normalized to the maximum values obtained by each patient across the breathing conditions (expressed as %max)

**Conclusions:** In 5 DTW patients, the similarity of ΔPes and EMGs during LLf- and HL-IMT indicates that performing deep and fast inspirations against low or high external IMT loads provides them with a training stimulus. ΔPes was considerably larger than ΔPaw, indicating that the external IMT loads constitute only a fraction of the total inspiratory effort. ΔPes is also better related to EMGs than ΔPaw.

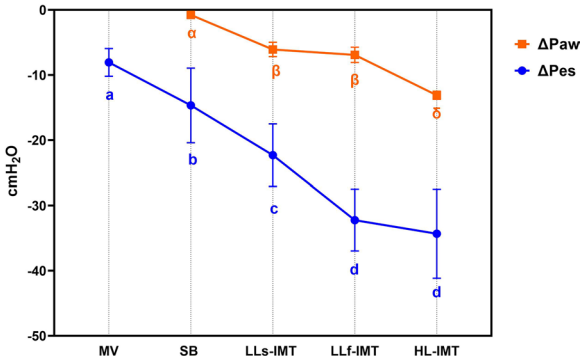


**Fig. 1 (abstract 000415)** Evolutions of airway pressure swings (ΔPaw) and esophageal pressure swings (ΔPes) across breathing conditions. For representation purposes, values are represented as means and standard deviations per condition. Statistical comparisons between conditions were conducted using mixed model analysis, a more sophisticated statistical method. Compact letter display (letters a-d and α-∂) was used for representation of comparisons of ΔPaw and ΔPes between conditions. Different assigned letters denote a significant difference between conditions (level of significance adjusted with Bonferroni correction: $p < 0.005$ for ΔPes and $p < 0.008$ for ΔPaw). Conditions sharing the same letter are not significantly different from each other. Number of breaths recorded per breathing condition: MV = 112, SB = 120, LLs-IMT = 26, LLf-IMT = 28, and HL-IMT = 45

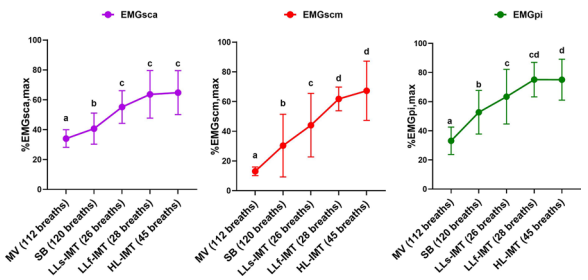


**Fig. 2 (abstract 000415)** Evolutions of activation of scalene (EMGsca), sternocleidomastoid (EMGscm), and parasternal intercostal (EMGpi) muscles across breathing conditions. EMG root-mean-square values (expressed as %EMGmax) were normalized to the highest activation value across breathing conditions. For representation purposes, values are represented as means and standard deviations per condition. Statistical comparisons between conditions were conducted using mixed model analysis, a more sophisticated statistical method. Compact letter display (letters a-d) was used for representation of comparisons of EMGs between conditions. Different assigned letters denote a significant difference between conditions (level of significance adjusted with Bonferroni correction: $p < 0.005$). Conditions

sharing the same letter are not significantly different from each other. Number of breaths recorded per breathing condition: MV = 112, SB = 120, LLs-IMT = 26, LLf-IMT = 28, and HL-IMT = 45

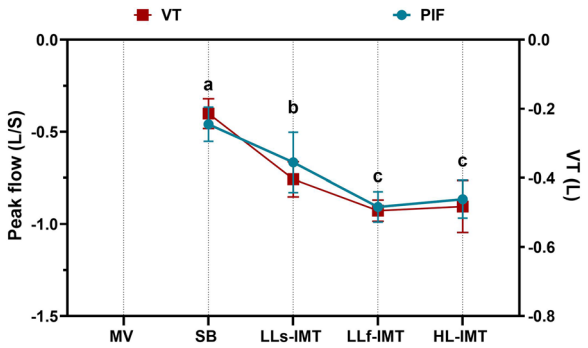


**Fig. 3 (abstract 000415)** Evolutions of inspiratory volume (VT) and peak inspiratory flow (PIF) across breathing conditions. For representation purposes, values are represented as means and standard deviations per condition. Statistical comparisons between conditions were conducted using mixed model analysis, a more sophisticated statistical method. Compact letter display (letters a–c) was used for representation of comparisons of VT and PIF between conditions. Different assigned letters denote a significant difference between conditions (level of significance adjusted with Bonferroni correction: $p < 0.008$). Conditions sharing the same letter are not significantly different from each other. Number of breaths recorded per breathing condition: MV = 112, SB = 120, LLs-IMT = 26, LLf-IMT = 28, and HL-IMT = 45

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3. This study was funded by Research Foundation Flanders (FWO Project Grant G053721N).

**Topic:** Nursing care and physiotherapy

## 000416

### Comparing critical care mortality prediction using general linear regression modelling (GLM) and deep learning

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**Introduction:** Prediction of mortality in critical care allows for optimization of resource allocation, early identification of high-risk patients, and aids in clinical decision-making. Regression is a traditional statistical model used to establish the relationship between predictor variables and a dependent variable and so can be used for prediction of outcomes in healthcare. Interest in using deep learning to predict mortality is rising with the hope that it can improve over traditional statistical models (Naimi, 2021; Stephens, 2023). Deep learning is a technique that uses neural networks with several layers to model complex patterns in data.
**Objectives:** To compare the effectiveness of a Deep Learning Model (DLM) and General Linear regression Model (GLM) in predicting mortality for patients being admitted to critical care.
**Methods:** Deidentified data for 1333 patients admitted to critical care at East Surrey Hospital between 1/1/20 and 30/12/23 were analysed with deep learning using a multilayer neural network and a generalised linear regression model. The variables included were age, length of stay, APACHE II and ICNARC Physiology score, maximum organ support, lowest GCS, and highest and lowest of these variables: non-central temperature, systolic BP, heart rate, serum sodium, and WBC.
The data were split into training (70%) and test (30%) datasets. All data were scaled using a min–max method. Confusion matrices were generated to predict how well deep learning predicted mortality in this group of patients, as well as to assess the accuracy of the DLM and GLM.

**Results:**

**Table 1 (abstract 000416)** Performance of the deep learning model and general regression model

| | Sensitivity | Specificity | PPV | NPV | Accuracy | MSE |
|---|---|---|---|---|---|---|
| Deep learning model | 0.55 | 0.93 | 0.47 | 0.95 | 0.89 | 0.108 |
| General regression model | 0.45 | 0.97 | 0.60 | 0.94 | 0.92 | 0.067 |

PPV: Positive Predictive Value, NPV: Negative Predictive Value, MSE: Mean Squared Error.

**Conclusions:** The comparison between a DLM and a GLM reveals interesting insights into their performance on a specific task. The DLM, despite achieving a comparatively lower accuracy of 89%, had a slightly better NPV of 95% which is a very significant parameter when it comes to mortality prediction. However, its Mean Squared Error (MSE) is higher at 0.10, indicating that its predictions have a larger average squared difference from the actual values. In comparison, the GLM boasts a higher accuracy of 92%, suggesting superior performance in correctly classifying instances. It achieves a lower MSE of 0.06, signifying closer proximity between its predictions and the true values.
In summary, while the DLM demonstrates competitive accuracy, the GLM outperforms it in terms of both accuracy and MSE. This comparison underscores the importance of evaluating models based on multiple metrics to gain a comprehensive understanding of their performance characteristics. Furthermore, it emphasises the necessity of selecting models tailored to the specific requirements and nuances of the task at hand.

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**Topic:** Health services research and outcome

## 000420

### The impact of body temperature on cerebral metabolism in acute brain injured patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000420

**Introduction:** Metabolic dysfunction is common in acute brain injured patients and is associated with poor outcomes (1, 2). Hyperthermia and hypothermia have also been associated with poor outcome in this setting (3, 4). Few data are available on the impact of body temperature on cerebral metabolism.
**Objectives:** To assess the association between body temperature and metabolic function in acute brain injured patients.
**Methods:** This is a prospective single-center study that enrolled consecutive patients admitted to the ICU due to acute brain injury from January 2019 to January 2024 and who required invasive multimodal neuromonitoring combining invasive intracranial pressure (ICP), brain tissue oxygenation (PbtO2), and cerebral microdialysis (CMD). Metabolic crisis was defined as a lactate-to-pyruvate ratio (LPR) on CMD > 40. Hyperthermia was defined as body temperature > 37.7 °C; hypothermia as a body temperature < 35.0 °C.
**Results:** We included 51 patients resulting in 4762 measures of body temperature and 2612 measures of LPR. Twenty-seven patients (53%) had head trauma, 19 (37%) had non-traumatic subarachnoid hemorrhage and 5 (10%) had spontaneous intracerebral hemorrhage. The median age was 43 (33–56) years old and 32 (80%) patients were male. The median Glasgow outcome scale on admission was 7 (4–13). The median LPR in hyperthermia ($n = 148/586$; 25%), normothermia ($n = 271/1130$; 24%), and hypothermia episodes ($n = 51/80$; 64%) was 33 (27–39), 31 (25–39), and 43 (33–55), respectively ($p = 0.001$). In a multivariable generalized linear model including PbtO2, ICP, and cerebral perfusion pressure values, hypothermia, when compared to normothermia, was independently associated with a higher LPR (beta coefficient 9.198 (0.203–18.194), $p = 0.045$).
**Conclusions:** In this study, hypothermia was associated with a higher probability of metabolic crisis in a mixed population of acute brain injury patients.

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**Topic:** Neurointensive care

## 000421

## Multicomponent family support intervention in Swiss adult intensive care units: FICUS trial cluster baseline characteristics

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**Introduction:** There is a need to develop intensive care unit (ICU) services that support families of patients experiencing critical illness to prevent acute stress and burden and to mitigate negative consequences for long-term individual and family health (Kiwankua et al., 2022; Rhoda et al., 2022; Zante et al., 2020). A Family Support Intervention (FSI) (Naef et al., 2020; 2021) was therefore developed and is currently tested for its clinical effectiveness in adult ICUs.
**Objectives:** To report cluster baseline characteristics of the FICUS cluster-randomized trial.
**Methods:** ICUs had to be able to provide highest level of patient care, run at least 8 beds, and have > 300 admission per year with a length of stay of ≥ 48 h. Intervention ICUs implemented a new family nursing role and care pathway consisting of three core components in addition to usual care: liaison and coordination, family support, and structured, interprofessional communication (Naef et al., 2022, Verweij et al., 2023). Control ICUs did not change their usual care. For each cluster, ICU characteristics were assessed at baseline via the last available Minimal Data Set as required by the Swiss Society of Intensive Care Medicine. The interprofessional core leadership teams appraised family care processes and policies, using the Self-Assessment Tool for Family-Centered Care in ICU (Hwang et al., 2017) and the Patient- and Family-Centered Care Organizational Self-Assessment Tool Institute for Healthcare Improvement, 2013). Descriptive analysis of cluster baseline characteristics was undertaken.
**Results:** A total of 30 ICUs were eligible. 16 ICUs agreed to participate and were randomly assigned 1:1 to intervention (IG) or control group (CG) using minimization. 11 were in major teaching hospitals (IG 62.5%, CG 75%). At the median, ICUs operated 12 beds (IG 11.6 vs. CG 15.4) and admitted 1037.5 patients per year (918.5 vs. 1145.5) with 21% of high-risk admissions (SAPS-2 score > 45, 21% vs. 24.1%) and a mean length of stay of 3.5 days (3.7 vs. 3.4). Most nursing staff held an ICU certification (median: 74.0%; IG 74.0%, CG 71.5%). ICUs rated the family-centeredness in the ICU with a median score of 3.0 (2.9 vs. 3.1) out of 1–4 (1 = high), and 2.1 (2.1 vs. 2.1) out of 1–5 (5 = high) for the hospital. From 06/2022 to 12/2023, 885 family members were enrolled (IG n = 412 vs. CG n = 473), with an average of 55 per cluster (52 vs. 59).
**Conclusions:** ICU characteristics were comparable across study arms. Clusters in the CG tended to be larger ICUs, treating a higher number of patients overall, and with high-risk admissions. Recruitment targets could be reached, with some heterogeneity between clusters.

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**Topic:** Health services research and outcome

### 000422 Adequacy of selection criteria for e-CPR candidacy in out-of-hospital cardiac arrest: preliminary results from an Italian tertiary care center

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**Introduction:** Out-of-Hospital Cardiac Arrest (OHCA) is burdened by high mortality and the implementation of extracorporeal life support (e-CPR) has shown conflicting results (1).
**Objectives:** Test the adequacy of selection criteria for e-CPR candidacy in out-of-hospital cardiac arrest at Turin University Hospital (Italy).
**Methods:** Single-center observational study. The inclusion criteria of the e-CPR program were: refractory OCHA, age < 65, witnessed cardiac arrest, continuous CPR, no flow < 6, and low flow < 60 min, no pre-existing organ failure, EtCO2 > 10 mmHg, and shockable rhythms or PEA. The study was approved by the local ethical committee and data concerning out-of-hospital care, timing of hospital arrival, post-resuscitative care, and outcome were recorded.
**Results:** In 4 years, all 192 OCHA patients were screened and those eligible for e-CPR were evaluated for VA-ECMO cannulation. Consequently, 30 patients received e-CPR with a 30-day survival of 13.3%. No difference was found in no flow, low flow, and time to ECMO start between e-CPR survivors and non-survivors. However, survivors received better perfusion (as indicated by etCO2) and ventilation. They had higher pH and lower lactate levels at ECMO start. After 24 h the amount of support by ECMO, as measured by blood flow and gas flow, was lower in patients who ultimately survived.

**Table (abstract 000422)**

| | | Survivor | Non-survivor | *p* |
|---|---|---|---|---|
| | *n*° (%) | 4 (13,3) | 26 (86,7) | |
| No flow | | 1 (0;1) | 2 (0;5) | 0,24 |
| Low flow at hospital | | 41 (33;47) | 48 (39;60) | 0,41 |
| Time to ECMO | | 72 (58;87) | 76 (67;86) | 0,7 |
| Before ECMO start | etCO2 | 38 (38;41) | 21 (15;29) | 0,01 |
| | pH | 7,02 (7;7,04) | 6,9 (6,9;7) | 0,03 |
| | pCO2 | 51 (44;57) | 86 (67;93) | 0,06 |
| | Lactate | 10,4 (7,7;13,6) | 12,8 (10,8;17) | 0,33 |
| Start ECMO | pH | 7,37 (7,30;7,40) | 7,07 (7;7,24) | 0,047 |
| | Lactate | 4,5 (3,7;9) | 15 (11,2;17) | 0,05 |
| After 6 h ECMO | Alive | 4 (15,4) | 22 (84,6) | |
| | pH | 7,42 (7,33;7,48) | 7,32 (7,29;7,35) | 0,14 |
| | Lactate | 2,9 (2,3;4,8) | 8,1 (5,8;12) | 0,06 |
| After 24 h ECMO | Alive | 4 (25) | 12 (75) | |
| | pH | 7,36 (7,32;7,38) | 7,32 (7,23;7,40) | 0,78 |
| | Lactate | 2,3 (1,3;5,3) | 3 (2,7;5) | 0,84 |
| | Blood flow | 3,2 (3;3,5) | 4,5 (4,1;5) | 0,01 |
| | Gas flow | 1,5 (0,9;3,4) | 3 (3;4) | 0,15 |

**Conclusions:** E-CPR survivors appear to be characterized by a lower metabolic imbalance at ECMO initiation even if there is no difference in ischemia time but rather in metabolic markers such as etCO2, pH and lactate. This likely indicates that comparable low flow time could be associated with different ischemic damages, as already seen in an experimental model (*2*). Consequently, it seems of particular importance to implement the use of more sensitive markers of ischemia to select better the population to be treated with e-CPR. In the ARREST trial (*3*), rigorous patient selection made it possible to obtain a positive effect of e-CPR on survival, while the most recent INCEPTION trial (*4*) found no difference with conventional CPR. Being ECMO a highly invasive and high-cost procedure, it is undoubtedly a priority to refine the selection criteria, so that e-CPR is truly effective in improving OCHA survival.

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**Topic:** Cardiac arrest.

### 000423

### Impact of protein catabolism and muscle mass loss on length of hospital stay and mortality in critically ill patients

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**Introduction:** Protein metabolism is the process by which the body breaks down and uses proteins to maintain effective homeostasis. In critically ill patients, protein breakdown occurs at a much faster rate than normal, caused by proteolysis, ubiquitination, bed rest, and stress. The result of this catabolic state is a substantial loss of muscle and lean body mass, which can affect ventilation time, hospital stay, and even patient mortality.
**Objectives:** To evaluate the impact of protein catabolism and loss of muscle mass on the length of hospital stay and mortality of critically ill patients in the intensive care unit (ICU).
**Methods:** We performed a prospective, descriptive, and analytical study at the adult ICU of the Hospital Juárez de México, from January 1, 2023 to January, 2024, that included critically ill patients over 18 years old who required invasive mechanical ventilation and vasopressor/inotropic agents. We excluded pregnant women, and all who did not fulfill at least 2 weeks of hospital stay. Muscle mass was analyzed through Bioelectrical Impedance Analysis (BIA) and degree of protein catabolism by quantification of nitrogen balance, serum albumin, prealbumin, and transferrin, on days 1, 5, 10, and 14 of hospital stay, and on the day of discharge. Other variables evaluated included primary diagnosis, prognostic and nutritional scales such as APACHE II, SAPS II, SOFA, and NUTRIC Score, total length of hospital stay, and/or mortality.
**Results:** 49 patients were evaluated, 29 men and 20 women with an average age 53 years. The phase angle (PA) values of 6.5° for men and 6° for women were the ones that presented the best balance between sensitivity and specificity for this study. The PA was significantly lower in patients with prolonged intubation, prone sessions, or admission for complicated surgical pathology that required more than one intervention (3.7°) than in patients with early extubation, early weaning of vasopressors, and resolution of surgical pathology without second intervention (4.81°). Significant correlations obtained between lower PA and higher degree of catabolism according to nitrogen balance ($r$: 0.411; $P < 0.00001$). The length of hospital stay in patients with a lower degree of catabolism and lower loss of muscle mass was 19.07 days (SD ± 1.9) and those with higher catabolism and loss of muscle mass were 28.77 (SD ± 7.9) ($p = 0.0001$).

**Conclusions:** Our results suggest that we now count with more feasible methods that can nicely complement the deficiencies of severity scoring systems and may be an important prognostic factor for survival in critically ill patients, as well as a predictor of length in the intensive care unit. Understanding the degree of catabolism and its impact on the muscle mass of our patients will allow us to provide appropriate and timely nutritional interventions.

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**Topic:** Metabolism, endocrinology, liver failure, and nutrition

## 000424

## Association of Driving Pressure (DP) and Mechanical Power (MP) in severe ARDS


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000424


**Introduction:** In patients with severe ARDS, mechanical ventilation is a pillar in the treatment, being focused on low Vt and high PEEP with the objective of alveolar protection against VILI. Mechanical power and alveolar driving pressure are in close relationship with development of VILI, starting from the point where patients have a baby lung, a great emphasis on Vt, and PEEP to improve patient survival.
**Methods:** Observational study of retrospective, analytic cohort, made in the high specialty regional hospital, imss-benestar; tertiary care hospital in the northeast of Mexico. 108 patients with severe ARDS (PaO2/FIO2 < 150 mmhg) due to SARS COV 2 were included, we collect the demographic information, pre-existing diseases, clinical variables: SOFA score, alveolar distension pressure (DP) Plateau pressure, volume/minute, FIO2, Total PEEP, PaO2/FIO2, Distensibility, Pao2, Paco2, and Mechanical Power (PM). We perform categorical variables with Chi X2, continuous variables with means and standard deviation with Student T, and association measures with ODDS ratio (OR) in SPSS 24.
**Results:** 108 patients were analyzed, age 59.1 ± 13.8 (22–80), with a BMI 32 ± 6.2 (24–52), male in 66.7%, pre-existing diseases 75%, and mortality 61.9%. We found an OR 2.78 with DP > 13.4 (IC 1.9–6.25) and an OR 4.68 in MP > 17j/min (IC 2.92—7.48).

**Table (abstract 000424)**

| Variable | Survival ($n = 42$) | No survival ($n = 66$) | $p$ value < 0.05 |
|---|---|---|---|
| Age (years) | 53.4 | 62.8 | **0.001** |
| BMI (Kg/m$^2$) | 32.2 | 32.5 | 0.780 |
| APACHE II | 18 | 26 | **0.001** |
| SOFA | 7.0 | 10.3 | **0.001** |
| Days of COVID-19 at admission | 17.4 | 16.7 | 0.426 |
| Vt (l/min) | 6.2 | 5.8 | 0.625 |
| PEEP (cmH2O) | 11.2 | 11.3 | 0.778 |
| Plateau (cmH2O) | 26.3 | 29.1 | 0.024 |
| Driving P (cmH2O) | 13.4 | 17.0 | **0.004** |
| Mechanical power (j/min) | 17.1 | 20.6 | **0.000** |
| Risk factor Model including mortality | OR | IC-95% | P-value < 0.05 |
| Driving pressure > 13.4 cmH2O | 2.78 | 1.90–6.25 | **0.004** |
| SOFA | 8.77 | 3.37–22.8 | **0.001** |
| APACHE II | 14.7 | 4.93–44.1 | **0.001** |
| Mechanical power > 17 J/min | 4.68 | 2.92–7.48 | **0.001** |

**Conclusions:** A statistically significant association was found with an increase in mortality in patients with SOFA values > 8.77 points and Apache II > 14.7 at admission, as well as protective mortality values with DP < 13.4 and MP < 17. The findings of this study highlight the importance of narrow monitoring and lung protection strategies as pillar in the survival of patients with severe ARDS.

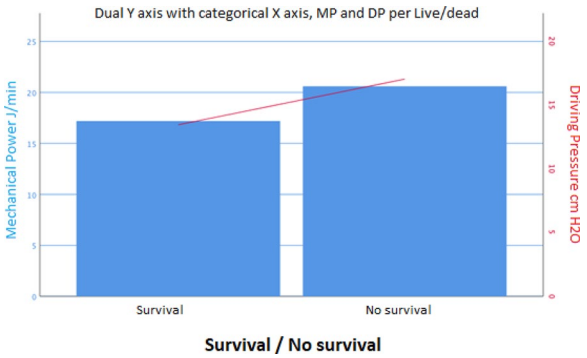


**Fig. (abstract 000424)** Mechanical power and driving pressure

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000425

### Hyperoxic test as a predictor of postoperative complications in chronic heart failure patients scheduled for coronary artery bypass graft surgery: a pilot study

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**Introduction:** Endothelial dysfunction in chronic heart failure (CHF) patients of New York Heart Association (NYHA) class II–III have been associated with reduced exercise hyperemia, impaired functional capacity, and increased incidence of hospitalization, or death [1]. The DeltaPCO2/C(a-v)O2 ratio seems a reliable marker of global anaerobic metabolism [2]. Patients suffering from CHF have microvascular abnormalities and endothelial dysfunction, so their vessels react to hyperoxia much quicker, and even light vasoconstriction will provoke essential hypoperfusion [3].
**Objectives:** The ΔPCO2 and the ΔPCO2/C(a-v)O2 in a response to hyperoxia as a predictors of postoperative complications (composite of acute myocardial infarction, need for pacemaker, intraaortic balloon pump, revision of the surgical wound for bleeding, acute kidney injury, delirium, pneumonia, mediastinitis, and stress ulcers of the gastrointestinal tract) during 60 days after surgery were assessed.
**Methods:** The study included 19 patients with CHF with reduced ejection fraction (male, 60 [54; 64] years old, BMI 26.7 [23.5; 29.8] kg/m$^2$) underwent coronary artery bypass graft with normothermic cardiopulmonary bypass (CPB). A hyperoxic test included inhaled gas mixture of 75–80% oxygen for 30 min. Test was conducted in an anesthetized, catheterized, and mechanically ventilated patients before CPB.
**Results:** The duration of the operation was median 360 [IQR 300; 480] min. The duration of CPB was 178 [113; 243] min, and the duration of myocardial ischemia was 129 [80; 153] min. The postoperative complications developed in 7 patients. Spontaneous sinus rhythm recovery in the postperfusion period was in 4 patients. The ΔPCO2 after 30 min of hyperoxia could serve as a predictor of spontaneous sinus rhythm recovery [area under curve (AUC) = 0.68 (95%CI 0.54–0.82), $p = 0.020$, cut-off more than 4.6 mmHg, sensitivity 88%, specificity 49%]. The ΔPCO2/C(a-v)O2 ratio after 10 min of hyperoxia appeared to be a predictor of postoperative complications in subgroup of patients with chronic heart failure with reduced ejection fraction [AUC = 0.83 (95%CI 0.64–1.00), $p = 0.018$, cut-off more than 0.9, sensitivity 80%, specificity 58%]. Length of stay in ICU was 2 [1; 3] days.
**Conclusions:** The ΔPCO2 after 30 min of hyperoxia could be a predictor of spontaneous sinus rhythm recovery in the post-CPB period. The ΔPCO2/C(a-v)O2 ratio after 10 min of hyperoxia can serve as a predictor of postoperative complications in patients with chronic heart failure underwent coronary artery bypass graft surgery.

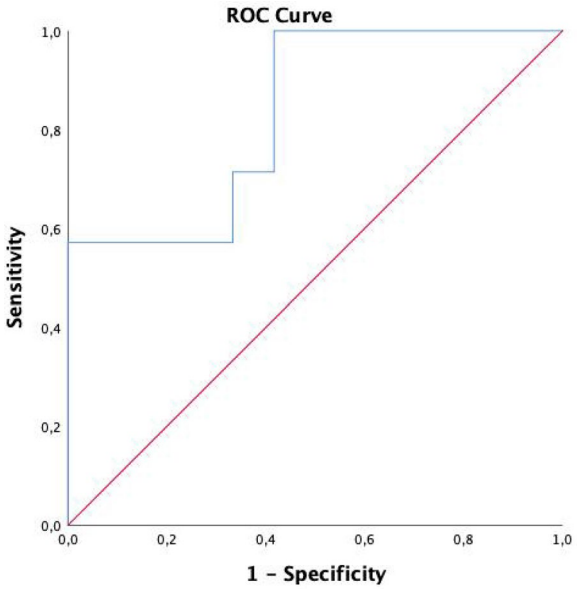


**Fig. (abstract 000425)** The ΔPCO2/C(a-v)O2 ratio after 10 min of hyperoxia appeared to be a predictor of postoperative complications in subgroup of patients with chronic heart failure with reduced ejection fraction [AUC = 0.83 (95%CI 0.64–1.00), $p = 0.018$, cut-off more than 0.9, sensitivity 80%, specificity 58%]

**Reference(s)**

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**Topic:** Perioperative care

## 000427

### The impact of implementing the usage of "I am Clean" stickers on Ultrasound machines to improve staff adherence to the local ultrasound probe cleaning protocol in the intensive care unit (ICU)

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**Introduction:** Ultrasound (US) equipment is frequently used in ICU as a diagnostic tool and to assist procedures. Point of care echocardiography is now commonplace and National Institute of Health and Care Excellence (NICE) recommends US guidance for insertion of central venous catheters [1]. Infection control is paramount in healthcare settings and routine cleaning of equipment is essential to prevent hospital acquired infections. "I am Clean" stickers allow quick and easy communication of when an item was last cleaned. This study aimed to assess and improve cleaning practices of US equipment in ICU.
**Objectives:** 1. To establish whether US machines were being cleaned pre- and post-use, using "I am Clean" stickers. 2. To evaluate if the use of digital communications and poster interventions improved the usage of "I am Clean" stickers.
**Methods:** Our ICU has 3 echocardiography and 3 US devices. Over a 2-week pre-intervention period, the presence of "I am Clean" stickers on all US machines was reviewed and recorded once daily, and a questionnaire was distributed to ICU staff regarding their cleaning practices and frequency of sticker use. A subsequent educational intervention involved the display of posters in clinical and non-clinical areas, as well as reminder emails and teaching sessions. The post-intervention period comprised a 2-week assessment of the presence of "I am Clean" stickers on all US machines.
**Results:** We received 20 responses to the questionnaire. This highlighted that 35% of respondents used US machines daily (Figure 1). However, 57% of these staff members were unaware of the protocol for US machine disinfection. Pre-intervention, despite 55% of respondents reporting they knew about the replacement of "I am Clean" stickers (Figure 2), zero "I am Clean" stickers were displayed on US machines. 70% of respondents did not know where stickers are kept. Post-intervention, 32 stickers were used during a 2-week period.
**Conclusions:** An educational intervention regarding "I am Clean" stickers on US machines has effectively improved staff adherence to probe cleaning protocols derived from the British Medical US Society (BMUS) guidelines, evidenced by increased sticker presence post-use [2]. While visual inspection alone may not always guarantee complete reliability, this intervention facilitates easier auditing of decontamination processes and promotes staff accountability. Our results were similar to those of a multi-centred study looking at disinfection practices of US in emergency wards. Poor adherence to decontamination protocols is a widespread issue throughout clinical environments, wards, and hospitals [3].
Future study should investigate whether this intervention reduces probe contamination instances and prevents organism spread. Additionally, obtaining staff feedback on US probe decontamination protocols will guide future education initiatives. Sustaining these improvements requires ongoing monitoring and education efforts to uphold hygiene and patient safety standards.

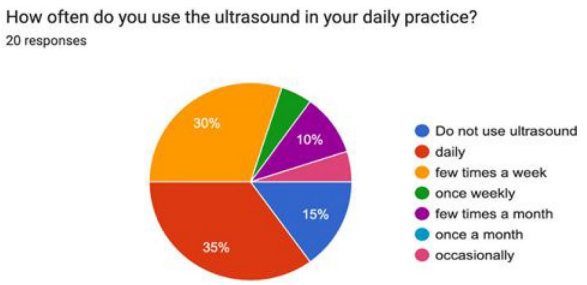


**Fig. 1 (abstract 000427)** Pie chart showing responses to survey question

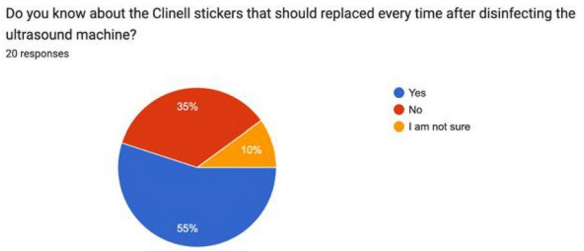


**Fig. 2 (abstract 000427)** Pie chart showing responses to survey question

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**Topic:** Infections and prevention

## 000429

## ROX score in pregnancies with COVID-19 respiratory failure predicts successful weaning of high-flow nasal cannula

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000429

**Introduction:** ROX score [Respiratory rate oxygenation index: SpO2 (oxygen saturation)/FiO2 (fraction of inspired oxygen)/RR (respiratory rate)] as well as ROX/HR (heart rate) Index (ROX/HR) are used in non-pregnant patients requiring high-flow nasal cannula (HFNC) for acute respiratory failure to predict the success or failure of HFNC. COVID-19 in pregnancy is associated with increased risk for mechanical ventilation. We hypothesized that ROX scores and ROX/HR index could be used in pregnant patients with COVID-19 respiratory failure to predict successful weaning of HFNC and to identify patients likely to benefit from early intubation, avoiding the adverse effects of delayed intubation.
**Methods:** Retrospective chart review of pregnant patients with COVID-19 including demographics, comorbidities, vital signs, and respiratory parameters. All pregnant patients presenting to our two hospitals at any gestational age with a positive COVID-19 test who initiated HFNC were included through 2022. Transferred patients already on HFNC or intubated were excluded. ROX and ROX/HR were calculated at four time points of HFNC: at initiation, 3, 6, and 12 h. The primary outcome was need for intubation. Statistical analyses included Chi-square, t test, Wilcoxon (for non-parametric data), and ROC curves.
**Results:** 44 patients required HFNC, of whom 11 eventually required intubation (25%). Median SpO2/FiO2 ratio, ROX score, and ROX/HR index were significantly lower at 3, 6, and 12 h of HFNC in patients who required intubation (Table 1). ROX/HR index at 6 h $< 4.16$ was associated with intubation with 91% sensitivity and 84% specificity (AUC $= 0.872$). ROX scores $> 4.88$ at 6 h and 12 h were associated with successful weaning of HNFC ($p < 0.01$).

**Conclusions:** The results of our small study of pregnant patients with COVID-19-associated respiratory failure are consistent with non-pregnant data in that ROX score and ROX/HR index may be helpful in predicting both successful weaning from HFNC and the need for intubation, especially at the 6-h HFNC time point. Validation in larger multicenter studies is needed to confirm our results:

**Table 1 (abstract 000429)** Demographics, medical comorbidities and respiratory parameters of pregnant patients with COIVD-19 and association with mechanical ventilation. GA = Gestational age, SpO2 = Oxygen saturation, FiO2 = Fraction of inspired oxygen (%), RR = Respiratory rate, HTN = Hypertension

| | | Intubated (n=11) | Not Intubated (n=33) | P value |
|---|---|---|---|---|
| Age (mean +/- SD) | | 30.64 (6.92) | 29.15 (7.26) | 0.56 |
| BMI | | 36 (18.47) | 34.67 (10.53) | 0.56 |
| GA (Mean +/-SD) | | 29.04 (4.40) | 28.81 (6.36) | 0.91 |
| Race N (%) | Asian | 0 (0) | 2 (6) | 0.24 |
| | Black | 1 (9) | 3 (9) | |
| | Other | 3 (27) | 2 (6) | |
| | White | 7 (64) | 26 (79) | |
| Ethnicity N (%) | Hispanic | 7 (64) | 23 (70) | 0.71 |
| | Not Hispanic | 4 (36) | 10 (30) | |
| HTN N (%) | Yes | 1 (9) | 7 (21) | 0.37 |
| | No | 10 (91) | 26 (79) | |
| Asthma N (%) | Yes | 0 (0) | 2 (6) | 0.40 |
| | No | 11 (100) | 31 (94) | |
| Smoking N (%) | Yes | 0 (0) | 1 (3) | 0.06 |
| | No | 11 (100) | 32 (97) | |
| **SpO2** | Initial | 96 (2) | 97 (3) | 0.45 |
| | 3 Hour | 94 (5) | 97 (4) | 0.08 |
| | 6 Hour | 96 (5) | 96 (3) | 0.42 |
| | 12 Hour | 97 (3) | 95 (4) | 0.65 |
| **FiO2** | Initial | 90 (40) | 70 (50) | 0.27 |
| | 3 Hour | 80 (30) | 60 (40) | 0.09 |
| | 6 Hour | 80 (30) | 60 (20) | **< 0.01** |
| | 12 Hour | 80 (30) | 55 (30) | **< 0.01** |
| **SpO2/FiO2 ratio** | Initial | 106.67 (62) | 137.14 (97) | 0.24 |
| | 3 Hour | 117.5 (34.43) | 165 (110) | **< 0.01** |
| | 6 Hour | 120 (35.67) | 165 (63.71) | **< 0.01** |
| | 12 Hour | 116 (39.71) | 174.55 (93.21) | **< 0.01** |
| **RR** | Initial | 33 (16) | 29.5 (13) | 0.68 |
| | 3 Hour | 35 (15) | 31 (9.5) | 0.49 |
| | 6 Hour | 39 (15) | 31 (11.5) | **0.04** |
| | 12 Hour | 36 (16) | 31 (10) | 0.32 |
| **ROX score** | Initial | 3.96 (2.61) | 4.94 (4.74) | 0.29 |
| | 3 Hour | 3.76 (3.03) | 5.28 (4.1) | **0.02** |
| | 6 Hour | 3.26 (1.88) | 5.2 (4.45) | **< 0.01** |
| | 12 Hour | 3.37 (2.25) | 5.77 (3.57) | **< 0.01** |
| **ROX/HR index %** | Initial | 4.2 (3.5) | 5 (4.7) | 0.20 |
| | 3 Hour | 3.9 (2.3) | 5.7 (3.6) | **< 0.01** |
| | 6 Hour | 3.1 (1.9) | 5.7 (4.8) | **< 0.01** |
| | 12 Hour | 3.8 (2.6) | 6.8 (4.6) | **< 0.01** |

*Median and Interquartile Range unless otherwise specified

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000431

### A dose-finding study to assess the haemodynamic and metabolic effects of the sulfide donor, ammonium tetrathiomolybdate: a putative therapy for ischaemia–reperfusion injury

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**Introduction:** Ammonium tetrathiomolybdate (ATTM) is used as an AQ21 oral copper chelator to treat Wilson's disease in humans. We recently discovered that ATTM also acts as a slow-release sulfide donor [1], reversibly inhibiting the mitochondrial electron transport chain. This leads to a reduction in both metabolic activity and reactive oxygen species production that confers therapeutic benefits in various experimental ischaemia–reperfusion injury (IRI) models [1]. To enhance its potential to translate into clinical use, an optimal dosing regimen needs to be identified.
**Objectives:** To evaluate the safety profile and haemodynamic impact of low and high ATTM dosing given to healthy rats.
**Methods:** Under isoflurane anaesthesia, instrumented Wistar rats (approx. 320-360 g) underwent carotid arterial and jugular venous cannulation, bladder catheterization, and tracheostomy. After 30–60 min stabilization, measurement was made of baseline cardiorespiratory variables (echocardiography, BP) and arterial blood gas and lactate analysis. Animals were then randomised to 4 groups: (1) control, (2) 10 mg/kg ATTM bolus, (3) 10 mg/kg ATTM bolus plus 30 mg/kg infused over 1 h, and (4) 10 mg/kg ATTM bolus plus 30 mg/kg/h infused for 3 h. At pre-specified timepoints [5 min, 60 min, and then hourly until 5 h (end-study)], repeat measurements were made as above, plus additional urine sampling at hourly intervals. Analyses were performed using 2-way RM-ANOVA and post hoc Sidak tests, and Mann–Whitney tests.
**Results:** Compared to controls, the highest dose ATTM (group 4) induced metabolic acidaemia and hyperlactataemia (all $p < 0.0001$; Fig 1, A, B, C, and D). A concurrent decrease in glucose (Fig 1E) was observed reflecting a greater reliance on glycolysis. Cardiac function and respiratory rate were comparable across the four study groups. ATTM caused a significant increase in urine output in a dose-dependent fashion ($p < 0.0001$) (Fig 1F).

**Conclusions:** The dose of 10 mg/kg plus 30 mg/kg for 1 h infusion appears to be safe and has potential to be used in IRI models. Further studies are warranted to investigate the mechanism behind the observed diuretic effect which may relate to mitochondrial inhibition of salt and water resorption via the Na + K + -ATPase.

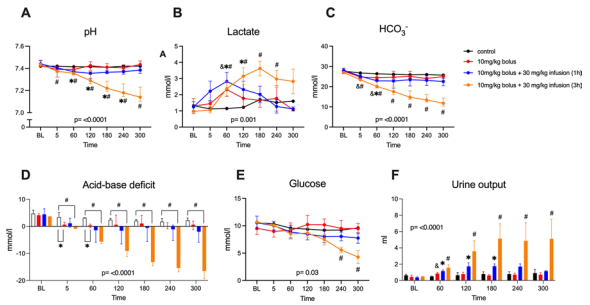


**Fig. 1 (abstract 000431)** Acid–base, glucose, and urine output changes during PK/PD study of ATTM in healthy anaesthetised rats. BL, baseline; Statistical testing by 2-way mixed effects ANOVA followed by Dunnett's test if the overall p value was significant (p-value shown is for the overall ANOVA). Data are presented as mean ± SD except pH, HCO3, and acid base deficit where data presented as median ± IQR. &S $p < 0.05$ group 2 vs control, * $p < 0.05$ group 3 vs control, # $p < 0.05$ group 4 vs control. N = 4 per group

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**Topic:** Translational biology

## 000432

### The role of different endotypes in acute respiratory distress syndrome

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000432

**Introduction:** Multiple molecular and biological pathways have been implicated in the complex pathophysiology of the acute respiratory distress syndrome (ARDS) (1). Discovery of relevant endotypes will open targeted therapeutic options directed towards specific abnormal biological pathways (2).
**Objectives:** To identify different relevant biological pathways in a population of ARDS patients.
**Methods:** We included consecutive admissions to our intensive Care Department with a diagnosis of ARDS (no COVID patients) during a 5-month period. We explored 5 relevant pathways implicated in ARDS pathogenesis, within the first 24 h after diagnosis. The inflammation was assessed using interleukin-2, interleukin-6, interleukin-18 and caspase-1; the coagulation using Von Willebrand factor, platelet count, and activated partial thromboplastin time; the endothelium using soluble intercellular adhesion molecule-1, citrulline, syndecan-1, angiopoietin-2, and e-selectin; the lung interstitium using matrix metalloproteinase-1, matrix metalloproteinase-3, and tissue metallopeptidase inhibitor-1; the alveolar epithelium using Krebs von Lungen-6 antigen. For each biomarker, we calculated the best cut-off point for ICU mortality (concordance probability method), giving scores of 1 and 0 for values above and below the cut-off, respectively. Thereafter, we considered pathways as "abnormal" or "normal", if the sum of scores in each specific pathway was above or below the median value for the whole population, respectively. We sought to identify the more significant combination of different pathways correlated with the mortality, by performing an exhaustive Chi-square automatic interaction detection (CHAIDs) analysis. All statistical analysis were performed using SPSS 23.0.
**Results:** We included 96 consecutive patients with a median APACHE II score of 21 (17–27), a PaO2/FiO2 ratio of 155 (113–206), 85% were under invasive mechanical ventilation, and 67% had sepsis. At diagnosis, the five different pathways were able to identify endotypes with different ICU mortalities (Table 1). Patients with 0–1, 2–3, or 4–5 abnormal pathways had a mortality of 9%, 34%, and 71% ($p < 0.001$), respectively. The CHAIDs analysis proposed the coagulation as the most important pathway (Figure 1).

**Table 1 (abstract 000432)** ICU mortalities considering different endotypes in ARDS patients

| Pathophysiological pathway | Pathway state | ICU mortality *n* (%) | *P* |
|---|---|---|---|
| Inflammation | Abnormal | 24/50 (48) | 0.001 |
| | Normal | 8/46 (17) | |
| Coagulation | Abnormal | 22/39 (56) | 0.001 |
| | Normal | 10/57 (17) | |
| Endothelium | Abnormal | 22/46 (48) | 0.004 |
| | Normal | 10/50 (20) | |
| Lung interstitium | Abnormal | 15/32 (47) | 0.047 |
| | Normal | 17/64 (27) | |
| Alveolar epithelium | Abnormal | 19/40 (48) | 0.013 |
| | Normal | 13/56 (23) | |

**Conclusions:** The simultaneous assessment of different pathophysiological pathways can identify ARDS populations with different severities. Alterations in coagulation may identify new important ARDS endotypes.

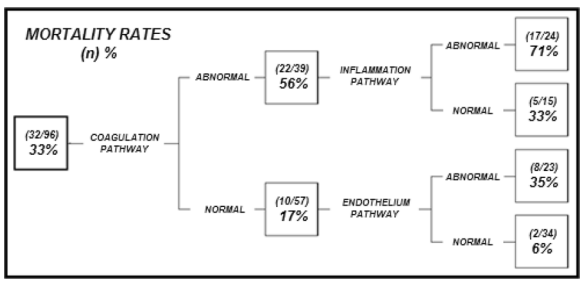


**Fig. 1 (abstract 000432)** CHAIDs analysis of different molecular pathways in ARDS patients

**Reference(s)**

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3. Institutional funds only

**Topic:** Acute respiratory failure and mechanical ventilation

## 000433

### A novel homogenous recombinant haemoglobin to treat global ischaemia reperfusion injury

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000433

**Introduction:** Human and bovine haemoglobin (Hb) solutions have attracted considerable attention as potential blood substitutes. Beyond its primary function as an oxygen carrier, haemoglobin may also mitigate damage associated with ischaemia–reperfusion injury (IRI). We produced a recombinant human Hb from *E. coli* with mutations designed to modify its nitric oxide scavenging capability. The Hb was then homogeneously PEGylated at a unique sulfhydryl residue to increase vascular retention. We previously demonstrated safety in healthy rats.
**Objectives:** To investigate the effects of this novel recombinant haemoglobin as a therapeutic intervention in a rat model of IRI using haemorrhage-reperfusion.
**Methods:** Wistar rats (approx. 270–300 g body weight) were anaesthetized with isoflurane. Carotid arterial and jugular venous lines were then inserted, and the bladder cannulated and a tissue oxygen sensor (Oxford Optronix) inserted subcutaneously. After 30–60 min' stabilization, measurement was made of baseline cardiorespiratory variables (echocardiography, BP) and arterial blood gas and lactate analysis. Approximately 7 ml of blood (35% of circulating blood volume assuming (70 ml/kg b.w.) were then withdrawn. After a 90-min period of ischaemia, the animals were resuscitated with either 8.33 mL/kg recombinant-Hb or an equivalent volume of Hartmann's solution over 5 min, followed by ~ 14 ml Hartmann's fluid given to both groups over 15 min, and then 10 ml/kg/hr thereafter until study end. At pre-specified timepoints (60 min, study end = 240 min), repeat measurements were made as above, plus additional blood sampling for renal and liver function, markers of injury (troponin, amylase, creatine kinase), inflammatory cytokine response (IL-6, IL-10), and complement activation (C3a and C5a). Analysis was by 2-way RM-ANOVA and post hoc Sidak tests, and log-rank and Mann–Whitney tests.
**Results:** Recombinant Hb improved 4 h survival (10/17 [59%] vs 6/18 [33%] in the control group; p = 0.10). Compared to controls, the Hb-treated group normalized BP faster, increased muscle tissue PO2 and methaemoglobin, and produced an approximate fivefold increase in urine output (all $p < 0.005$) (Fig 1). In samples taken from those surviving to study end (240 min), amylase and IL-6 were significantly lower in the Hb group (both $p < 0.01$); however, C3a was significantly elevated ($p < 0.001$). Other physiological and biochemical tests were similar between groups.
**Conclusions:** In this model of haemorrhage-reperfusion, IV bolus administration of this novel recombinant Hb given at the onset of reperfusion promptly improved BP, had a marked effect on diuresis and improved 4-h survival from 33 to 59%. Further studies are warranted.

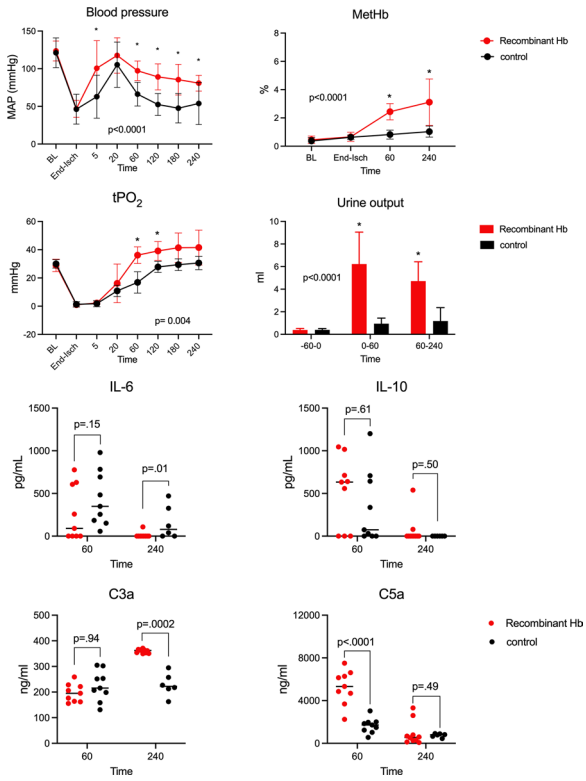


**Fig. 1 (abstract 000433)** End-Isch: end of ischaemia; MetHb: methemoglobin; Hb: haemoglobin; tPO2: tissue oxygen tension; IL: interleukin. Tests: * $p \leq 0.05$. Data are presented as median ± IQR; except for MetHb and tPO2 where data are presented as mean ± SD. RM-ANOVA, and post hoc Sidak tests, or Mann–Whitney tests

**Reference(s)**

1. Medical Research Council.

**Topic:** Trauma.

## 000434

### Factors influencing safety and outcomes in directly discharging patients with early tracheostomy to home from ICU: a retrospective cohort study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000434

**Introduction:** Direct from ICU Sent Home (DISH) is an innovative healthcare approach that directly discharges patients from the Intensive Care Unit (ICU) to their homes upon achieving clinical stability. DISH is gaining popularity worldwide, including in Indonesia, as healthcare systems strive for improved efficiency and patient-centered care. Patient safety in critical care involves various aspects, including airway management, where tracheostomy aids in patient comfort, infection prevention, and transition to standard treatment facilities. However, implementing DISH poses challenges due to the absence of standardized success parameters and guidelines for safe discharge, prompting further investigation to establish evidence-based protocols ensuring its effectiveness and safety.

**Methods:** We conducted a retrospective analysis of medical records with ethical clearance. Eligible participants were patients who were directly sent home from the ICU with an early tracheostomy, liberation of a mechanical ventilator, and adequate family education. This study examines various factors potentially influencing the outcomes of patients discharged through the DISH program, including age, gender, initial and discharge Glasgow Coma Scale (GCS), APACHE II score, LOD score, SOFA score, length of stay, transportation method upon discharge, and caregiver involvement. The study also records the readmission and mortality rate at 3-day and 7-day intervals post-discharge. The Chi-square test was utilized for data analysis using SPSS.
**Results:** The study included 18 participants. Patient outcomes were evaluated at 3-day and 7-day intervals post-discharge from the ICU under the DISH program, with favorable outcomes defined as the absence of readmission or mortality during these periods. Statistical analysis revealed significant associations between the APACHE II score and the likelihood of readmission or mortality at 3 days (RR: 3.43, *p* value: 0.04) and 7 days (RR: 3.14, *p* value: 0.04). Similarly, a significant association was observed between the Glasgow Coma Scale (GCS) upon admission and the probability of readmission or mortality at the 7-day mark (RR: 2.00, *p* value: 0.04), highlighting varying levels of significance among different variables.
**Conclusions:** Elevated APACHE scores and diminished GCS upon admission were found to be strong predictors. The quality of caregiving and transportation methods also indicated more favorable outcomes, although without statistical significance. Further research with a larger cohort is necessary to validate these findings, emphasizing the need for caution in interpreting the results. This study highlights the complexity of factors influencing patient outcomes post-DISH discharge, offering insights for optimizing discharge protocols and enhancing patient care strategies in critical care settings.

**Table 1 (abstract 000434)** Factors influencing the outcomes of patients discharged through the DISH program

| | 3 days | | 7 days | |
|---|---|---|---|---|
| | RR (CI 95%) | P value | RR (CI 95%) | P value |
| Age (year) | 1.60 (0.85-2.99) | 0.15 | 1.40 (0.71-2.76) | 0.31 |
| Gender | 1.07 (0.61-1.89) | 0.62 | 0.89 (0.46-1.75) | 0.56 |
| **GCS Admitted** | 1.60 (0.85-2.99) | 0.15 | **2.00 (0.93-4.30)** | **0.04** |
| GCS Discharge | 1.12 (0.58-2.16) | 0.56 | 1.50 (0.63-3.56) | 0.29 |
| **Apache II Score** | **3.43 (0.62-18.97)** | **0.04** | **3.14 (0.56-17.54)** | **0.04** |
| LOD Score | 1.50 (0.36-6.17) | 0.49 | 1.37 (0.33-5.71) | 0.57 |
| SOFA Score | 1.35 (0.78-2.31) | 0.32 | 1.12 (0.59-2.14) | 0.29 |
| Length of stay (LOS) | 1.46 (0.82-2.58) | 0.22 | 1.25 (0.66-2.38) | 0.44 |
| Caregiver | 1.35 (0.78-2.31) | 0.32 | 1.12 (0.58-2.14) | 0.57 |
| Mode of Transportation | 0.85 (0.49-1.53) | 0.57 | 0.77 (0.42-1.42) | 0.44 |

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11. The authors have not declared a specific grant for this research from any funding agency in the public, commercial, or not-for-profit sectors.

**Topic:** Health services research and outcome

## 000435

### Risk factors associated with mortality in hematological patients: 14 year experience

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000435

**Introduction:** Despite advances and new therapies, mortality of hematologic patients in the ICU remains high. Our purpose is to assess known mortality risk factors presented in HM patients admitted in ICU in a 14 year period.
**Methods:** Retrospective analysis (2009–2022) of patients with HM admitted to the ICU of a tertiary university hospital. Data were obtained through the electronic medical record. Statistical analysis: quantitative variables: medians (min–max); categorical variables: percentage (*n*). Fisher's test (continuous) and Mann–Whitney U test (categorical) were used for the analysis.
**Results:** 223 ICU admissions of patients with HM were identified. The description of the population is presented in Figure 1. Overall ICU mortality was 30% ($n=67$) with a 1 year after discharge mortality of 59% ($n=130$).
Factors statistically associated with ICU mortality were: 1) primary diagnosis of acute leukemia [40%(40) vs 22%(27) death patients; $p=0.003$]; 2) hospital length of stay prior to ICU admission [20 (0–68) vs 7 (0–393) days; $p=0.002$]; 3) requirement for vasoactive support [38% (60) vs 10% (7) death patients; $p<0.001$]; 4) presence of anuria upon ICU admission [57% (25) vs 23% (42) patients; $p<0.001$]; 5) need for renal replacement therapy [51%(34) vs 21%(32) death patients; $p<0.001$]; 6) number of organ failures (vasoactive ± intubation ± renal replacement therapy): 0–1 failures 7% (7) vs 2–3 failures 51%(60) death patients ($p<0.001$).
Mortality was not statistically associates with variables such us: sex [male 28% (39) vs female 34% (28)]; age distribution with a cut-off of 65 years [<65: 30%(52) vs >65:29% (15)]; days of ICU stay [6 days (0–127) death vs 5 (0–62) days alive patients]; or allogenic transplant (36% (35) vs non 25% (32) p:0.058).
**Conclusions:** In our study, patients with acute leukemia, longer hospital stay prior to ICU admission and multiple organ failure had a higher

mortality. There is a higher mortality rate in allogeneic bone marrow transplantation, but no statistical significance was found in this study.

| | |
|---|---|
| Male gender (%) | 63 (141) |
| Median age (years) | 55 (16-84) |
| Median hospitalization days before ICU admission | 11 (0-393) |
| Median ICU length of stay (days) | 6 (0-127) |
| Hematological diagnosis (%) | -Acute leukemia 44 (99)<br>-Lymphoma 23 (52)<br>-Gammopathies 10 (22)<br>-Chronic lymphoid leukemia 8 (17) |
| Reason for ICU admission (%) | -Respiratory failure 38 (25)<br>-Distributive shock 23 (52)<br>-Others 18 (41) |
| Allogeneic transplant patients (%) | 43 (97) |
| Vasoactive therapy (%) | 61 (136) |
| Mechanical ventilation (%) | 44 (98) |
| Anuria at ICU admission (%) | 20 (44) |
| Renal replacement therapy (%) | 29 (63) |
| APACHE II (Median) | 15 (3-39) |
| SOFA (Median) | 8 (0-17) |

**Fig. 1 (abstract 000435)** Population description (n = 223)

**Topic:** Haematologic-oncologic issues in the ICU.

## 000437

### Brainstem death testing: a computational modelling investigation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000437

**Introduction:** During brainstem death testing patients must be demonstrated not to make ventilatory effort if brainstem death is to be confirmed. Patients must not become hypoxaemic during the period of apnoea and must be demonstrated to have a significant increase in arterial carbon dioxide partial pressure (PaCO2).
**Objectives:** The optimal placement of an oxygen catheter and the optimal flowrate of oxygen are not currently known. Despite this, guidelines [1–4] that govern how brainstem death testing is performed specify various oxygen catheter placements and oxygen flowrates. In this study, we aimed to address this clinical problem.
**Methods:** We used a high-fidelity and highly integrated computational modelling of the cardiopulmonary system to examine the effects of the positioning of the oxygen insufflation catheter and the flow of oxygen delivered via the catheter. The modelling has been extensively validated for investigations into apnoea [5–9].
Five virtual subjects were configured whose physiological characteristics are shown in Table 1. .

**Table 1 (abstract 000437)** Model parameters and ranges used to configure the five virtual subjects

| Parameter | Range |
|---|---|
| Weight (kg) | 48–87 |
| Tidal volume (ml) | 6.3 × weight |
| Ventilatory frequency (breaths/min) | 9–11 |
| Metabolic oxygen consumption (ml/min) | [3.3–3.7] × weight |
| Functional residual capacity (litres) | 2.19–2.23 |
| Haemoglobin (g/L) | 146–165 |
| Anatomical deadspace (ml) | 2.2 × weight |
| Anatomical shunt (%) | 1–3 |

The five virtual subjects underwent pulmonary denitrogenation (pre-oxygenation) during resting, tidal breathing with an inspired oxygen fraction of 100% for 10 min. Then, apnoea commenced for 10 min and 100% of oxygen was provided at the open glottis with different five oxygen catheter placements (equally spaced between glottis [placement 1] and carina [placement 5]) and five oxygen flowrates (0.2, 0.5, 1.0, 2.0 and 5.0 L/min).
**Results:** Figure 1 shows arterial partial pressure of oxygen (PaO2) at the end of pre-oxygenation and 10 min after the commencement of the apnoea for the different oxygen flowrates and catheter placements studied. Oxygenation was achieved for all scenarios investigated.
Figure 2 shows the rate of rise of the PaCO2 calculated 1 and 10 min after the commencement of the apnoea. PaCO2 increases more rapidly in the first minute and at lower flowrates with the catheter placed at the glottis. However, CO2 clearance was minimal even at the higher flowrates and deeper placements.
**Conclusions:** This study indicates that lower oxygen flowrates still protect the subject against hypoxaemia during the brainstem death testing as all the subjects remained well-oxygenated throughout each investigation, and this could be beneficial as there is less risk of CO2 washout at lower flowrates. However, none of the flowrates and placements led to CO2 washout. Catheter placement and oxygen flowrate may have little impact on the accumulation of CO2 and O2 desaturation. This may indicate that attention should be given to pre-oxygenation to ensure the patient does not become hypoxaemic.

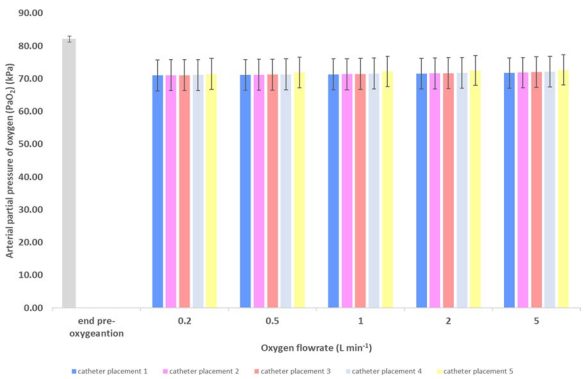


**Fig. 1 (abstract 000437)** Arterial partial pressure of oxygen (PaO2) at the end of pre-oxygenation and at 10 min after the commencement of apnoea for the various oxygen flowrate and catheter placements studied. Values are reported as mean (standard deviation) calculated over the five subjects. Catheter placement 1 corresponds to glottis and catheter placement 5 corresponds to carina. The remaining placements are equally distributed between the glottis and carina

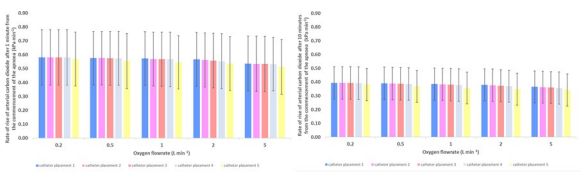

**Fig. 2 (abstract 000437)** Rate of rise of arterial partial pressure of carbon dioxide (PaCO2) calculated 1 min (left panel) and 10 min (right panel) after the commencement of the apnoea. Values are reported as mean (standard deviation) calculated over the five subjects. Catheter

placement 1 corresponds to glottis and catheter placement 5 corresponds to carina. The remaining placements are equally distributed between the glottis and carina

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**Topic:** Brain death, organ donation, and transplantation.

### 000438

## ICU recovery clinic activity and referral patterns: a retrospective cohort study comparing patients attending clinic exclusively with those also enrolled in a novel ICU digital recovery pathway

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000438

**Introduction:** Multi-professional post-ICU recovery clinics address physical, psychological, and cognitive needs of ICU survivors conducting assessments and making treatment plans and onwards referrals. A few studies report clinic activity which is a surrogate for ICU survivor ongoing recovery needs.
**Objectives:** To explore number/type of outpatient referrals made and actioned and ICU recovery clinic activity comparing exclusively clinic attendees with those also enrolled on a digital recovery pathway managed by a specialised occupational therapist (OT) and commenced on hospital discharge. We hypothesised pathway patients would have (1) more outpatient referrals actioned in a shorter time; and (2) fewer referrals required at recovery clinic.
**Methods:** Retrospective cohort study of adult ICU recovery clinic attendees (Nov 2021 to June 2023). We excluded patients living outside the hospital provider catchment area as unable to ascertain actioning of referrals. We collected demographics, referral patterns, and clinic visit characteristics.
**Results:** Of 661 clinic attendees, we excluded 355 living out of catchment and 90 for other exclusions, leaving 216 participants (183 (85%) clinic only; 33 (15%) digital pathway). Mean (SD) age was 56 (15.4) years, APACHE II score 15 (5.6), with 64% male, and 72% admitted for medical reasons. Median (IQR) invasive ventilation duration was 9 (4, 22) days, ICU length of stay (LOS) 16 (8, 33) days, and hospital LOS 39 (19, 72) days. There were no statistically significant differences in baseline demographic or clinical characteristics between pathway and clinic-only patients.
At hospital discharge (baseline), mean (SD) number of outpatient referrals/patient was 4.4 (2.3) for pathway patients vs 3.7 (1.9) for clinic-only ($P=0.26$). Of 847 outpatient referrals made, most common were medical specialist clinics (respiratory, cardiac, surgical) (424, 50%), community rehabilitation (75, 9%), and home health services (73, 9%). Mean (SD) number of referrals actioned was 3.7 (2.0) for pathway patients vs 3.2 (1.7) for clinic only ($P=0.11$). Median (IQR) time to action was 32 (11, 53) days vs 37 (13, 83) for clinic only ($P=0.06$).
Mean (SD) days to clinic visit was 141 (46) for pathway patients and 162 (53) for clinic only ($P=0.03$). In recovery clinic, fewer patients required OT review (4 (12%) vs 58 (32%) $P=0.02$); review by other professionals was similar between groups. Mean (SD) number of outpatient referrals/patient made was 2.2 (1.6) for pathway vs 2.5 (2.0) for clinic-only patients ($P=0.33$) Of the 523 referrals made, most common were medical specialist clinics (136, 26%), GP (91, 17%), and community rehabilitation (51, 10%).
**Conclusions:** We found a reduction in time to actioning of referrals and number of referrals made for patients enrolled on an ICU digital recovery pathway, though this did not reach statistical significance. Fewer pathway patients required within-clinic assessment by an OT.

**Reference(s)**
1. Funded by Guy's & St Thomas' Charity

**Topic:** Health services research and outcome

### 000440

## Severe hypocholesterolemia in patients with septic shock is attenuated by therapeutic plasma exchange

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000440

**Introduction:** Acquired hypocholesterolemia in patients with septic shock is associated with increased mortality. In preclinical sepsis models, survival could be improved by cholesterol substitution. However, comparable clinical therapeutic interventions have not yet been investigated.
We hypothesized that therapeutic plasma exchange (TPE), using plasma from healthy donors as substitution fluid, could attenuate hypocholesterolemia in patients with septic shock.
**Methods:** This was a retrospective clinical and biobank analysis of a non-randomized study (EXCHANGE-Pilot) and a randomized-controlled trial (EXCHANGE-1) investigating the adjunctive effect of TPE in patients with refractory (noradrenaline (NE) $\geq 0.4$ µg/kg/min $\geq 30$ min) and early (onset of shock $< 24$ h) septic shock. A single TPE was performed within 6 h of randomization and compared to a standard of care (SOC) control arm. Biomaterial was available from 34 patients in

the TPE group and 14 patients in the SOC group. Total, LDL- and HDL-cholesterol as well as triglyceride concentrations were determined enzymatically from patient plasma at time of randomization and 6 h thereafter, respectively.
**Results:** Pronounced hypocholesterolemia was observed in both the SOC and TPE groups at study inclusion (median (IQR) SOC: 1.9 (1.1–3) mmol/l vs. TPE: 1.8 (1.4–2.2) mmol/l, $p = 0.848$). While cholesterol remained unchanged in the SOC-, it increased significantly in the TPE group 6 h after randomization [SOC: 1.8 (1.3–2.4) mmol/l vs. TPE: 2.3 (2.1–2.8) mmol/l, $p = 0.006$]. The same effect of exclusive substitution in the TPE group was found for LDL ($p < 0.001$) and HDL cholesterol ($p < 0.001$). Triglyceride concentrations were not decreased at inclusion and did not differ significantly between the two groups. The relative median changes in cholesterol concentrations in both groups (SOC vs. TPE) between baseline and 6 h after randomization were -2.6 vs. + 35.7% ($p = 0.001$) for total cholesterol, -14.8 vs. + 246.7% ($p < 0.001$) for LDL- and -5.9 vs. + 175% ($p < 0.001$) for HDL-cholesterol, respectively.
**Conclusions:** Severe acquired hypocholesterolemia in patients with septic shock could be alleviated by therapeutic plasma exchange. These are the first clinical data reporting successful control of dyslipidemia in patients with septic shock. The potential of TPE will be further explored in future larger randomized trials (EXCHANGE-2).

**Topic:** Sepsis.

## 000442

### Impact of body composition on the long-term survival of critically ill patients with extracorporeal membrane oxygenation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000442

**Introduction:** Although the obesity paradox has been continuously studied, the relationship between body composition and long-term prognosis in extracorporeal membrane oxygenation (ECMO) patients has not yet been clearly identified.
**Objectives:** In this study, we investigated factors affecting long-term survival of patients receiving ECMO treatment and determined whether they were related to body composition.
**Methods:** Among the 264 patients who received ECMO from November 2014 to June 2023, the final 212 patients participated in this study. We retrospectively reviewed patients who underwent computed tomography (CT) imaging before ECMO initiation. Sarcopenia was assessed with psoas muscle index (PMI) using an artificial intelligence-based algorithm in patients who underwent abdominal CT scan, and adiposity was assessed with body fat percentage (BFP).
**Results:** One-year mortality was not significantly different between the obese (body mass index [BMI] ≥ 25) and non-obese groups (BMI < 25). The Kaplan–Meier survival curves for 1 year mortality showed that initial BMI did not predict mortality ($\chi^2 = 0.093$, $p = 0.760$). Multivariate analyses showed that low PMI (odds ratio [OR] 2.47, 95% confidence interval [CI] 1.14–5.45, p = 0.022), bridge to transplantation (BTT) (OR 0.22, 95% CI 0.10–0.49, $p < 0.001$), use of steroid before ECMO (OR 2.49, 95% CI 1.11–5.59, $p = 0.027$), and renal replacement therapy (OR 2.16, 95% CI 1.02–4.55, $p = 0.044$), and Charlson comorbidity index (OR 1.38, 95% CI 1.13–1.68, $p = 0.001$) were associated with 1-year mortality. In a subgroup analysis of sarcopenic (low PMI) patients, hospital mortality (54.9% vs. 36.8%, $p = 0.016$) and 1-year mortality (62.2% vs. 45.3%, $p = 0.024$) were significantly higher in the high BFP group than in the low BFP group (Figure 1). However, the rate of home discharge was significantly higher in the low BFP group than in the high BFP group (35.4% vs. 55.8%, $p = 0.007$). To assess the differential impact of body fat and muscle mass on 1-year mortality in ECMO patients, four subgroups were divided according to sarcopenia and adiposity. Kaplan–Meier curves showed that sarcopenic patients with adiposity resulted in a higher risk for 1-year mortality ($\chi^2 = 10.38$, $p = 0.016$; Figure 2).
**Conclusions:** In this study, the obesity paradox was not observed in ECMO patients. Instead, sarcopenia was an important factor affecting their survival. Additionally, when sarcopenia was accompanied by adiposity, survival and functional status at hospital discharge were poor.

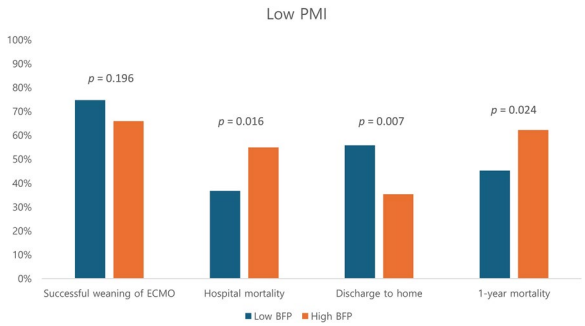


**Fig. 1 (abstract 000442)** Clinical outcomes according to BFP in patients with low PMI

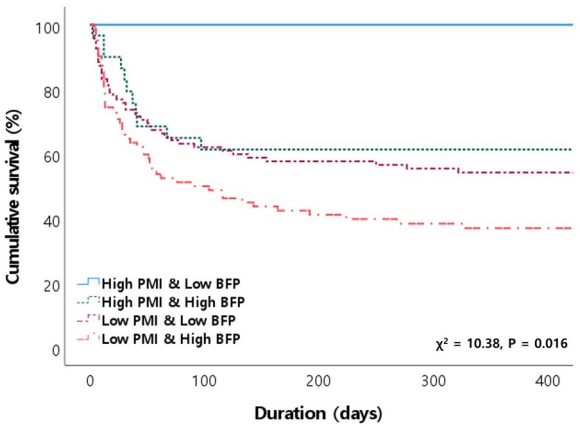


**Fig. 2 (abstract 000442)** K–M curves for 1-year mortality according to PMI and BFP

**Topic:** Imaging in intensive care

## 000443

### Prevalence and associations of positive pleural fluid cultures in the ICU: a 10-year retrospective cohort study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000443

**Introduction:** Pleural effusions are common in the intensive care unit (ICU), often requiring thoracentesis with subsequent routine fluid culturing. Despite this, pleural culture results in adult ICU patients remain poorly characterised, and as pleural infection has been associated with increased mortality in hospitalised patients, clarifying the prevalence and implications of positive pleural fluid cultures in the ICU may be crucial for patient management.
**Objectives:** This study aimed to: (1) determine the prevalence of positive pleural fluid cultures in ICU patients undergoing thoracentesis,

relating this to physicians' suspicion of pleural infection or the presence of parapneumonic effusion; (2) assess the association between pleural infection and 90-day mortality; and (3) characterise the cultured microorganisms.
**Methods:** We conducted a retrospective cohort study including all adult patients who underwent pleural fluid culturing in one of the eight ICUs in the North Denmark Region over a 10-year period, following a pre-published protocol (1). The primary outcome was a positive primary pleural fluid culture, excluding pre-specified non-pathogenic microorganisms, while the secondary outcome was 90-day all-cause mortality following primary pleural fluid sampling. Associations between pre-drainage suspicion of pleural infection and parapneumonic effusion, respectively, and the risk of a positive culture were assessed using a generalised linear model adjusted for potential confounders. The association between a positive culture and 90-day mortality was assessed similarly. Pleural fluid microbiological findings are reported descriptively.
**Results:** A total of 1251 patients were included in the study, of whom 51 patients (4.1%) exhibited a positive primary pleural fluid culture. Suspected pleural infection was associated with a higher risk of a positive culture [adjusted risk ratio (RR): 4.88, 95% confidence interval (CI) 2.70–8.83], whereas no such association was observed for parapneumonic effusions (adjusted RR: 1.41, 95% CI 0.83–2.38). A positive pleural fluid culture was associated with increased 90-day mortality (adjusted RR: 1.35, 95% CI 1.04–1.73); see Figure 1. Among the positive pleural cultures 39/51 (76.5%) exhibited monomicrobial and 12/51 (23.5%) polymicrobial growth. The most prevalent pleural microorganisms were *Candida* species (15/51, 29.4%), *Streptococcus anginosus* (9/51, 17.6%), *Staphylococcus aureus* (6/51, 11.8%), and *Escherichia coli* (6/51, 11.8%).
**Conclusions:** This 10-year retrospective cohort study revealed that 4.1% of ICU patients undergoing pleural drainage with fluid culturing exhibited positive microbiological findings. Suspected pleural infection significantly increased the likelihood of positive culture results, which was not the case for parapneumonic effusions. A positive pleural fluid culture was associated with increased 90-day mortality, underscoring its potential clinical significance in prognostication and management.

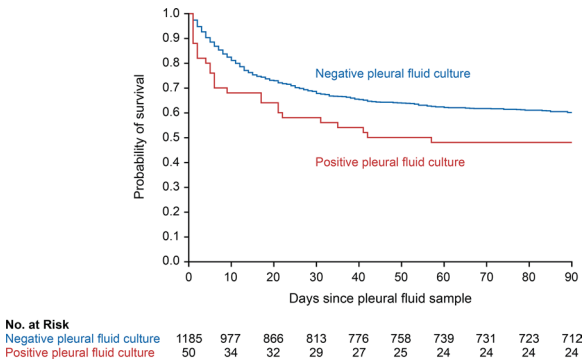


**Fig. 1 (abstract 000443)** Kaplan–Meier plots of probability of survival according to primary pleural fluid culture results, administratively censored at 90 days. A total of 15 patients with negative pleural fluid cultures and 1 patient with a positive pleural fluid culture were lost to follow-up within 90 days, and are consequently not included in the plots

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2. Departmental funding only

**Topic:** Infections and prevention

## 000445

### Perioperative intravenous amino acid infusion for reducing post-operative acute kidney injury in major laparoscopic urologic surgery: a clinical study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000445

**Introduction:** Post-operative acute kidney injury (PO-AKI) is a prevalent complication following major abdominal surgery, with an incidence of approximately 15.5% in major laparoscopic urologic procedures. PO-AKI is linked to heightened short-term adverse outcomes and long-term morbidity and mortality. Risk factors for PO-AKI are diverse, spanning pre-operative, intra-operative, and post-operative factors. This study aims to assess the efficacy of perioperative intravenous amino acid infusion in mitigating the occurrence of PO-AKI in major laparoscopic urologic surgery.
**Objectives:** To evaluate the effectiveness of perioperative intravenous amino acid infusion in reducing the incidence of PO-AKI in major laparoscopic urologic surgery.
**Methods:** A before–after clinical study was conducted, encompassing 331 patients undergoing major urological minimally invasive surgery. Patients were allocated to receive either standard crystalloid fluid therapy or intravenous amino acid infusion perioperatively. Primary outcomes included the incidence and severity of PO-AKI, while secondary outcomes comprised intensive care unit admission, hospital length of stay, 30-day readmission, and complications. Logistic regression analysis was employed to identify predictors of reduced PO-AKI incidence.
**Results:** Out of the 331 patients included in the study, the initial 169 received perioperative crystalloid fluids, while the subsequent 162 received perioperative amino acid (AA) infusions. Post-operative acute kidney injuries (PO-AKIs) were significantly more prevalent in the crystalloid group compared to the AA group (34 vs. 17, $p=0.022$), primarily attributed to a lower incidence of KDIGO I and II in the AA group (14 vs. 30, $p=0.016$). Patients in the AA group who developed PO-AKI exhibited a higher number of risk factors compared to those who did not (2 (2–4) vs. 1 (1–2), $p=0.031$), with a cutoff of 3 risk factors identified in the ROC curve ($p=0.007$, sensitivity 47%, and specificity 83%). Furthermore, hospital length of stay was prolonged in the crystalloid group ($p<0.05$), resulting in consequent savings in hospital costs. Only intravenous amino acid infusion made a unique statistically significant contribution to the model with an OR = 0.480, CI 0.250–0.923, $p=0.028$ controlling for all other factors in the mode (see Table 1).
**Conclusions:** The study demonstrated a significant reduction in the incidence of mild-to-moderate PO-AKI in the amino acid infusion group compared to the crystalloid group, alongside a shorter hospital stay and associated cost savings. Logistic regression analysis identified intravenous amino acid infusion as a significant predictor of reduced PO-AKI incidence. These findings suggest that perioperative intravenous amino acid infusion is safe and may effectively lower the occurrence of PO-AKI, leading to shorter hospital stays and decreased costs in major urological surgeries. Further randomized trials are necessary to validate these findings and explore specific surgical interventions.

**Table (abstract 000445)** Multiple logistic regression analysis of predictors of PO-AKI

| Variables | B | OR | 95% CI | | p |
|---|---|---|---|---|---|
| Sex, m/f, n | −0.259 | 0.771 | 0.312 | 1.906 | 0.574 |
| ASA physical status, class | 0.416 | 1.516 | 0.834 | 2.757 | 0.173 |
| Duration of surgery, min | −0.006 | 0.994 | 0.988 | 1.000 | 0.064 |
| Blood loss, mL | 0.001 | 1.001 | 1.000 | 1.002 | 0.226 |
| Intra-operative fluids, L | 0.000 | 1.000 | 0.999 | 1.001 | 0.817 |
| Intravenous amino acid infusion | −0.734 | 0.480 | 0.250 | 0.923 | 0.028 |

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3. None


**Topic:** Acute kidney injury and haemofiltration

## 000446

### Intrarenal venous flow and renal Doppler resistive index as predictors of postoperative acute kidney injury and complications in major laparoscopic urologic surgery: a prospective observational study


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000446



**Introduction:** Perioperative acute kidney injury (AKI) is a severe complication associated with high morbidity and mortality rates. Despite advancements in pre- and postoperative management, the contribution of surgical techniques and perioperative care to the development of AKI remains underappreciated. Point-of-care ultrasonography (POCUS) with arterial Doppler assessment has been utilized to evaluate organ-specific blood supply. However, the role of intrarenal venous flow (IRVF) patterns in predicting postoperative AKI and complications after major laparoscopic surgery remains unexplored.
**Objectives:** The primary objective was to evaluate whether the combination of IRVF and RDRI measured at different perioperative time points could predict postoperative AKI within the first seven days. The secondary objective was to assess if IRVF and RDRI could predict the occurrence of any other postoperative complications at day 7.
**Methods:** This prospective observational study, conducted between December 2019 and April 2022, aimed to assess the utility of combining IRVF and renal Doppler resistive index (RDRI) measurements in predicting postoperative AKI and complications in patients undergoing major laparoscopic urologic surgery. Two expert operators performed ultrasonographic examinations using a Mindray TE7 ultrasound device. Demographic, clinical, and ultrasonographic data were collected, and statistical analyses were performed using SPSS and R environment.
**Results:** Patients experiencing a combination of arterial hypoperfusion and moderate-to-severe venous congestion, as indicated by POCUS, had significantly worse outcomes (hazard ratio [HR]: 2.993, 95% confidence interval [CI] 1.522–5.884 and HR: 8.124, 95% CI 3.542–18, respectively; $p < 0.001$). High intra-operative abdominal pressure was identified as the sole independent determinant of postoperative severe venous congestion (odds ratio [OR]: 1.354, 95% CI 1.017–1.804, $p = 0.038$). Moreover, the overall number of complications was found to be influenced by the balance between arterial inflow and venous outflow, ensuring peripheral perfusion adequacy. Splanchnic perfusion assessment by Doppler demonstrated high reliability, with strong inter-rater agreement (intraclass correlation coefficient [ICC]: 0.844, 95% CI 0.792–0.844).
**Conclusions:** The combination of IRVF and RDRI provides a non-invasive method for predicting postoperative AKI and complications after major laparoscopic urologic surgery. Monitoring IRVF patterns may aid in early identification of patients at risk, facilitating timely interventions to mitigate complications and improve outcomes.


**Table (abstract 000446)** Predictors of postoperative AKI by the Cox proportional hazard model

| Variables | B | HR | CI | p | B | HR | CI | p |
|---|---|---|---|---|---|---|---|---|
| Postoperative monophasic IRVF | 2.950 | 19.108 | 4.845–75.359 | <0.001 | 2.211 | 9.126 | 3.474–23.973 | <0.001 |
| Age (years) | −0.017 | 0.983 | 0.943–1.026 | 0.430 | | | | |
| Active smoker | −0.029 | 1.030 | 0.216–4.900 | 0.971 | | | | |
| Sex | 0.039 | 1.040 | 0.219–4.924 | 0.961 | | | | |
| Preoperative RDRI | −4.045 | 0.018 | 0.000–9.096 | 0.205 | | | | |
| Intra-abdominal pressure | 0.083 | 1.087 | 0.745–1.586 | 0.665 | | | | |
| Postoperative RDRI | 8.206 | 33.314 | 0.025–23.376 | 0.046 | 7.235 | 13.925 | 1.583–12.420 | 0.036 |
| Preoperative monophasic IRVF | −0.891 | 0.410 | 0.138–1.220 | 0.109 | | | | |
| Preoperative creatinine | 1.338 | 3.812 | 0.238–60.953 | 0.344 | | | | |
| Charlson index | 0.317 | 1.373 | 0.952–1.980 | 0.090 | 0.166 | 1.181 | 0.978–1.425 | 0.084 |
| Arterial hypertension | −0.353 | 0.703 | 0.200–2.470 | 0.582 | | | | |
| Cadiovascular diseases | 0.342 | 1.408 | 0.369–5.366 | 0.617 | | | | |
| Chronic respiratory diseases | −0.172 | 0.842 | 0.210–3.374 | 0.808 | | | | |
| Diabetes | 0.058 | 1.059 | 0.272–4.124 | 0.934 | | | | |

RDRI, renal Doppler resistive index; IRVF, intrarenal venous flow patterns.

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4. None


**Topic:** Acute kidney injury and haemofiltration

## 000448

### Quality improvement project on daily VTE assessments in ICU


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000448



**Introduction:** In the intensive care unit (ICU), the risk of venous thromboembolism (VTE), including deep vein thrombosis (DVT) and pulmonary embolism (PE), is significant (1,2). With PE mortality rates ranging from 8 to 13% (3), proactive management is crucial. Daily VTE assessments are essential, enabling clinicians to identify warning signs and implement preventive measures. Assessments comprise daily INR and platelet values, risk factors, and clinical markers. As a gold-standard, all patients (if appropriate) receive full prophylactic VTE treatment. Patients may deteriorate requiring treatment modification, therefore emphasising the importance of daily risk assessments.

Currently prophylaxis includes TED stockings, intermittent pneumatic compression, and prophylactic Low-Molecular Weight Heparin (LMWH).
**Objectives:** Assess whether VTE assessments are being completed and if correct VTE treatments are being administered according to this.
**Methods:** Records of 20 patients were electronically reviewed for retrospective analysis within the period of 2024. Inclusion criteria included two daily drop-down options: "mechanical VTE prophylaxis" and "Pharmacological VTE prophylaxis." Completion status was noted, with reasons sought if criteria were incomplete. Data on pharmacological treatment administration and blood results (INR, platelets) were also collected for analysis.
Post-implementation data were accessed in the same format, with dates ranging from 24/3/24 to 29/4/24.
**Results:** A total of 126 entries were assessed (20 patients). Mechanical VTE entries were not completed in 32 and pharmacological VTE in 26 with an overlap of 23 for both categories (Figure 1). Only on 3 occasions were reasons found for this in the daily reviews.
In 41 instances, Dalteparin was not administered out of which 39 had rationale documented, while 2 had none.
We informed the department of these results and provided education regarding VTE events and susceptibility on ICU to junior staff.
The re-audit showed significant improvement where 58 entries from 14 patients showed 100% completion. Of the 58 entries; 38 received prophylactic LMWH, 17 had contraindications documented, and 3 received treatment dose LMWH (Figure 2).
**Conclusions:** Prior to implementing strategies to facilitate VTE assessment completion, despite its inclusion in the daily review within the electronic system, it became apparent that clinicians were frequently overlooking this documentation. Pre-implementation data revealed a non-completion rate of 20–25%, suggesting a significant risk of patients developing preventable VTE events. Nonetheless, a multi-disciplinary approach to VTE prevention ensured appropriate prophylaxis for 98.4% of patients. With the implementation of straightforward educational interventions, we achieved 100% compliance. To sustain this improvement, we have instituted a biannual audit process to ensure ongoing adherence to the protocol.

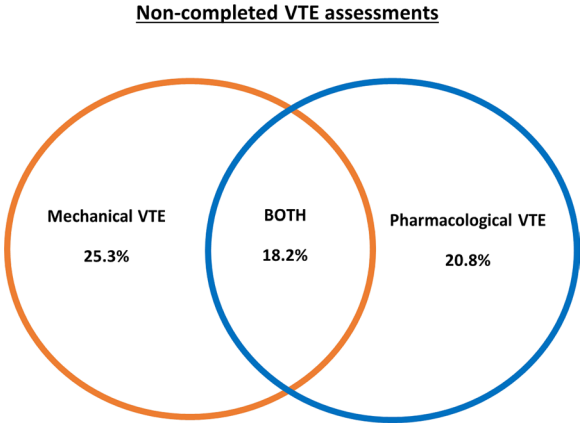


**Fig. 1 (abstract 000448)** Non-completion of daily VTE assessments. 126 entries in total

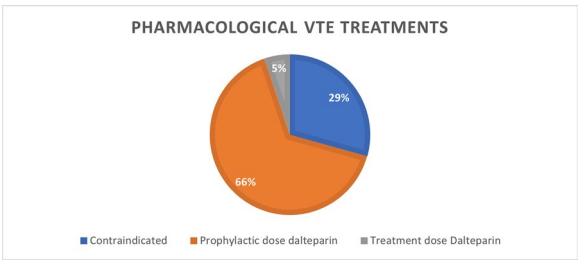


**Fig. 2 (abstract 000448)** Pharmacological VTE treatments

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**Topic:** Systemic diseases

## 000449

### High rate of hospital-acquired infections in an infectious diseases dedicated intensive care unit

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000449

**Introduction:** Critically ill patients are exposed to invasive interventions that destroy the anatomical integrity of natural defence barriers. As a result, the frequency of hospital-acquired infections (HAI) is the highest in intensive care units (ICU), with up to 25%, varying greatly between countries. In Europe, 7.4% of patients staying in ICU presented with at least one ICU-acquired HAI in 2019.
**Objectives:** Aim of the present study was to evaluate the burden of HAI in tertiary ICU in Slovenia, specialised in treating infectious diseases.
**Methods:** We performed a prospective study, analysing the documentation on patients ($N=74$) treated in infectious diseases ICU in University Medical Centre, Ljubljana, Slovenia, between 19.2.2019 and 10.3.2020. Data were collected prospectively and statistical evaluation was performed. $P$ values $\leq 0.05$ were considered statistically significant.
**Results:** Mean age of the included patients ($\pm$SD) was $64.7 \pm 16.1$ years, 66.2% were male and average APACHE score ($\pm$SD) was $8.9 \pm 11.5$. Length of stay ($+$SD) was $21.1 \pm 27.1$ days and 82.4% patients required mechanical ventilation (MV). There were 50 HAI events recorded (Figure 1). Incidence of catheter line-associated blood stream infection (CLABSI) was 3.54/1000 catheter days and incidence of ventilator associated events/pneumonia (VAE/VAP) was 29.36/1000 MV days. Overall mortality was 12.2%. Active malignant disease ($p \leq 0.001$), chronic liver disease ($p = 0.009$), and left subclavian central vein catheterisation ($p = 0.029$) were statistically significantly associated with CLASBI, while therapeutic rest ($p = 0.007$) and initial high-flow nasal cannula (HFNC) ventilation ($p = 0.001$) were statistically significantly associated with VAE/VAP.
**Conclusions:** In our infectious diseases, ICU rate of HAI, especially VAP, was higher than the rate observed in European ICUs in the same period. Main reasons might be, that the use of antibiotics in our ICU

is higher, as we primarily treat patients with the most severe, mostly bacterial infectious diseases. We found the initial HFNC ventilation as a significant risk of VAP, which was already described previously. HFNC may help avert intubation in patients with hypoxemic respiratory failure, but further studies will be necessary to evaluate consequences of its potential failure.

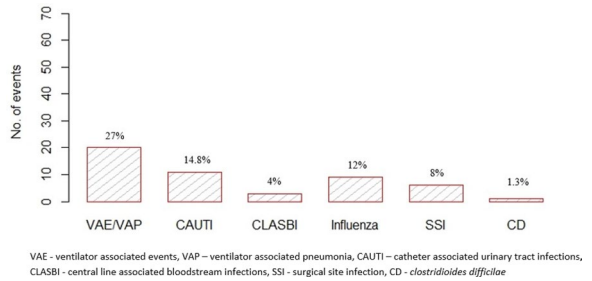


**Fig. 1 (abstract 000449)** Percentage of events observed out of all the studied subjects

**Reference(s)**

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**Topic:** Infections and prevention

## 000450

### Predicting length of stay in the intensive care unit using an accelerated failure time (AFT) model

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000450

**Introduction:** Predicting Length of Stay (LOS) in the Intensive Care Unit (ICU) is a commonly used metric which can aid individual patient management as well as to optimise wider resource utilisation, costs, and efficiency; and help clinicians efficiently deliver high quality healthcare (1,2). Most studies that have evaluated models for ICU LOS prediction use multivariate linear regression. Studies have also demonstrated that there is a nonlinear relation between ICU LOS and severity of illness. In an AFT model, the effect of these covariates acts to accelerate or decelerate the time to event of interest, i.e., shorten or extend the time to event, which in this case is the length of stay. This is a type of survival analysis that directly models the length of stay as a function of a constellation of factors (3).
**Objectives:** To investigate factors influencing the length of stay in the ICU using survival regression analysis.
**Methods:** Data were analysed retrospectively for 1451 patients within the first 24 h of admission, between 1/1/22 and 30/12/23. A total of 1203 patients had complete data, which was analysed using an accelerated failure time (AFT) model using a Weibull distribution. The model included covariates, such as sex, age, 2 organs supported, lowest systolic blood pressure, lowest heart rate, lowest and highest serum sodium levels, and lowest and highest white blood cell counts. All analyses were performed using R (version 4.3.2).
**Results:** Significant predictors of length of stay included 2 organ systems supported ($p < 0.001$) and lowest systolic blood pressure ($p = 0.040$). Age showed a trend towards significance ($p = 0.078$). Other variables, such as sex, lowest heart rate, lowest and highest serum sodium levels, and lowest and highest white blood cell counts, were not significant predictors. The Weibull distribution was used, and the model demonstrated good fit ($\chi^2 = 168.62$, $p < 0.001$).
**Conclusions:** When the maximum number of organs supported is 2, this factor emerges as a critical predictor for length of stay. Additionally, our analysis suggests that lower systolic blood pressure, indicative of hemodynamic instability and severe illness, is significantly associated with shorter critical care stays. The reason for this is unclear, but it most likely reflects the increased mortality in this cohort of patients (e.g., those presenting with septic shock). While age appears to have a marginal impact, heart rate and serum sodium levels do not show significant associations with the length of stay.
As a single-centre study, caution should be employed regarding generalisation and further work should involve analysing datasets for other patient populations. We aim to improve upon the analysis by taking into consideration some possible correlates that are not included in this model. Overall, these findings underscore the importance of timely and appropriate medical interventions, in determining the duration of hospitalization for critically ill patients.

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**Topic:** Health services research and outcome

## 000453

### Setting up a national online critical care rehabilitation group: ICUsteps active

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000453

**Introduction:** Survivors of critical illness may suffer from a range of AQ23 physical, cognitive, and psychosocial impairments, described as Post Intensive Care Syndrome (PICS), affecting their ability to return to a satisfactory quality of life. In the United Kingdom, funding for ICU recovery services after hospital discharge is poor, resulting in patchy provision of specialist rehabilitation support for critical care survivors. A group of ICU physiotherapists worked with the UK charity ICUsteps to set up a national online critical care rehabilitation group.
**Objectives:** To set up a national online critical care rehabilitation group including weekly exercise, education, and peer support, and evaluate the impact on patient recovery.
**Methods:** The ICU physiotherapists involved worked with ICUsteps to set up a programme based on their previous experience of running online rehabilitation classes for ICU survivors of COVID-19. An online rehabilitation group for cohorts of 8 ICU patients was developed, with once weekly sessions delivered for 8 weeks. Patients were initially recruited through ICU peers around the UK. Patients were eligible

to attend who were within 2 years of ICU discharge and able to use Zoom. All patients completed baseline questionnaires (HAD, IPAT, and SF-36) and undertook the 30 s sit to stand (STS) test during their initial 1:1 online assessment. Data were also collected on challenges, enablers, and learning points over the 8 week programme.
**Results:** All patients ($n=8$) showed significant improvement in mean 30 s STS scores (8.5 vs 5.4), and a reduction in psychological distress (mean IPAT score 7.2 vs 5.4) between initial assessment and 8 week follow-up. Improvements were also seen in all dimensions of the SF36 questionnaire (see Table 1).

**Table 1 (abstract 000453)** Change in assessment between pre-group and post-group scores

| Outcome measures | Pre-score | Post-score | % Improvement |
|---|---|---|---|
| SF-36 Physical functioning | 16 | 33.2 | 108% |
| SF-36 Physical role limitations | 0.5 | 15 | 2900% |
| SF-36 Emotional role limitations | 33.32 | 40 | 20% |
| SF-36 Energy/fatigue | 15 | 40 | 167% |
| SF-36 Emotional well-being | 49.6 | 72.8 | 47% |
| SF-36 Social functioning | 30 | 57.5 | 92% |
| SF-36 Pain | 30.6 | 43.75 | 43% |
| SF-35 General health | 20 | 37.5 | 88% |

A number of challenges were identified, including obtaining referrals, clashes with research projects, and undertaking online assessments. Enablers, such as weekly motivational emails, goal setting, and group bonding, aided the group functioning. Learning points have allowed the programme to develop. Through the online group forums, it was also noted that relatives of the patients also needed help to come to term with the experiences of ICU and recovery.
**Conclusions:** All participants improved in their objective measures from baseline and feedback from the group was also universally positive. Although numbers have been small so far, the impact of the programme has provided a lot of information to build on. Additionally, the programme development may help other healthcare professionals to set up similar online groups.

**Reference(s)**

Funding acknowledgements Andrew Mikhail, an ICU COVID-19 survivor, who had himself experienced the lack of rehabilitation and wished to support other survivors by funding ICUsteps Active

**Topic:** Nursing care and physiotherapy.

## 000456

### Variation of the diastolic shock index at 24 and 48 h as a factor associated with mortality in patients with distributive shock unresponsive to norepinephrine treated with arginine vasopressin

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000456

**Introduction:** The use of arginine vasopressin (AVP) is recommended in septic shock when norepinephrine (NE) is between 0.25 and 0.5 ucg/kg/min and mean arterial blood pressure (MAP) $\leq$ 65 mmHg. Diastolic shock index (DSI) was defined as the ratio between heart rate and diastolic blood pressure (DBP). DSI is a reflex of circulatory system dysfunction.
**Objectives:** The aim of the study is to determine the utility of DSI for the initiation of AVP, and to assess the therapeutic response and its prognostic value for mortality.
**Methods:** Observational and prospective study in a 24-bed third-level ICU, between November 2022 and September 2023. Patients $\geq$ 18 years old with a diagnosis of distributive shock (DS) and who met criteria for AVP initiation were included. Different variables, DSI, *vasopressor inotrope score* (VIS), lactate, corticosteroid use, intra-ICU mortality, and intra-ICU stay were analyzed (Table 1). Exclusion criteria: mortality during the first 24 h from admission to the ICU. The DSI cut-off value for mortality was determined using ROC curves.
**Results:** 51 patients, 80.4% were men with a median age of 60 years. Intra-ICU mortality was 35.3%, and mean length of stay was 13 days. Higher DSI clearance was observed at 24 h and 48 h hours in survivor patients ($p=0.009$ and $p=0.004$, respectively). The cut-off point for DSI clearance at 24 h was 9.3% with a sensitivity of 94%, specificity of 62%, PPV of 82% and NPV of 84%, and AUC: 0.724 (Image 1). The cut-off point at 48 h was 22.8% with a sensitivity of 73%, a specificity of 77%, a PPV of 86% and NPV of 61%, and AUC: 0.749 (Image 2). Both at 24 h and 48 h, significant differences were observed between survivors and non-survivors patients in relation to the cut-off points found. There was no association between corticosteroids and DSI.

**Table 1 (abstract 000456)**

| | Evolution 24 hores | | | | Evolution 48 hours | | | |
|---|---|---|---|---|---|---|---|---|
| | Survivors | Non-survivors | Total | p-value | Survivors | Non-survivors | Total | p-pavalue |
| AVP | 1 (0,6-1,7) | 1,3 (0,8-1,8) | 1,2 (0,6-1,8) | 0,422 | 0,96 (0-1,4) | 1,3 (0,8 - 1,8) | 1,2 (0,2-1,4) | 0,087 |
| NE | 0,4 (0,3-0,5) | 0,8 (0,6-1,4) | 0,5 (0,3- | < 0,001 | 0,3 (0,1-0,4) | 0,6 (0,4-1,1) | 0,3 (0,2- | 0,001 |
| | | | 0,7) | | | | 0,6) | |
| DSI | 1,6 (1,3-1,8) | 1,9 (0,5-2,2) | 1,6 (1,3-2,1) | 0,133 | 1,4 (1,2-1,6) | 1,5 (1,3-1,8) | 1,4 (1,2-1,6) | 0,083 |
| Δ DSI | 0,41 (0,04-0,8) | -0,3(-0,6-0,4) | 0,3(-0,2-0,7) | 0,019 | 0,7 (0,3-0,9) | 0,2 (-0,01-0,4) | 0,5 (0,2-0,8) | 0,004 |
| % improvement DSI | 20,4 (1,8 - 35,6) | -15,6 (-45,7-24,2) | 18,7 (-9,4 - 34,2) | 0,009 | 33,3 (17,8 -46,1) | 13,5 (-0,6-22,8) | 26 (11,4-40) | 0,004 |
| LACTATE | 17 (12-29,5) | 37 (16,8-91,3) | 22 (12 - 43) | 0,048 | 14 (8,5-24,5) | 26,5 (12,3-45,5) | 15 (9-28) | 0,016 |

**Conclusions:** A 61.1% of the non-survivors patients had a worsening of more than 9.3% of the DSI at 24 h after AVP administration, and 77.8% of the non-survivors patients had a worsening of more than 22.8% at 48 h. Surviving patients had lower lactate, NE and VIS values at 24 and 48 h. We recommend the use of DSI in the first 24 and 48 h as an indicator of response to treatment and for the introduction of a rescue therapy: methylene blue, angiotensine II, ascorbic acid, and hydroxocobalamin.

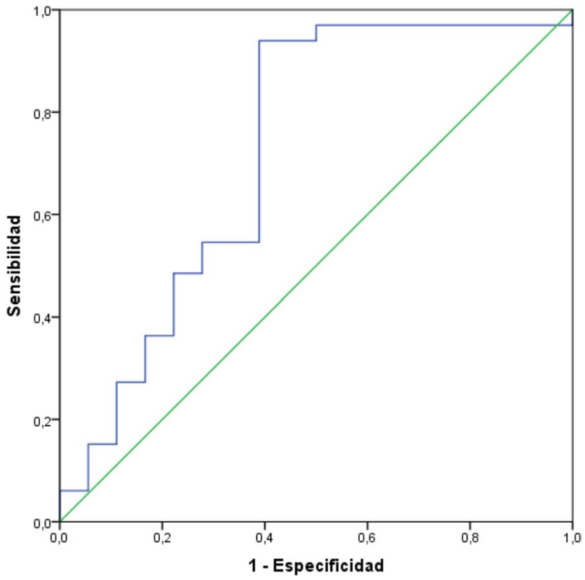


**Image 1 (abstract 000456)** ROC curve, cut-off point of DSI at 24 h

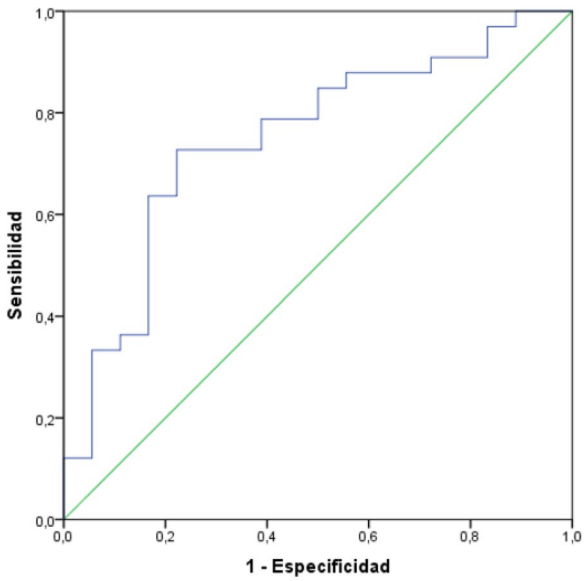


**Image 2 (abstract 000456)** ROC curve, cut-off point of DSI at 48 h

**Reference(s)**

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2. Gustavo A. Ospina Tascón et al. Using the diastolic shock index to determine when promptly administer vasopressors in patients with septic shock. Clinical and Experimental Emergency Medicine, 2022.
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4. No

**Topic:** Cardiovascular issues in ICU

## 000458

### The removal characteristics of immunoglobulin G subclasses in selective immunoadsorption comparison with conventional immunoadsorption

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000458

**Introduction:** Immunoadsorption (IA) therapy for neuroimmune diseases is usually performed using a conventional plasma separator such as Plasmaflo OP® (OP-05D, Asahi Kasei Medical Co. Ltd, Japan) as the first membrane and an immunoadsorption column, Immusorba TR® (TR-350, Asahi Kasei Medical Co. Ltd, Japan) as the second membrane. The removal characteristics of IgG subclasses in IA are that IgG1 and IgG3 are adsorbed up to 2000 mL of processed plasma volume (PPV), while IgG2 is desorbed at 1500 mL of PPV and IgG4 is desorbed at 1000 mL of PPV and returned to the human body. The frequent use of this method on consecutive days causes bleeding complications due to the adsorption of fibrinogen (Fib) and coagulation factor XIII.
In this study, a female patient in her 70's admitted to the ICU with anti-acetylcholine receptor (AchR) antibody-positive myasthenia gravis crisis were treated with selective immunoadsorption (SeIA) using Evacure Plus® (EC-4A10, Asahi Kasei Medical Co. Ltd, Japan), which has a smaller pore size of 0.03 μm than conventional membrane of 0.3 μm, as the primary membrane. SeIA was performed three times and conventional IA was performed once.
**Objectives:** The purpose of this study was to investigate the removal characteristics of immunoglobulin G subclasses (IgG1, 2, 3, and 4) during SeIA and the removal rates of anti-AchR antibodies, IgG, and Fib during each therapeutic plasma exchange (TPE).
**Methods:** We examined the removal characteristics of IgG subclasses in plasma samples collected from the inlet and outlet of TR-350 (Fig 1) at 500 mL, 1000 mL, 1500 mL, and 2000 mL of PPV during the SeIA. In addition, we measured anti-AchR antibodies, IgG, and Fib before and after TPE and examined the differences in removal rates in each treatment.
**Results:** The dynamics of IgG subclasses (IgG1, 2, 3, and 4) during SeIA are shown in Fig 2. IgG1 was not detected at the outlet at 2000 mL of PPV and the concentration did not increase at the inlet. IgG2 began to be detected at the outlet at 1000 mL of PPV, but the concentration did not increase at the inlet until 2000 mL of PPV. IgG3 was not detected at the outlet at 2000 mL of PPV, and its concentration at the inlet tended to decrease. IgG4 was detected at the outlet only at 2000 mL of PPV in the second session, but the concentration did not increase at the inlet. The removal rate of anti-AchR antibody, IgG, and Fib at SeIA (average of 3 times) and IA (once) were 74.9% and 57.7%, 39.3% and 28.5%, and 36.3% and 64.4%, respectively.
**Conclusions:** The removal characteristics of IgG subclasses during SeIA were investigated, and it was found that the adsorption performances of IgG1, 2, 3, and 4 were maintained even at 2000 mL of PPV,

suggesting that the PPV could be increased to 2000 mL or more. In addition, the loss of Fib was less than that of IA, and there seemed to be lower risk of hemorrhage even if the procedure was performed frequently in a short period. In this study, we did not investigate the behavior of bradykinin, and further safety evaluations are needed.

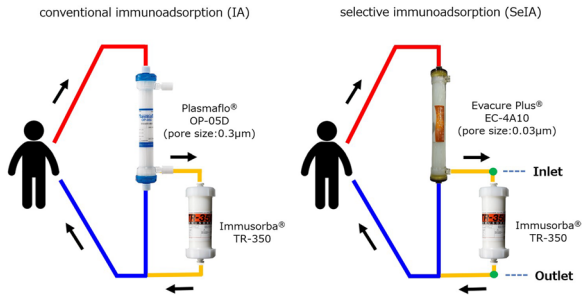


**Fig. 1 (abstract 000458)** Schematics of conventional immunoadsorption (IA) and selective immunoadsorption (SeIA)

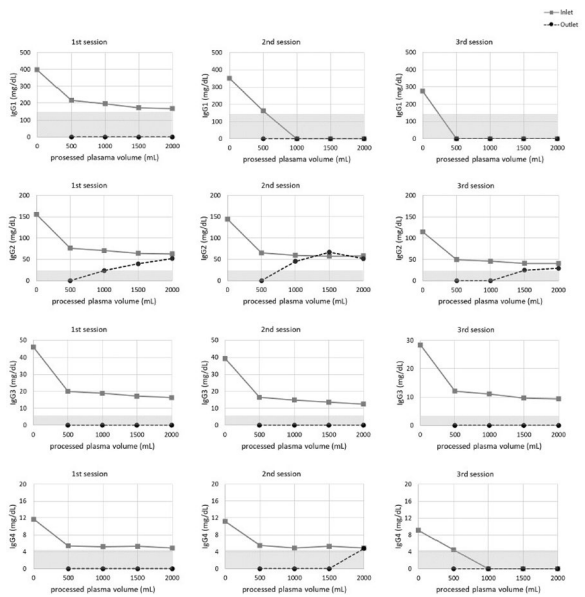


**Fig. 2 (abstract 000458)** IgG subclasses dynamics during selective immunoadsorption (SeIA)

**Reference(s)**

1. Ther Apher Dial.1998;2:297–299.
2. Acta Neurol Scand.1999;99:147–151.
3. None
4. Ther Apher Dial.2019;23:271–278.

**Topic:** Neurointensive care

## 000459

### The efficacy and safety of galactomannan (PHGG)-enriched enteral formulas on gastrointestinal tolerance in critically ill patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000459

**Introduction:** Enteral nutrition (EN) is a crucial therapeutic approach for managing critically ill patients. Early initiation of EN is linked to improved intestinal function, preservation of mucosal barrier integrity, and stabilization of microbial balance, providing significant benefits for critically ill individuals [1]. Nevertheless, compromised intestinal function in critical illness often leads to gastrointestinal (GI) intolerance, manifesting as diarrhea, bloating, emesis, and gastric retention. These clinical manifestations can result in delayed or discontinued EN administration. Galactomannan (partially hydrolyzed guar gum, PHGG) is a soluble dietary fiber known to efficaciously prevent and mitigate GI intolerance [2]. Despite this, there is a paucity of data regarding the efficacy and safety profile of PHGG-enriched EN formulas for early EN administration in Intensive Care Units (ICUs) within the Chinese healthcare setting.
**Objectives:** This study aims to evaluate the efficacy and safety of a PHGG-enriched EN formula in improving GI tolerance in critically ill patients in China.
**Methods:** This multicenter, randomized, non-inferiority trial (ChiCTR2100041789) allocated eligible patients in a 1:1 ratio to either the treatment or usual care group. The treatment group received a PHGG-enriched EN formula aimed to achieve a daily nutritional intake of 25–30 kcal/kg for 10 days, whereas the usual care group received an equivalent fiber-free EN formula for the same period. The primary outcome was the proportion of the patient who reaching the 70% of the EN target on day 7 and secondary outcomes included GI intolerance, parenteral nutrition requirement, length of ICU and hospital stay, mechanical ventilation duration, clinical scores (AGI, SOFA and APACHE-II), intra-abdominal pressure (IAP), blood glucose (BG) levels, prealbumin and nitrogen balance, 28-day mortality, and the incidence of adverse events.
**Results:** There were no significant differences in baseline characteristics among the enrolled 328 critically ill patients. The proportion of subjects achieving $\geq$ 70% of the EN goal by the 7th day did not differ between the two groups (89.66% vs 89.80%, $p = 1.00$). Notably, the treatment group exhibited lower IAP on the 5th (6.00 *vs.* 8.00, $p = 0.01$) and 10th day (5.00 vs. 8.00, $p < 0.01$) compared to the usual care group. By the 10th day, a higher proportion of patients in the treatment group demonstrated reduced GI intolerance scores compared to those receiving usual care ($p = 0.03$). On the 5th day, the treatment group reported significantly lower AGI scores than the control group

($p = 0.02$). Incidences of adverse events related to EN did not differ significantly between groups.

**Conclusions:** The PHGG-enriched EN formula did not enhance the energy achievement rate when compared to the fiber-free formula. However, it did improve GI tolerance and AGI scores in critically ill patients. In addition, the PHGG-enriched EN formula did not result in an increase in adverse events.

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**Topic:** Metabolism, endocrinology, liver failure, and nutrition

## 000462

## Liver stiffness in critically ill patients with septic shock: a 2D shear-wave elastography evaluation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):000462**

**Introduction:** Septic shock, not an uncommon clinical condition in critically ill patients, affects various organs including liver. Usually, acute liver injury is identified as a change in biochemical values. In recent years with advancement in ultrasonography, transient elastography (Fibroscan) is being used to detect morphological liver damage more objectively [1]. However, liver stiffness in critically ill patients with septic shock has not been studied by 2D shear-wave elastography (2D SWE) which is technically superior to the Fibroscan assessment.

**Objectives:** We aimed to study the liver stiffness in critically ill patients having septic shock with previous apparently normal liver.

**Methods:** After Institutional Ethics Committee approval and trial registration (CTRI/2023/06/053891), this prospective study screened all adult ICU patients within 1 week of septic shock onset. Those with normal liver function test (LFT) and normal liver echogenicity on ultrasonography before the onset of septic shock were considered for inclusion. Exclusion criteria were known liver disease, congestive heart failure, raised intra-abdominal pressure, and recent abdominal surgeries. All included patients underwent liver stiffness assessment by 2D SWE technique between days 2 and 7 after the onset of septic shock [Fig 1]. In included patients, further follow-up assessment was also considered among ICU survivors at 4–6 weeks after resolution of septic shock. All 2D SWE assessments were performed by an experienced radiologist as per recommendations from the World Federation for Ultrasound in Medicine and Biology guidelines published in 2018 [2]. The normal range is 2–7 kPa; highest possible value is 75 kPa.

**Results:** During the study period (Jun 2023–Mar 2024), 182 patients screened, and 26 patients met eligibility criteria. At ICU admission, included 26 patients had median age of 37.5 years (IQR 35.5–59.5) and 50% were females, Charlsons comorbidity index was 1 (IQR 0–2) and SOFA score was 9 (IQR 7–12). On the day of study inclusion, median duration of septic shock was 5 days (IQR 3–6) with median SOFA score 10 (IQR 8.25–11.75). At the time of assessment, the median vasopressor cumulative dose was 325.65 × 103 mcg (IQR 9.7–22.9 × 103 mcg) and median cumulative fluid balance was + 4.2 l (IQR 3.7–6.1), with no statistical significance correlation with the value of liver stiffness (r2 linear 0.005 and 0.012, respectively) [Fig. 2 and 3]. Liver stiffness was found elevated in all patients with a median value of 31.65 kPa (IQR 25.2–34.2). Among ICU survivors, reassessment could be done in 6 patients, in whom median values decreased significantly from 28.5 kPa (IQR 25.2–31.7) to 5.9 kPa (IQR 5.27–6.37) [Fig. 4].

**Conclusions:** Our study found out that liver stiffness, measured by 2D SWE, is significantly higher in septic shock patients. However, our study found no correlation between the degree of liver stiffness with either the cumulative dose of vasopressors or the cumulative fluid balance in these patients. However, the value of stiffness decreases in follow-up.

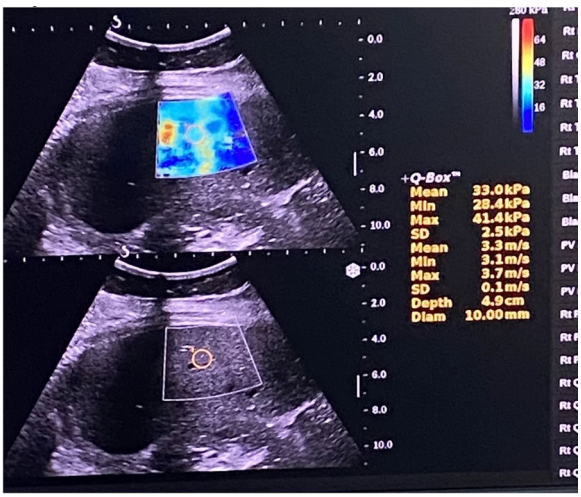


**Fig. 1 (abstract 000462)** 2D shear-wave elastography being assessed using Aixplorer®, Super Sonic Imagine (Aix-en-Provence, France) with XC6-1 (Single Crystal Curved) convex probe

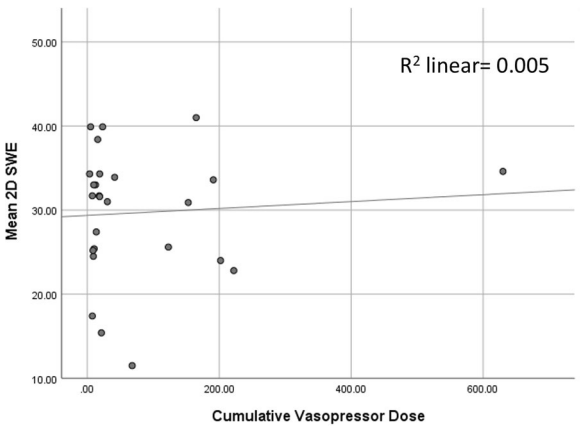


**Fig. 2 (abstract 000462)** Correlation between liver stiffness value (kPa) and cumulative dose of vasopressors patients received till the time of 2D SWE assessment ($n = 26$)

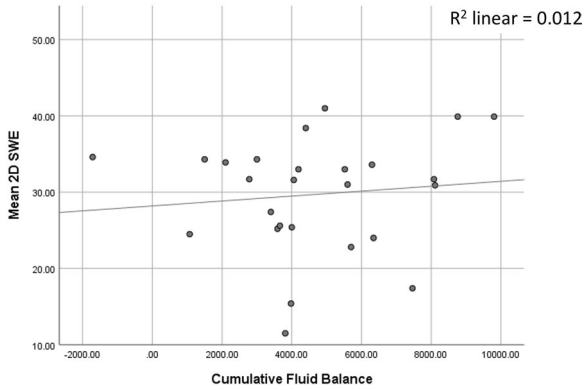


**Fig. 3 (abstract 000462)** Correlation between liver stiffness value (kPa) and cumulative fluid balance of patients from ICU admission till the time of 2D SWE assessment ($n = 26$)

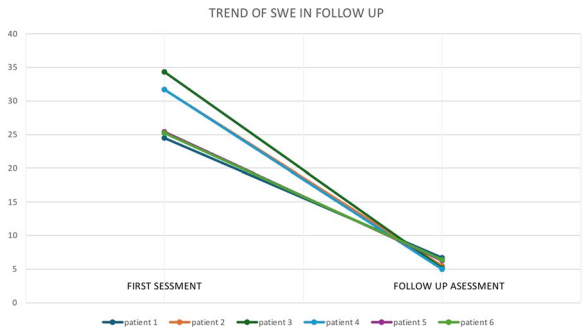


**Fig. 4 (abstract 000462)** Changes in liver stiffness values (kPa) in follow-up assessment among ICU survivors ($n = 6$)

**Reference(s)**

1. 2.Ferraioli G, Wong VW, Castera L, Berzigotti A, Sporea I, Dietrich CF, Choi BI, Wilson SR, Kudo M, Barr RG. Liver Ultrasound Elastography: An Update to the World Federation for Ultrasound in Medicine and Biology Guidelines and Recommendations. Ultrasound Med Biol. 2018 Dec;44(12):2419–2440. https://doi.org/10.1016/j.ultrasmedbio.2018.07.008. Epub 2018 Sep 9.
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**Topic:** Imaging in intensive care

## 000463

## Colistin monotherapy versus colistin-based combination therapy for bloodstream infections caused by carbapenem-resistant Gram-negative bacilli in the ICU: a multi-center, retrospective, cohort study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000463

**Introduction:** Bloodstream infection (BSI) caused by carbapenem-resistant Gram-negative bacilli (CR-GNB) has high mortality and limited therapeutic options. Colistin is highly active against carbapenem-resistant Gram-negative bacilli (CR-GNB), with a low resistance rate.
**Objectives:** To investigate the clinical benefits of colistin-based combination therapy as compared to colistin monotherapy in treating nosocomial BSI caused by CR-GNB in intensive care units (ICU).
**Methods:** This multi-center, retrospective, cohort study enrolled ICU-admitted patients with nosocomial BSI caused by CR-GNB. Treatment outcomes were compared between patients treated with colistin monotherapy and combination therapy in the original and propensity score (PS)-matched cohorts. Differences in treatment outcomes between various sources of BSI were also compared. A subgroup analysis was performed to identify the specific population that benefitted from the combination therapy.
**Results:** We analyzed 262 patients with CR-GNB-related BSI, of whom 107 received colistin monotherapy and 155 received colistin-based combination therapy. No significant differences in mortality, clinical failure, or microbiological eradication rates were noted between monotherapy and combination therapy in the original and PS-matched cohorts. In the multivariate analysis, pneumonia-related BSI was significantly associated with day-28 mortality (aHR 1.68, 95% CI 1.13–2.49) and clinical failure (aOR 1.72, 95% CI 1.02–2.97); colistin monotherapy was not an independent factor associated with day-28 mortality and clinical failure. In the subgroup analysis, pneumonia-related BSI patients benefitted from combination therapy by reducing day-28 mortality (63.6% vs. 43.4%, $p = 0.047$), while catheter-related patients benefitted from monotherapy by reducing day-14 mortality (15.6% vs. 34.7%, $p = 0.047$).
**Conclusions:** Colistin monotherapy and combination therapy showed comparable treatment outcomes among ICU-admitted patients with nosocomial BSIs caused by CR-GNB. Subgroups of patients with pneumonia-related BSI benefitted from combination therapy by reducing day-28 mortality.

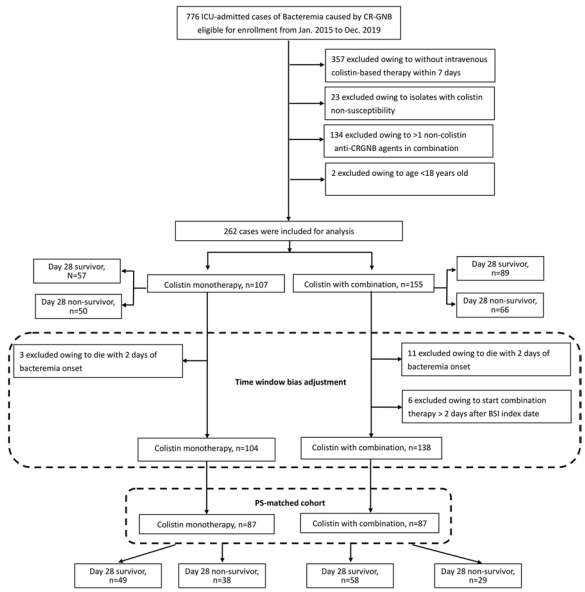


**Fig. (abstract 000463)** Changes in liver stiffness values (kPa) in follow-up assessment among ICU survivors ($n = 6$)
Flow diagram of inclusion and exclusion

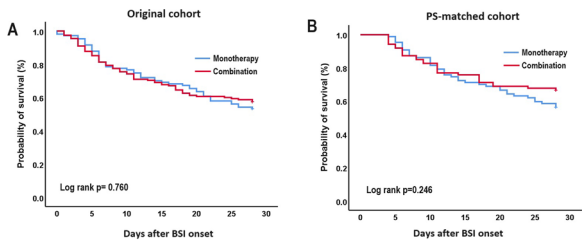


**Fig. (abstract 000463)** Kaplan–Meier analysis of 28-day mortality between patients undergoing colistin monotherapy and colistin-based combination therapy

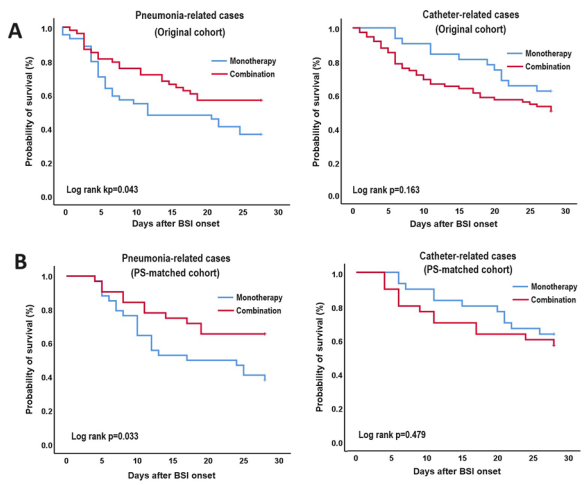


**Fig. (abstract 000463)** Kaplan–Meier analysis of 28-day mortality status in patients with various sources of bloodstream infection

**Reference(s)**
1. Paul M, Daikos GL, Durante-Mangoni E, Yahav D, Carmeli Y, Benattar YD et al.: Colistin alone versus colistin plus meropenem for treatment of severe infections caused by carbapenem-resistant Gram-negative bacteria: an open-label, randomised controlled trial. Lancet Infect Dis 2018, 18(4):391–400.
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**Topic:** Infections and prevention

## 000465

### Recovery characteristics of patients using two anesthesia techniques in major maxillofacial surgery: a randomized-controlled trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000465

**Introduction:** General anaesthesia (GA) provided during surgical procedures is usually conducted using either inhaled anaesthetics or total intravenous anaesthesia (TIVA), but there is little evidence regarding its impact on the patient's perception of quality of recovery in the post-operative period. The Quality of Recovery-40 questionnaire (QoR-40) has been validated and used to determine the functional recovery of patients following GA in various surgeries, but its impact on patients undergoing maxillofacial surgery remains unexplored.
This study was designed with the objective to compare the difference in patient recovery using QOR-40 in patients who were anaesthetised using TIVA (propofol and dexmedetomidine) with those receiving inhalational anaesthesia (desflurane) in patients undergoing major maxillofacial surgery.
**Objectives:** Primary: To compare the QoR-40 score using two anaesthetic techniques, TIVA or inhalational anaesthesia, in patients undergoing major maxillofacial surgery on postoperative day one (POD1).
Secondary: Incidence of postoperative nausea and vomiting, postoperative analgesic requirement, blood glucose levels in the peri-operative period, extubation time, incidence of postoperative agitation, and duration of stay at post anaesthesia care unit (PACU).
**Methods:** A total of 80 patients undergoing major maxillofacial surgery were recruited prospectively. Adult patients above 18 years, belonging to ASA I-II, undergoing maxillofacial surgery for tumor or fracture with surgical duration of > 2 h were included as study subjects. Patients with cognitive/verbal communication impairment, chronic pain on analgesic medication were excluded from the study. Institutional ethical committee approval and CTRI registration *(IECPG-38/27.02.2021; CTRI/2021/03/031993)* was obtained prior to commencement of the study. Sample size was calculated from previous observations by Lee WK et al. (1).
The enrolled patients were randomized using Stata 14.0 into two groups as follows:
Group- I: desflurane in air and oxygen.
Group-T: propofol–dexmedetomidine continuous infusion.
All patients received standard anaesthesia induction with intravenous (IV) propofol, fentanyl, and atracurium followed by endotracheal intubation. Maintenance was as per the group allocation. A target plasma concentration of 4mcg/ml was maintained for propofol with target controlled infusion device and dexmedetomidine was maintained within a range of 0.2–0.75mcg/kg/hr after the initial bolus dose of 1

mcg/kg/hr over 10min. An investigator blinded to group allocation, administered the QoR-40 a day before surgery and on POD1.
Data were analysed by statistical software Stata 14.0 (Stata Corp LLC, College station, TX, USA).
**Results:** Desflurane group had significantly higher QoR-40 score (190.72 + _8.81) on POD1 compared with the TIVA group (184.1 + − 13.0) (adjusted $p = 0.045$). Among the five dimensions of QoR 40, emotional status and pain scores were better for the desflurane group. Extubation time was significantly higher in the T group ($P < 0.001$). There was no statistical difference in PONV, post-operative analgesic requirement, and blood glucose levels between the two groups. Extubation time and duration of PACU stay were significantly higher in the TIVA group ($p = 0.001$ & $p = 0.009$, respectively). Post-operative agitation was higher in the desflurane group ($p = 0.001$).
**Conclusions:** This study illustrates that the quality of recovery perceived by patients undergoing major maxillofacial surgery was better in a statistically significant way with inhalational anaesthesia as compared to TIVA. However, a mere 5-point increase in the QoR 40 may not be clinically significant.

**Reference(s)**
1. Lee WK et al. Type of anaesthesia and patient quality of recovery: a randomized trial comparing propofol–remifentanil total iv anaesthesia with desflurane anaesthesia. Br J Anaesth. 2015;114(4):663–8.
2. This study did not receive any funds.

**Topic:** Perioperative care

## 000466

### A comparative analysis of traumatic cardiac arrest: understanding out-of-hospital and in-hospital characteristics

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000466

**Introduction:** This study aims to understand the characteristics and factors influencing post-traumatic cardiac arrest (TCA) survival rates, comparing out-of-hospital TCA (oTCA) with higher occurrence to in-hospital TCA (iTCA).
**Methods:** This is a retrospective review of 286 TCA patients transported to the regional trauma center (RTC) in Gangwon Province, Korea, between 2013 and 2019. Patients were categorized based on 72-h survival status after TCA.
**Results:** The results revealed significant protective effects for transfer from another hospital (HR 0.86 [0.76–0.97]), and longer time from accident to CPR (HR 0.95 [0.90–0.99]). Transferred patients demonstrated a significant protective effect in all patients and high injury severity score (ISS) groups, but not in the lower ISS group. Subgroup analysis indicated that patients transferred from another hospital had significantly lower HR compared to directly transported patients to RTC in oTCA (HR 0.36 [0.23–0.57]), total cardiopulmonary resuscitation (CPR) time > 30 min (HR 0.34 [0.23–0.52]), and accident-to-CPR time < 30 min (HR 0.25 [0.11–0.55]). Additionally, restricted cubic spline curve analysis revealed that shorter distances from the accident to the first hospital were associated with lower relative HRs.
**Conclusions:** Considering the extremely poor outcomes of TCA, it is important to prioritize basic resuscitation and evaluation at nearby medical institutions rather than immediate transfer to specialized trauma centers, especially when TCA occurs or is anticipated. The study's findings support the notion that early damage control resuscitation at a nearby hospital can have a significant impact on improving the survival rate of TCA patients.

**Topic:** Trauma

## 000467

### Long-term outcomes of time-dependent phenotypes of perioperative myocardial injury

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000467

**Introduction:** Myocardial injury (MI) defined as increased high-sensitivity cardiac troponin (hs-cTn) during the perioperative period is associated with increased major adverse cardiovascular events (MACE) and mortality in the short term. We evaluated how different phenotypes based on timing of MI may impact long-term MACE and mortality among patients undergoing major non-cardiac surgery (NCS).
**Methods:** Patients ≥ 50 yo undergoing elective, major NCS were included. Hs-cTnT, ECG, and symptoms were collected preoperatively and up to 3 days after surgery. Searches of patients' medical records were supplemented with national patient registries, censored 3 years after surgery. Patients were classified to (1) isolated preoperative increases (> 99th URL) in hs-cTnT, (2) normal preoperative hs-cTnT with perioperative elevation (postop-preop > 99th URL), and (3) increased preoperative hs-cTnT with perioperative elevation. Comparators were patients without hs-cTnT increases. We examined the effect of the MI phenotypes on MACE and mortality using multivariable Cox and logistic regression analyses.
**Results:** We included 1290 patients. MI phenotypes and outcomes are shown in Table **1**. MI increased the short- and long-term risk for MACE even after adjustment for age, sex, ASA class, preoperative anaemia, preoperative increased creatinine, intraoperative transfusion, duration of surgery, intraoperative hypotension, comorbidities, and RCRI (Table 2). Arrhythmias accounted for the majority of MACE (13.9%), followed by heart failure (10.0%), stroke/TIA (4.3%), angina (3.8%), myocardial infarction (2.5%), and cardiac arrest (1.2%). MI increased the risk for mortality, but no differences between the phenotypes were observed (Figure 1).

**Table 1 (abstract 000467)** Phenotypes of myocardial injury & outcomes

| | Without exposure *n* = 869 | Isolated preop increase *n* = 277 | Preop normal, periop elevation *n* = 73 | Preop increase, periop elevation *n* = 71 |
|---|---|---|---|---|
| MACE % | 17.1 | 37.9 | 45.2 | 50.7 |
| Mortality % | 21.4 | 30.3 | 30.1 | 33.8 |

**Table 2 (abstract 000467)** Logistic regression for MACE

| Variable | 30 d OR (CI) | *P* | 1 y OR (CI) | *P* | 3 y OR (CI) | *P* |
|---|---|---|---|---|---|---|
| Myocardial injury | | < 0.001 | | < 0.001 | | < 0.001 |
| Isolated preop increase | 2.0 (1.2–3.3) | 0.013 | 2.2 (1.5–3.3) | < 0.001 | 1.6 (1.1–2.3) | 0.007 |

| Variable | 30 d OR (CI) | *P* | 1 y OR (CI) | *P* | 3 y OR (CI) | *P* |
|---|---|---|---|---|---|---|
| Preop normal, periop elevation | 4.5 (2.3–8.8) | < 0.001 | 4.0 (2.3–7.2) | < 0.001 | 3.5 (2.0–5.9) | < 0.001 |
| Preop increase, periop elevation | 3.4 (1.7–6.8) | < 0.001 | 3.3 (1.8–6.0) | < 0.001 | 2.3 (1.3–4.0) | 0.003 |

**Conclusions:** All MI phenotypes increased the risk for long-term MACE and mortality up to 3 years. Perioperative MI without preoperative increases in hs-TnT had the largest effect on long-term MACE. This suggests that interventions should be targeted at the prevention of perioperative MI to reduce its impact on long-term cardiovascular outcomes.

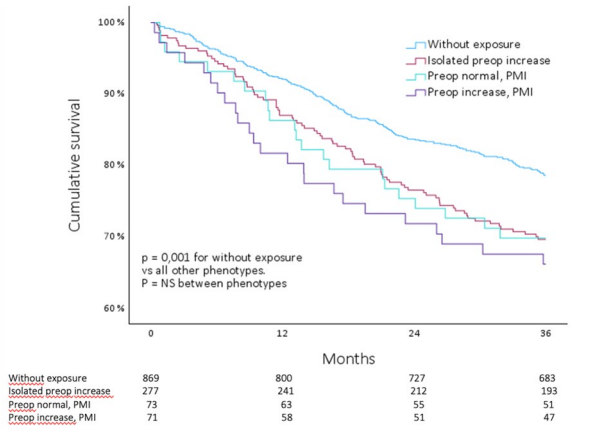


**Fig. 1 (abstract 000467)** Kaplan–Meier for mortality at longest follow-up

**Reference(s)**

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**Topic:** Perioperative care

## 000469

### The impact of early resuscitative endovascular balloon occlusion of the aorta as bridging intervention on early phase of resuscitation

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000469

**Introduction:** Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) is recognized as a crucial intervention during early trauma resuscitation, providing a window of opportunity for subsequent treatment in hemodynamically unstable hemorrhagic patients. However, concerns regarding potential complications of REBOA and the absence of a standardized consensus on its indications have led to varying approaches in timing across trauma centers and among practitioners. This study seeks to compare the implementation of an early REBOA protocol in Korean trauma centers with other approaches to evaluate the effectiveness of early REBOA application.
**Methods:** This retrospective analysis includes 251 trauma patients who underwent REBOA across five Korean trauma centers between 2015 and 2021. In two institutions, an early REBOA application protocol was adopted for cases of unresponsive shock state with systolic blood pressure below 80 mmHg, and in the absence of radiologically confirmed aortic injury. The study divides these institutions into a "protocol group" and other institutions into a "no-protocol group" for comparative analysis.
**Results:** While the door-to-puncture time for the protocol group was 31.7 ± 35.1 min, comparable to the no-protocol group's time of 36.6 ± 33.5 min (p = 0.078), the puncture-to-balloon time was significantly longer in the protocol group (7.6 ± 7.3 vs 0.1 ± 0.8, $p < 0.001$). Although 24-h survival rates did not differ between the groups ($p = 0.386$), the 3-h mortality rate was significantly lower in the protocol group ($p = 0.040$). The survival benefit for the protocol group was notable in the time interval of 176–227 min, with the most pronounced effect observed within the 215–219-min interval.
**Conclusions:** The protocol group proactively inserted the REBOA catheter prior to finalizing the decision to inflate the REBOA balloon. While early REBOA application did not impact overall survival rates, it demonstrated a substantial increase in survival during the initial 3–4 h of resuscitation. This underscores REBOA's role in creating a critical time window for subsequent treatments following the initial resuscitation of severely injured patients.

**Topic:** Trauma

## 000471

### Epidemiology and Impact of *Candida auris* in the intensive care unit: insights from a tertiary hospital in Greece

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000471

**Introduction:** Candida auris, a newly identified hospital-acquired pathogen, has shown a notable surge in both colonization and infection rates within intensive care units (ICUs). The resistant nature of *C. auris* and the significant mortality risk associated with bloodstream infections pose a significant hurdle for medical practitioners.
**Objectives:** To report epidemiological surveillance data and impact of *Candida auris* in critically ill patients admitted to the ICU of a tertiary hospital in Greece.
**Methods:** This is a single-center retrospective observational study that included all patients admitted to the ICU of a tertiary hospital in Greece, over a 33-month period (between April 2021 and January 2024), in whom *C. auris* was isolated on admission, during or after ICU stay. Cutaneous swabs from axillae and inguinal creases were screened for *C. auris* upon ICU admission and on a regular basis for epidemiological reasons. Clinical specimens (e.g., urine, blood, respiratory secretions) were also regularly screened for infection investigation

purposes. Medical records were reviewed for age, sex, source of ICU admission, previous hospitalizations and antibiotic therapy, comorbidities, candidemia, concomitant MDR infections, length of ICU, and hospital stay (LOS) and outcome. *Candida auris* was isolated in clinical and screening specimens by culture-based method on Sabouraud Chloramphenicol agar and Brilliance Candida agar (Oxoid, UK). The identification of *C. auris* was carried out by matrix-assisted laser desorption ionization–time of flight mass spectrometry (MALDI-TOF MS–AUTOF MS 1000; Autobio Diagnostics, China). Sporadically, the isothermal LAMP method (AMPLEX, Germany) was also used for the direct molecular detection of the pathogen. Categorical variables were summarized with numbers and percentages, and continuous variables with median and interquartile range.

**Results:***Candida auris* was isolated from 46 patients that were admitted to the ICU during the study period. Thirty four of them were male (74%), with a median age of 67.5 [IQR 17.5]; 20 of them (43.5%) had a diagnosis of COVID-19 infection upon hospital admission. In 37 patients (80.4%), *C. auris* was isolated from non-sterile sites. Nine patients (19.5%) developed *C. auris* bloodstream infection during their hospital stay. Among carriers, 27 (58.7%) reported hospitalization within the previous 6 months and 39 (84.8%) recent antibiotic therapy. Thirty patients (65.2%) were concomitantly colonized or infected by $\geq 1$ multidrug-resistant (MDR) Gram-negative pathogen. The median length of ICU stay was 29 days [IQR 34]. The median time of hospital stay before the first isolation of *C. auris* was 17 days [IQR 17.5], and the total length of hospital stay was 44 days [IQR 44.5]. Number of comorbidities: 31 patients (67.4%) reported more than one comorbidity and 20 (43.5%) $\geq 2$. Sites of colonization were: skin ($n=31$), urine ($n=7$), and respiratory system ($n=2$). All the patients in the cohort had a central venous catheter and received mechanical ventilation (100%). One patient underwent extracorporeal membrane oxygenation (ECMO) due to severe COVID-19 ARDS. Fifteen patients (34%) received an echinocandin and eight patients (18%) other antifungal drugs. All *C. auris* blood isolates were resistant to fluconazole (100%) and susceptible to echinocandin, while three were resistant to amphotericin B (33.3%). The overall mortality rate in the entire *C. auris* cohort was 50% (23/46), and 55% (5/9) in patients with *C. auris* bloodstream infection.

**Conclusions:** The results of our study demonstrate that critically ill patients colonized or infected by *C. auris* present a high rate of adverse outcomes, such as prolonged ICU and total hospital stay, high incidence of concurrent MDR infections, and high mortality rates. Early recognition and measures to prevent further dissemination of this highly transmissible and difficult to eradicate fungus are necessary, especially in the ICU setting.

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**Topic:** Infections and prevention

## 000472

## Epidemiology of hypoxaemia and breathlessness among patients admitted to hospitals in Malawi

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**Introduction:** Patients admitted to hospital in low-income countries with breathlessness and hypoxaemia suffer high mortality rates [1]. In these settings, limited access to diagnostic resources impacts on patient assessment and therefore impedes prompt initiation of appropriate treatment [2,3]. In our prospective cohort study, we explore the pathology and outcomes of patients admitted to hospital with breathlessness and hypoxaemia in Malawi.

**Methods:** We enrolled adults ($\geq 18$ years) with any of: breathlessness; hypoxaemia (SpO2 < 94%); respiratory rate > 24; or those treated with oxygen therapy. Participants were consecutively recruited in two hospitals in Malawi: Queen Elizabeth Central Hospital, Blantyre and Chiradzulu District Hospital, Chiradzulu. Participants were systematically screened for common causes of breathlessness on admission using enhanced diagnostic modalities (including chest X-ray, lung ultrasound, echocardiography, microbiology, biochemistry, and spirometry), to enable determine estimates of disease pathology against gold-standard criteria. Participants were followed-up for 90 days post-admission; 1-year follow-up post-admission is currently on-going.

**Results:** We recruited 312 participants of whom 99% (310/312) completed follow-up. Mean age was 52 (standard deviation 18). In-hospital mortality rate was 23% (71/310) and day-90 mortality rate was 43% (133/310). From preliminary analyses, the most common clinical diagnoses were pneumonia (34%; 104/312), heart failure (26%; 82/312), tuberculosis (16%; 51/312) anaemia (8%; 25/312), asthma (6%; 22/312), and chronic obstructive pulmonary disease (3%; 8/312). Multiple co-existent diagnoses affected 21% (64/312) patients; the most common dual pathology was pneumonia and heart failure (6%; 18/312).

**Conclusions:** In Malawi, we have observed a high mortality among adult patients admitted to hospitals with hypoxemia and breathlessness. The in-hospital mortality rate was 23%, which nearly doubled to 43% by day 90. The restricted availability of diagnostic resources in this resource-constrained setting negatively impacts on diagnosis accuracy and subsequently affects treatment planning for these patients. Studies to develop and evaluate the impact of context-sensitive diagnostic-treatment algorithms are needed to improve outcomes for acutely breathless patients in sub-Saharan Africa.

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**Topic:** Health services research and outcome

## 000476

## Checklist for analyzing educational resources on the basics of adult life support

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**Introduction:** A lack of knowledge about cardiopulmonary resuscitation (CPR) and the fear of causing harm are the main reasons preventing people from administering CPR. Training increases the willingness of bystanders to perform resuscitation, which in turn improves the chances of survival and neurological outcomes after out-of-hospital cardiac arrest. Despite the support for CPR training in the scientific community, knowledge about CPR is not widely disseminated, especially in some regions of the world. As an alternative to traditional courses, self-learning through digital resources is proposed. However, the quality of these materials often does not meet current recommendations, which also applies to some certified courses. There is a need for a standardized system to assess the quality of educational resources on resuscitation, but a unified tool for this has not yet been developed. The study aims to create a checklist for evaluating CPR training resources for lay people.
**Objectives:** Due to the absence of a universal method for assessing the quality of training materials for lay rescuers performing basic life support (BLS) for adults, the goal of this study was to create a checklist for evaluation, developed based on international expert consensus.
**Methods:** During a two-stage research process, experts filled out questionnaires to evaluate 72 items on a preliminary drafted checklist, aimed at determining whether each item should be used to verify the compliance of Basic Life Support (BLS) educational materials for adults with resuscitation standards. The acceptance of compliance items was based on receiving a score of 7 or more points from at least 75% of experts. Experts were also given the opportunity to anonymously suggest changes or additions to the list.
**Results:** Initially, 46 participants took part in the study, of whom 42 (91.3%) passed the first round, and 40 (87.0%) passed the second. These participants represented 25 countries and had an average of 16 years of experience in the resuscitation field. Out of 72 proposed theses, 13 were rejected, 55 accepted without changes, 4 approved after modification, and 4 new items were added. The final checklist contains 63 items, distributed into categories: "safety" (1 item), "recognition" (9 items), "calling for help" (4 items), "chest compressions" (12 items), "breathing in resuscitation" (12 items), "defibrillation" (9 items), "continuing CPR" (2 items), "choking" (10 items), and "miscellaneous" (4 items).
**Conclusions:** The created checklist is a ready-to-use tool based on agreed expert opinions, designed to assess the quality of educational material used in teaching lay rescuers the basics of BLS. This tool enables the creators of educational content to ensure their materials are in line with current scientific achievements in the field of resuscitation. Moreover, it could play a role in a future global system for standardization and quality control of education in the sphere of resuscitation measures.

**Topic:** Cardiac arrest.

## 000477

### Spectral edge frequency and dilation pupillary velocity in critically ill patients: a pilot study

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**Introduction:** In a previous study, low dilation velocity (DV) measured using an automated pupillometry could effectively identify an unreactive electroencephalographic (EEG) background in critically ill patients without anoxic brain injury. However, there are no data comparing DV and other EEG-derived parameters.
**Objectives:** To assess the association of DV and the spectral edge frequency (SEF) derived from EEG in critically ill patients.
**Methods:** A prospective pilot study was conducted in the Department of Intensive Care at Erasme University Hospital in Brussels, Belgium. In critically ill patients on mechanical ventilation, and undergoing a 4-channel processed EEG monitor of sedation (SedLine, Masimo, CA, USA) according to the decision of the treating physician, pupillary assessment (NPi-300; Neuroptics, CA, USA) was performed at baseline (T1) and within 2 h from changes in sedation regimens (T2; e.g., either reduced or increased). In particular, mean value of SEF and DV values from both hemispheres or eyes were recorded at the two time-points. Changes in SEF and DV over time were calculated as = (value at T2 − value at T1)/value at T2.
**Results:** The study included 25 patients (mean age 66 years, 72% male). Median Glasgow Coma Scale on the day of recording was 5 (3–14) and 15 (60%) patients were also on continuous opioids infusion. Main reasons for ICU admission were respiratory failure ($n = 9$), heart surgery ($n = 8$), sepsis ($n = 3$), and other diseases ($n = 5$). In 18 patients, sedation regimens was increased (72%).
SEF significantly decreased (from 11.9 [7.0–14.3] to 8.5 [5.2–11.2] Hz; $p = 0.02$), while DV did not (from 0.46 [0.28–0.82] to 0.40 [0.29–0.62] mm/sec; $p = 0.36$). SEF was not correlated with DV at baseline ($r = 0.01$; $p = 0.95$), but it was after changes in sedation regimens ($r = 0.41$; $p = 0.04$). However, changes in SEF were not correlated with changes in DV after the intervention ($r = 0.15$; $p = 0.45$).
**Conclusions:** In this pilot study, dilation pupillary velocity was not correlated with baseline values or changes over time of SEF measured on simplified quantitative EEG in critically ill patients.

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**Topic:** Neurointensive care

## 000478

### Characterization of patient–ventilator asynchronies in COVID-19 ARDS and the effect of neuromuscular blockade

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**Introduction:** The management of Acute Respiratory Distress Syndrome (ARDS) patients requiring invasive mechanical ventilation (MV) focuses on protective MV strategies aimed to improve clinical outcomes (1,2), but can lead to a high number of patient–ventilator asynchronies (3,4). Although patient–ventilator asynchronies have been associated with negative outcomes (5–8), but some studies suggest potential positive effects in some specific scenarios (9–13). On the other hand, treatment with neuromuscular blockers (NMB) in ARDS patients with PaO2/FiO2 ratio < 150 mmHg has been associated with survival improvement (14), but this point has not been confirmed in subsequent studies (15,16). In fact, the most recent guidelines do not advocate its widespread utilization, limiting their recommendation to early ARDS with low certainty (1,2). One of the suggested beneficial mechanisms has been the reduction in patient–ventilator asynchronies, thus reducing the risk of ventilator-induced lung injury, but this has not been specifically evaluated. It is also unclear whether a total or partial blockade is necessary, merely to reduce the magnitude of the effort and reduce dyssynchronous efforts (2). Additionally, COVID-19 infection may have implications beyond respiratory and ARDS by affecting the central nervous system (CNS). The virus's potential neurotropism raises concerns regarding its effects on the respiratory center, which plays a crucial role in regulating breathing patterns and maintaining respiratory function. Then, respiratory failure observed in COVID-19 patients may be influenced not only by direct lung injury

but also by CNS involvement, which could affect the control of breathing and further complicate ventilatory management (17–19). COVID-19 ARDS patients then present unique clinical features that may influence the pattern of patient–ventilator asynchronies during MV, resulting in atypical respiratory patterns and presentation of patient–ventilator asynchronies in contrast to patients with ARDS from other causes, and which merit further study. Given the challenges posed by patient–ventilator asynchronies and the complexities of COVID-19 ARDS patients, our aim was to analyze the prevalence and characteristics of patient–ventilator asynchronies in these patients.
**Objectives:** To analyze the prevalence of patient–ventilator asynchronies in COVID-19 (ARDS) patients, its modulation by (NMBA), and their association with clinical outcomes.
**Methods:** Observational study from a prospective real-world data cohort from two hospitals. We included mechanically ventilated ARDS COVID-19 ICU patients (ClinicalTrials.gov NCT04448782). Exclusion criteria were age less than 18 years, invasive mechanical ventilation (MV) less than 48 h, and ICU admission from other centers under invasive MV. Demographic and clinical data were obtained from medical records. We analyzed the prevalence, characteristics, and clusters of the following patient–ventilator asynchronies: double triggering (DT), ineffective inspiratory efforts (IE), reverse triggering (RT), and reverse triggering with double cycling (RT-DC), which were detected using a dedicated software (Better Care S.L., Sabadell, Spain). We also explored the effect of NMBs in patient–ventilator asynchronies. The outcome measures evaluated were duration of invasive MV, length of ICU stay, and ICU mortality.
**Results:** We analyzed 82 ARDS patients. The most frequent patient–ventilator asynchronies were RT (0.72% [IQR, 0.17–3.07]) and DT (0.44% [IQR, 0.19–0.80]). The most common clusters were RT (4.6 clusters/day [IQR, 2.0–8.1]) and DT (4.6 clusters/day [IQR, 2.1–7.3]). NMB treatment was associated with lower DT (0.14% [IQR, 0.07–0.28] vs. 0.68% [IQR, 0.34–1.16]; $p < 0.001$) and lower IE (0.06% [IQR, 0.02–0.21] vs. 0.30% [IQR, 0.18–0.71]; $p = 0.001$), but not significantly difference in RT and RT-DC. The presence of DT and clusters of DT was independently associated with longer MV duration and higher ICU survival.
**Conclusions:** In ARDS COVID-19 patients, RT and DT events and clusters of DT and RT were the most frequent patient–ventilator asynchrony. The use of NMBs decreased all asynchronies but not RT and RT-DC. Patients who survived ICU exhibit higher incidence of DT. Further studies are warranted to elucidate whether clusters of DT and IE are associated with increased mortality or simply are a phenomena associated with the liberation of invasive MV.

**Topic:** Acute respiratory failure and mechanical ventilation

## 000480

### Central venous catheter insertion and patient safety: an audit on current practice against updated 2023 national guidance

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**Introduction:** National Safety Standards for Invasive Procedures (NatSSIPs) aim to help organisations and healthcare teams deliver safe care in a complex and pressurised system (1). Insertion of central venous catheters (CVC) is a common procedure undertaken in Intensive Care Units (ICU). The CVC Insertion Checklist by the Intensive Care Society and the Faculty of Intensive Care Medicine was updated in November 2023 following patient safety incidents reported nationally. These incidents mainly related to the unintended arterial placement of CVCs, which can lead to significant morbidity and mortality. This new national standard states that all CVCs should be transduced prior to their use (2).
**Objectives:** Current local ICU policy states that 2 out of 3 confirmatory modalities are sufficient to confirm safe use of CVCs: transduction, paired blood gases, or ultrasound visualisation of guide wire in vein. The objectives of this audit were twofold: to check compliance to the current confirmatory modalities policy, and to compare current practice against the recently updated national standards. The key change audited being that all CVCs should be transduced prior to their use.
**Methods:** An audit was performed on patients who had a CVC inserted during their ICU stay between February and March 2024 at Buckinghamshire Healthcare NHS Trust. Checklists were reviewed to assess whether any of the 3 locally agreed safety checks were documented—transduction, paired blood gases, or venous ultrasound visualisation of guidewire.
**Results:** Forty checklists were analysed. 23 (57.5%) had 2 out of 3 safety checks recorded. 5 (12.5%) CVCs were transduced before use, 22 (55%) checklists had paired blood gases documented, and 38 (95%) indicated that ultrasound was used to visualise the guidewire in a vein.
**Conclusions:** This audit highlighted poor compliance to the locally agreed confirmatory modalities for safe use of CVCs. Additionally, results demonstrated that transduction of the line prior to use occurs infrequently. Seven out of the ten safety bulletins published by the Faculty of Intensive Care Medicine (December 2020–February 2024) reported cases of inadvertent arterial placement of central venous catheters, including cases of associated morbidity and mortality following intra-arterial infusion of vasoactive medications (3). Despite the widespread use of dynamic ultrasound scanning during CVC insertion, mechanical complications do still occur (4). A recent multicentre study in 2022 estimated the incidence of mechanical complications to be 7.7%, of which 0.4% were major complications including arterial catheterisation (5). The aim of the updated CVC guidance is to help improve the safety of this common procedure. The authors have distributed the updated guidance, findings, and conclusion of this project to the Anaesthetic and Critical Care Department, including nurses and doctors, and will re-audit soon.

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**Topic:** Information systems and data science.

## 000481

### In vitro evaluation of a novel target controlled dialysis of antimicrobials

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**Introduction:** Our understanding of the pharmacokinetics/pharmacodynamics of antiinfectives has greatly improved over the last decades [1, 2]. Predicting the effects of renal replacement therapy (RRT) on drug levels is theoretically possible—achieving it in practice is not easily accomplished. While some antimicrobials require alternating levels, many, such as betalactam antibiotics, require sustained concentrations for efficacy [3]. Inappropriate drug exposure can lead to treatment failure or emergence of resistance. Therefore, maintaining effective antiinfective levels in critically ill patients during RRT poses an everyday challenge in intensive care medicine [4].
**Objectives:** Our primary objective is to validate the "target controlled dialysis" (TCD) concept in vitro, to offer an elegant and simple solution for reliably achieving and maintaining drug concentrations during renal replacement therapy.
**Methods:** A MultiFiltratePRO® hemodialysis circuit from Fresenius Medical Care was used. Meropenem and voriconazole were added to the dialysis solution aiming for concentrations of 30 mg/L and 1 mg/L, respectively. A 3 L simulated patient reservoir (SPR) consisting of saline and bovine serum albumin (30 g/L) was prepared, and the circuit primed. 270 mg of meropenem and 9 mg of voriconazole were then added to the SPR. The SPR was continuously dialyzed for 150 min at a "blood flow rate" of 200 mL/min, counterflow against dialysis solution containing both substances at a rate of 66.6 mL/min. Samples were collected from the dialysate outflow line and the SPR at specific intervals (Figure 1), and the antiinfective levels were quantified by high-performance liquid chromatography. Their unbound fractions were determined by an additional ultrafiltration step.
**Results:** Concentrations in the dialysis solution resulted in 37.2 mg/L and 0.9 mg/L for meropenem and voriconazole. Figures 2 and 3 depict their concentration–time curves in the SPR and the dialysate outflow line. Meropenem exhibited an unbound fraction of 100%, voriconazole of 29%.
**Conclusions:** The concentration–time curves clearly demonstrate that TCD prevents a drop in plasma concentration below the threshold set by the "target" dose in the dialysis solution. Concentrations in the dialysate outflow line decrease toward the concentration in the dialysis solution. Since only the free/unbound substance is dialyzed, levels in the simulated patient tend to stabilize at a total concentration higher than the (free) target concentration in the dialysis solution, depending on the degree of protein binding. Meropenem exhibits a very high (nearly 100%) unbound fraction, while voriconazole is significantly protein-bound. The concentrations in the dialysate outflow should closely reflect the concentration of the unbound substance in plasma. In summary, our in vitro experiments demonstrate the concept of TCD: using TCD, drug levels gradually reach and maintain the chosen target concentration during continuous renal replacement therapy, ensuring effective therapy.

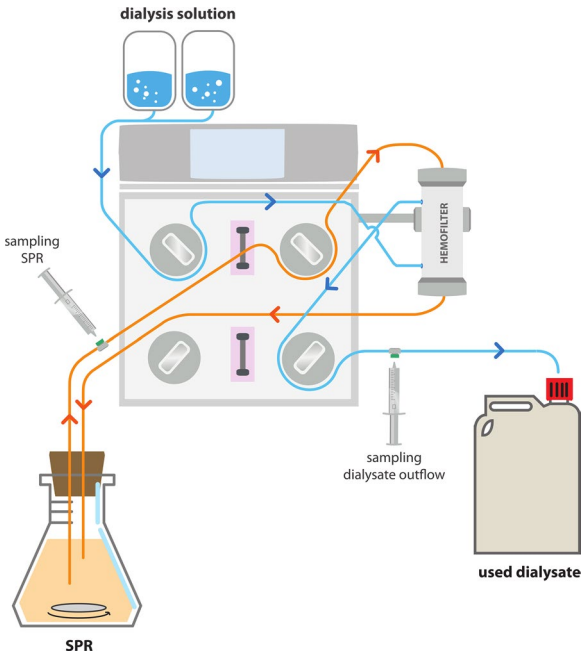


**Fig. 1 (abstract 000481)** Schematic representation of the experimental setup with illustration of the sampling locations. SPR: simulated patient reservoir

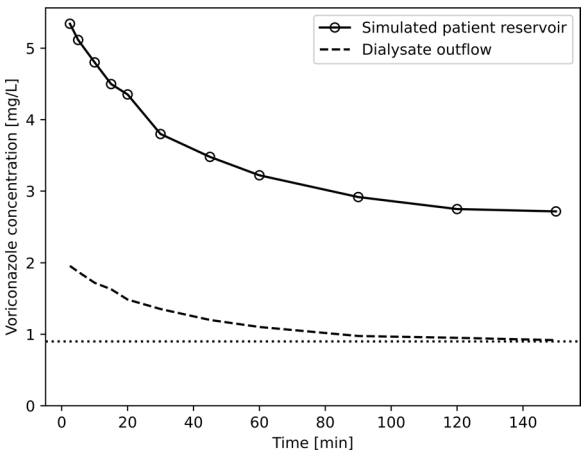


**Fig. 2 (abstract 000481)** Voriconazole concentration–time curves of the simulated patient reservoir and the dialysate outflow. The dotted horizontal line shows the "target" level based on the confirmed voriconazol concentration in the dialysate solution (0.9 mg/L)

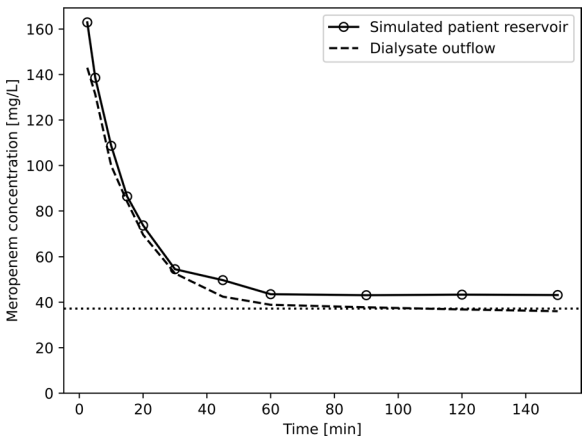


**Fig. 3 (abstract 000481)** Meropenem concentration–time curves of the simulated patient reservoir and the dialysate outflow. The dotted horizontal line shows the "target" level based on the confirmed meropenem concentration in the dialysate solution (37.2 mg/L)

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**Topic:** Acute kidney injury and haemofiltration

## 000483

### Development and validation of a multivariable logistic regression model showing the association between right shift in oxyhemoglobin dissociation curve and mortality in a large multi-center cohort of critically ill patients

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**Introduction:** Rightward shifts in oxyhemoglobin dissociation curve (ODC) reflect decreased oxygen affinity to hemoglobin. In critically ill patients, decreased tissue perfusion can induce changes in tissue milieu that result in right shift. Recent studies in COVID-19 patients have shown that right shift is associated with worse clinical outcomes [1].
**Objectives:** In this study, we evaluated the association between right-shifted ODC and mortality in a large, multi-center cohort of critically ill patients. We hypothesized that right shift will be associated with increased mortality.
**Methods:** This is a retrospective, observational cohort study. The cohort was selected from a previously described blood gas and oximetry linked dataset (BOLD) containing time-aligned, paired SpO2 and SaO2 measurements and other demographic and clinical data. BOLD was developed by merging data from three publicly available, de-identified databases (MIMIC-III, MIMIC-IV, and eICU-CRD) [2][3][4]. Patients with missing data for key variables were excluded. Temporally paired PaO2 and SpO2 were used to estimate the p50 (oxygen tension when hemoglobin is 50% saturated with the oxygen) using the modified Hill equation ($p50 = PaO2\ ((1 - SpO2)/SpO2)^{2.711}$) [5]. These estimates of p50 were used to define ODC shifts as left shift ($p50 < 24$ mmHg), normal (p50 24–28 mmHg), and right shift ($p50 > 28$ mmHg). The study cohort was divided into primary dataset (eICU-CRD) and external validation dataset (MIMIC-IV). Primary dataset was further split into a training set and a test set. Multivariable logistic regression with tenfold cross-validation was used to develop the model evaluating the association between ODC shift and mortality, after adjusting for known mortality risk predictors (demographics and severity of illness indicators). Model performance was assessed in the test set and validated in the external validation set.
**Results:** A total of 23,848 patients were included in the final cohort. Mean p50 was higher in non-survivors compared to survivors ($29 \pm 13$ vs. $26 \pm 10$ mmHg, $p < 0.001$). Non-survivors also differed from survivors with respect to age ($69 \pm 15$ vs. $64 \pm 15$ years, $p < 0.001$) and severity of illness (APACHE $92 \pm 33$ vs. $63 \pm 25$, $p < 0.001$, SOFA $6.3 \pm 4.0$ vs. $4.5 \pm 3.2$ and Charlson Index $5.1 \pm 2.9$ vs. $4.0 \pm 2.7$). Multivariable logistic regression model developed showed significant association between right-shifted ODC ($p50 > 28$ mmHg) and mortality (odds ratio 1.38 with 95% confidence interval 1.20–1.58). This model performed well in the test cohort (AUC 0.773—95% CI 0.759–0.790). A model without APACHE score was developed as well from the training set and performance assessed in MIMIC-IV derived dataset (AUC 0.733—95% CI 0.708–0.757). Figure 1 shows the ODC generated from the dataset. Figure 2 shows the survival curves for the three ODC groups.
**Conclusions:** In this large cohort of critically ill patients, right shifts in ODC as assessed by p50 were associated with increased mortality independent of organ dysfunction score and illness severity.

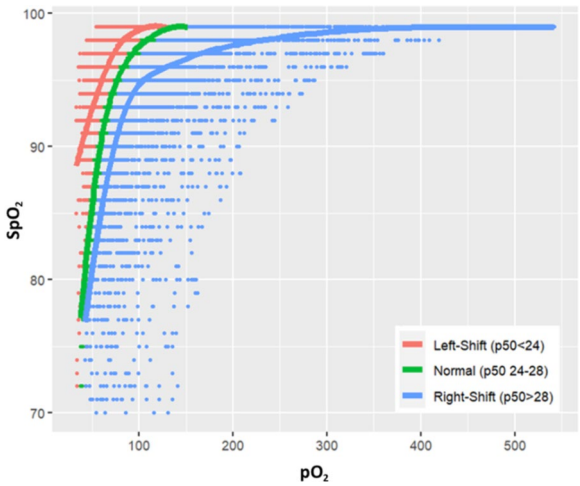


**Fig. 1 (abstract 000483)** Oxyhemoglobin dissociation curve

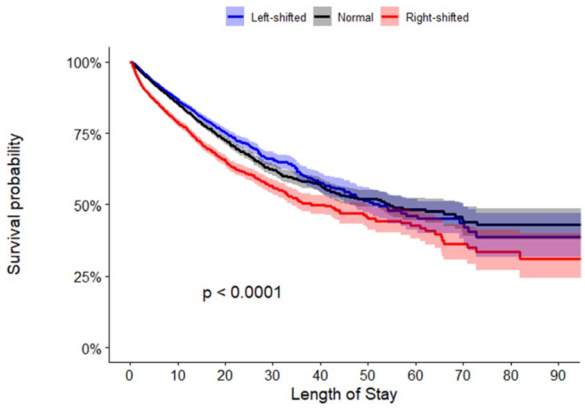


**Fig. 2 (abstract 000483)** Survival curves—ODC groups

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000484

## Navigating healthcare outcomes with predictive analytics: insights into COVID-19 treatment approaches

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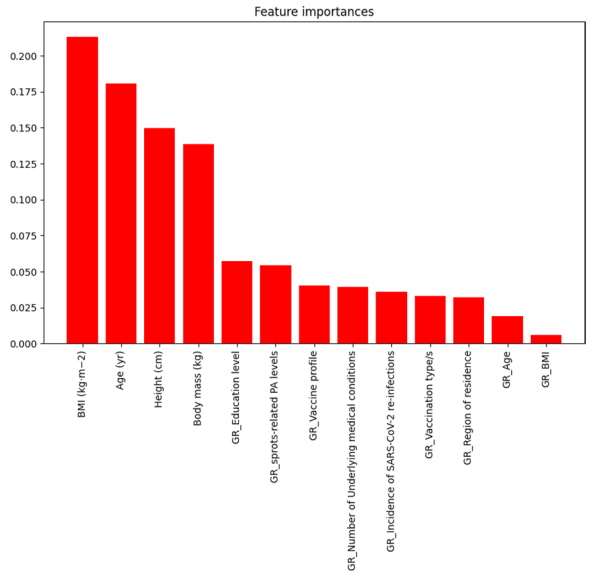
*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000484

**Introduction:** The relationships between pre-SARS-CoV-2 infection sports-related physical activity (PA) levels and COVID-19 disease severity, as well as treatment outcomes remain unexplored.
**Objectives:** To investigate the unknown associations between pre-SARS-CoV-2 infection sports-related physical activity (PA) levels and COVID-19 disease severity, as well as treatment outcomes, within a Greek adult population.
**Methods:** This study utilized a comprehensive dataset derived from the Greek adult population, incorporating responses from 5829 participants. The dataset, collected via the Active-Q questionnaire, encompassed a wide range of variables, including sports-related physical activity (PA) levels prior to SARS-CoV-2 infection, and disease severity alongside post-infection treatments, demographic characteristics, medical history, vaccination status, and details regarding COVID-19 illness experiences. The primary objective was to explore the potential associations between pre-infection PA levels ("Inactive", "Low PA", "Moderate PA", "High PA"), disease severity, and post-infection treatment outcomes ("No treatment", "Home remedies", "Prescribed medication", "Hospital admission", "Intensive care unit admission").
Machine learning analysis: The analysis was conducted using the Tree-based Pipeline Optimization Tool (TPOT), an automated machine learning tool that evaluates numerous machine learning pipelines to identify the most effective model and its parameters for the given dataset. A custom TPOT configuration was utilized, focusing on the ExtraTreesClassifier due to its robustness and efficiency in handling complex datasets. The configuration specified parameters such as the number of estimators, criterion for splitting, max features, and others, aimed at optimizing the model's predictive accuracy.
A five-generation process with internal cross-validation was employed to iteratively refine and assess the performance of various pipeline configurations. Each generation's best internal cross-validation (CV) score was recorded, ensuring the selection of the most promising model based on its ability to generalize across different subsets of the dataset.
**Results:** The TPOT optimization process across five generations consistently identified the best internal CV score as approximately 0.702. This stability in CV scores across generations indicated a strong consistency in the model's predictive accuracy during the training phase.
The optimal pipeline, as determined by TPOT, featured the ExtraTreesClassifier with specific parameters: bootstrap = False, max_features = 'log2', min_samples_leaf = 1, min_samples_split = 2, and n_estimators = 100. This configuration underscores the model's reliance on ensemble methods and the effectiveness of the ExtraTreesClassifier in navigating the dataset's complexity.
Upon evaluation on the test set, the chosen model achieved a test accuracy of approximately 0.713. This performance metric signifies the model's capacity to accurately predict treatment outcomes based on pre-infection PA levels and other relevant variables, illustrating the predictive power and generalizability of the machine learning approach employed. The features that were used to predict the target variable 'TreatmentOutcome' are as follows: Age (yr), Height (cm), Body mass (kg), BMI (kg $m^{-2}$), Region of residence, Education level: Categorical variable indicating the highest level of education attained by the participants, Sports-related PA levels: Quantitative measure of physical activity levels related to sports, likely measured in metabolic equivalent minutes (MET-minutes/week) or a similar unit, Number of Underlying medical conditions, Vaccine profile (e.g., unvaccinated, partially vaccinated, fully vaccinated), Vaccination type/s: Categorical variable indicating the type of vaccine(s) received, if any, and Incidence of SARS-CoV-2 re-infections.
**Conclusions:** The results of this study demonstrate the potential of machine learning, particularly the use of ensemble methods like the ExtraTreesClassifier, in uncovering meaningful patterns within extensive datasets related to COVID-19. The consistent internal CV scores across generations highlight the robustness of the chosen model, while the test accuracy underscores its applicability in predicting COVID-19 treatment outcomes from pre-infection PA levels and other factors.

**Fig. (abstract 000484)**




Feature importances derived from the ExtraTreesClassifier model, showing the relative importance of each predictor in determining COVID-19 treatment outcomes. The highest importance is attributed to anthropometric measurements, with BMI, height, and body mass taking the lead. Error bars represent the standard deviation of the importance scores across the ensemble of decision trees.

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2. None

**Topic:** Information systems and data science.

## 000485

## Validation of the behavioral indicators of pain scale-brain injury (ESCID-DC)

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000485

**Introduction:** Pain assessment in critically ill patients unable to self-report is recommended to be performed with behavioral scales. However, in patients with brain damage and altered level of consciousness, experts recommend validating the existing tools to improve their applicability and pain detection capability.

**Objectives:** To validate the adaptation of the Behavioral Indicators of Pain Scale (ESCID) for patients with acquired brain injury (ESCID-DC), unable to self-report and with artificial airway.
**Methods:** Multicenter validation study conducted in 2 phases: scale development and evaluation of psychometric properties. Patient inclusion criteria were: age $\geq$ 16 years, acquired brain injury (of different etiology), unable to self-report (verbal or motor), artificial airway, and signed consent. Patients with previous pathology of injury and/or cognitive impairment, diagnosis of brain death, and conditions that prevented or limited behavioral response (spinal cord injury, severe polyneuropathy, continuous infusion of neuromuscular blocking agents, barbiturate coma, Richmond Agitation and Sedation Scale (RASS) = −5 and Glasgow Coma Scale score = 3) were excluded. The data collection procedure consisted of assessment by two independent observers, blinded to each other, of pain response with two scales: ESCID-DC and Nociception Coma Scale-Revised version-adapted for Intubated patients (NCS-R-I). Assessments were performed at 3 time points: 5 min before, during, and 15 min after the application of the procedures (painful vs. non-painful). On the day of measurement, the Glasgow Coma Score (GCS) and the RASS were evaluated. A descriptive and psychometric analysis was performed.
**Results:** 4152 pain assessments were performed in 346 patients, 70% were men with a mean age of 56 years (SD = 16.4). The most frequent etiologies of brain damage were vascular 155 (44.8%) and traumatic 144 (41.6%). The median GCS and RASS on the day of evaluation were 8.50 (RIQ = 7 to 9) and −2(RIQ = −3 to −2), respectively. In ESCID-DC, the median score was 6(RIQ = 4 to 7) during secretion aspiration, 3(RIQ = 1 to 4) for right nail pressure and 3(RIQ = 1 to 5) for left nail pressure. During the non-painful procedure, it was 0. The ESCID-DC showed a high discrimination capacity between painful versus non-painful procedures (AUC > 0.83) and is sensitive to change depending on the time of application of the scale ($p < 0.001$). High interobserver agreement (Kappa > 0.87), good internal consistency during procedures ($\alpha$-Cronbach's $\alpha \geq 0.80$), and high correlation between ESCID-DC and NCS-R-I ($r \geq 0.75$) were obtained.
**Conclusions:** The ESCID-DC is a valid and reliable tool to assess pain in patients with acquired brain injury, unable to self-report and artificial airway.

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**Topic:** Sedation, analgesia, and delirium

## 000486

### Establishing consensus on patient- and family-centered care in adult intensive care units: a Delphi survey

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000486

**Introduction:** Patient- and family-centered care has the potential to improve care and clinical outcomes (IPFCC 2024; Secunda 2022). The Institute for Patient- and Family-Centered Care has proposed four concepts central to patient- and family-centered care; dignity and respect, information sharing, participation of patients and family in care, and collaboration (IPFCC 2024; Johnson & Abraham 2012). To fulfill the potential of patient-and family-centered care for reducing unnecessary suffering and improve short- and long-term clinical and psychological outcomes, translation of the concepts into more concrete, context-specific interventions is needed.
**Objectives:** To establish consensus between intensive care unit (ICU) experts on patient- and family-centered care statements for adult patients and relatives in the ICU.
**Methods:** We did a three-round Delphi survey with a panel of ICU health care professionals from 23 ICUs in Denmark. We used an online tool, Research Electronic Data Capture (REDCap), to create the surveys and collect all data anonymously.
In the first survey round, participants answered 20 open-ended questions, based on existing evidence (Bohart 2021; Bohart 2022). Analysis of their responses generated close-ended statements, which participants rated in second and third survey round on a five-point-Likert-scale, from very important to not important at all. Consensus was predefined as $\geq$ 75% of participants rating a statement important/very important.
**Results:** Sixty-nine clinical experts participated: 38 nurses, 24 physicians, and four occupational and physiotherapists. In total, 96%, 90% and 72% answered the first, second, and third rounds, respectively.
In round 1, participants answers resulted in > 3000 statements that were analyzed end resulted in 82 condensed statements. The statements described patient- and family-centred care interventions ranging from very concrete to more abstract interventions. In round 2 and 3, participants were asked to rate the importance of each statement. 47 statements reached consensus as important/very important.
**Conclusions:** The 47 statements rated to be important included interdisciplinary approaches to systematic information sharing and consultations with patients and family members, with the aim being to accommodate patients and family members' individual needs throughout the ICU stay. The statements will be collated in a future study, into a multicomponent patient- and family-centred care intervention and the effect on patient delirium and the psychological burden in both patients and their family members will be tested.

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**Topic:** Nursing care and physiotherapy.

## 000488

### Prognostication of ICU-length of stay for the next years until 2040 in Australia and New Zealand using projection models and retrospective data from the ANZICS Adult Patient Database from 2006 to 2019: PrognostICate Study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000488

**Introduction:** The COVID-19 pandemic has dramatically proven AQ25 the critical importance of sufficient healthcare resources (1). Given a global population increase and the aging demographic of patients admitted to ICU over the last decades, it is crucial to provide accurate predictions of the mean ICU length of stay (ICULOS) and length of mechanical ventilation (LOMV) for ICU patients within the next decades. Several studies have already aimed to address this problem using different prognostic tools (2–5). However, reliable data projecting future ICULOS and LOMV are still missing.
**Objectives:** Utilizing statistical projection models, historical data from the Australian and New Zealand Intensive Care Society (ANZICS) Adult Patient Database (ADP) from 2006 to 2019, as well as general population data of Australia and New Zealand ICULOS including ICULOS in ventilated patients (ICULOSvent) can be predicted through to the year 2040, divided by sex, age group and admission type.
**Methods:** To quantify the mean ICULOS as a function of gender, age, admission type, and calendar year, retrospective nationwide comprehensive data (from the years 2006–2019) from the ANZICS ADP of all ICU patients > 16yrs were extracted. Since data of the LOMV were only available from the year 2017 onwards, we assessed ICULOSvent as a surrogate. Data from the years 2020–2023 were excluded due to possible distortions during the COVID-19 pandemic as was data with missing characteristics of sex, age or admission type. To predict ICULOS and ICULOSvent in Australia/New Zealand for the next years until 2040, different projection models [Poisson regression, logarithmic regression, autoregressive integrated moving average modeling

(ARIMA), and exponential smoothing (ETS)] were employed. These data were set in relation to official population projections from the Australian Bureau of Statistics and Stats NZ (New Zealand) from 2020 to 2040. The prediction accuracy of each model was verified using out-of-time cross validation and the best-fitting model was chosen. The study was approved by the Ethics' committee of the University of Cologne, Germany (23–1096-retro).

**Results:** A total of 1 866 883 (72%) of 2 610 738 patient admissions from the ANZICS ADP from 2006 to 2023 could be included in our projection model. The best-validated and chosen projection model for our analysis proved to be the ARIMA and ETS model predicting a decreasing trend from 2006 onwards in the total mean ICULOS: 2.8 days (95%CI 2.7–2.8) by 2040 versus 3.4 days in 2006. The forecasted mean ICULOSvent is 4.4 days (95%CI 3.8–4.8) by 2040 compared to 4.6 days in 2006 (see figure). The decline in the mean ICULOS is foreseen in both sexes (2.6 95%CI 2.5–2.7 vs 2.9 95%CI 2.9–3.0 days in women vs men by 2040) and in all age categories. Moreover, the model prognosticates an (89%) increase of ICU-admissions of 366 141 (95%CI 338 829–393 454) in 2040 vs 193 661 admissions recorded in 2019. Regarding different admission types, the mean ICULOS is predicted to be 2.1 days (95%CI 2.1–2.2) for surgical admissions vs 3.5 days (95% CI 2.5–4.3) for non-surgical admissions in 2040.

**Conclusions:** ARIMA and ETS as statistical projection models provide essential insights into future ICULOS and ICULOSvent enabling the proactive and timely allocation of healthcare resource management. Despite a predicted general decrease in mean annual ICULOS and ICULOSvent, alongside an increase in ICU admission rates until 2040, our study reveals significant disparities among sexes, age groups, and admission types. Those differences require further in-depth investigation in the future.

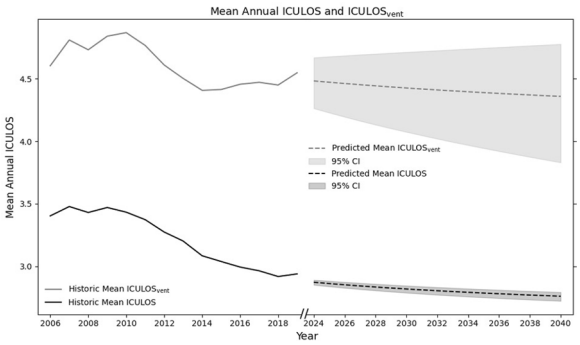


**Fig. (abstract 000488)** Predictions for total ICU population and for patients with a positive status of ventilation

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**Topic:** Information systems and data science

## 000489

### Evaluation of right-ventricular function by atrioventricular coupling as a predictor of complications in cardiac surgery patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000489

**Introduction:** Right-ventricular dysfunction represents an entity that worsens the prognosis of patients in any scenario; its evaluation and management is complex and requires close monitoring for adequate treatment.

In cardiac surgery patients, previous cardiac diseases have an influence on the outcome of the surgeries and a worse outcome is expected in those who present them; however, it is rare for a targeted analysis of the function of the right ventricle to be performed. To date, various tools have been used to analyze right-ventricular function, most of which are invasive strategies. With the advent of the use of echocardiography at the patient's bedside, indices such as right ventriculoarterial coupling have been designed, which, together with standard measurements such as TAPSE and S wave, guide the efficiency of ventricular function in the face of the afterload generated by the pulmonary artery, which makes it a useful tool in the analysis of right-ventricular function and its relationship with complications in cardiac surgery patients.

**Objectives:** Primary:

Demonstrate that there is a relationship between right-ventricular arterial coupling and complications in cardiac surgery.

Secondary:

Identify the right-ventricular arterial coupling cut-off point in which complications occur most frequently.

Recognize the percentage of patients who undergo surgery and have right heart failure.

To observe the characteristics of the outcomes of patients with right-ventricular dysfunction identified by ventricular–arterial coupling.

**Methods:** A cohort study is carried out in the cardiovascular therapy unit of the National Institute of Cardiology from January 1, 2020 to July 30, 2023. Patients entering cardiac surgery will be registered their pre-surgical echocardiogram and their post-surgical outcomes.

Right-ventricular arterial coupling is estimated using the TAPSE/PSAP formula, 0.36 is used as a cut-off point to define right-ventricular dysfunction. The association between the TAPSE/PSAP variable and the complications (acute kidney injury, cardiogenic shock and death) will be carried out in search of a direct relationship between both variables, and finally, using an ROC curve, the most specific and sensitive cut-off point will be sought to identify the risk of complications in cardiac surgery from ventricular–arterial coupling.

**Results:** A total of 184 patients were analyzed, of which 58% were male and the most frequent comorbidity was systemic arterial hypertension in 95 (51.6%). The surgery performed most frequently in the series of patients was aortic valve replacement 96 (52%), with an average aortic clamping time of 90 min and extracorporeal circulation time of 131 min. The most common complication was hypovolemia in 75 (40.8%). From the echocardiographic findings, we obtained an average LVEF of 56%, an average TAPSE of 21, and an average of 0.66 pre-surgical right arterial–ventricle coupling. The average hospitalization time in intensive care was 2 days and in-hospital mortality was 6%.Using TAPSE as the gold standard of right-ventricular dysfunction with a cut-off point of 17, a relationship was found between TAPSE of 17 or less and an average ventriculoarterial coupling of 0.4. In the group corresponding to TAPSE less than 17, a higher incidence of post-surgical complications such as delirium, cerebral vascular event, pneumonia, acute kidney injury, liver failure, and mesenteric ischemia was found. In a ROC curve, 0.36 was found as the most sensitive and specific cut-off point. The low TAPSE/PSAP index reports a sensitivity of 37.8% and

a specificity of 92.5, it has a positive predictive value of 56% for complications and a negative predictive value of 14%.

**Conclusions:** According this study, there is no relationship between right-ventricular arterial coupling and complications in cardiac surgery. The right-ventricular arterial coupling cut-off point of 0.36 was identified as the one with the highest sensitivity and specificity in which complications occur most frequently. 20% of patients who undergo surgery have right heart failure according to their echocardiographic findings.

**Table 1 (abstract 000489)** Basal characteristics

| Variable | N = 184 |
|---|---|
| **Sexo (Hombres)** [a] | **107.0 (58.2)** |
| Edad (años) [b] | 56.9 (±12.1) |
| **Peso (Kg)** [b] | **69.3 (±12.1)** |
| Talla (m) [b] | 1.6 (±0.1) |
| **Índice de Masa Corporal (IMC) [Kg/m²]** [b] | **26.4 (±3.9)** |
| Comorbilidades [a] | |
| **Hipotiroidismo** | **18.0 (9.8)** |
| Infarto Agudo al Miocardio (IAM) | 24.0 (13.0) |
| **Diabetes Mellitus Tipo 2 (DM2)** | **47.0 (25.5)** |
| Enfermedad Pulmonar Obstructiva Crónica (EPOC) | 0.0 (0.0) |
| **Enfermedad Renal Crónica (ERC)** | **8.0 (4.3)** |
| Hipertensión Arterial Sistémica (HAS) | 95.0 (51.6) |
| **Enfermedad Vascular Cerebral (EVC)** | **10.0 (5.4)** |
| Insuficiencia Cardiaca | 45.0 (24.5) |
| **Fibrilación Auricular (FA)** | **33.0 (17.9)** |
| Cirugia cardiaca previa | 16.0 (8.7) |
| Clasificación funcional de la New York Heart Association (NYHA) [a] | |
| **I** | **22.0 (12.0)** |
| II | 116.0 (63.0) |
| **III** | **39.0 (21.2)** |
| IV | 7.0 (3.8) |
| Euroscore 2 [c] | 1.2 (0.8, 2.9) |
| **CVAo** [a] | **96.0 (52.2)** |
| CRC [a] | 44.0 (23.9) |
| **CVM** [a] | **35.0 (19.0)** |
| CVM + CVT [a] | 8.0 (4.3) |
| **CVAo + CVM** [a] | **0.0 (0.0)** |
| REVAS + Valvula aórtica [a] | 0.0 (0.0) |
| **Bentall y Bono** [a] | **0.0 (0.0)** |
| Otro [a] | 3.0 (1.6) |
| **TCE** [c] | **131.5 (104.0, 157.0)** |
| Tiempo de Pinzamiento Aórtico (PAo) [min] [c] | 90.0 (73.0, 108.7) |
| Evaluación ecocardiográfica | |
| **Desplazamiento Sistólico del Plano del Anillo Tricuspideo (TAPSE) [mm]** [c] | **21.0 (18.5, 23.0)** |
| Presión Sistólica de la Arteria Pulmonar (PSAP) [mmHg] [c] | 31.5 (24.0, 42.0) |
| **Onda S** [c] | **11.0 (10.0, 12.0)** |
| Fracción de Eyección del Ventriculo Izquierdo (FEVI) [%] [c] | 56.5 (45.0, 62.0) |
| **AVAD** [c] | **0.6619 (0.4607, 0.8571)** |

[a] Los values son presentados en n y porcentajes
[b] Los values son presentados como media y DE
[c] Los values son presentados como mediana, P 25 y 75

**Table 4 (abstract 000489)** Complications with TAPSE

| Variable | N = 184 | | |
|---|---|---|---|
| | TAPSE < 17.0 n = 37 | TAPSE > 18.0 n = 147 | p < 0.05 |
| Complicaciones QX [a] | | | |
| **Hemorragia mediastinal** | **4.0 (10.8%)** | **13.0 (8.8%)** | **0.752** |
| Síndrome de bajo gasto postcardiotomia | 4.0 (10.8%) | 6.0 (4.1%) | 0.117 |
| **Síndrome vasopléjico** | **2.0 (5.4%)** | **6.0 (4.1%)** | **0.663** |
| Hipovolemia | 16.0 (43.2%) | 59.0 (40.1%) | 0.731 |
| Complicaciones Hospitalización [a] | | | |
| **Delirium** | **5.0 (13.5%)** | **14.0 (9.5%)** | **0.545** |
| Enfermedad Vascular Cerebral (EVC) | 1.0 (2.7%) | 2.0 (1.4%) | 0.492 |
| **Neumonia intrahospitalaria** | **9.0 (24.3%)** | **10.0 (6.8%)** | **0.004** |
| Mediastinitis | 2.0 (5.4%) | 8.0 (5.4) | 1.000 |
| **Necesidad de transfusión** | **20.0 (54.1%)** | **64.0 (43.5%)** | **0.251** |
| Lesión Renal Aguda | 10.0 (27.0%) | 37.0 (25.2%) | 0.817 |
| **Terapia de Sustitución Renal** | **4.0 (10.8%)** | **7.0 (4.8%)** | **0.236** |
| Falla Hepática | 5.0 (13.5%) | 15.0 (10.2%) | 0.560 |
| **Isquemia Mesentérica** | **1.0 (2.7%)** | **0.0 (0.0)** | **0.201** |
| Fibrilación Auricular Postqx | 3.0 (8.1%) | 19.0 (12.9%) | 0.575 |
| **Mortalidad intrahospitalaria** [a] | **4.0 (10.1%)** | **7.0 (0.05%)** | **0.236** |

[a] Los values son presentados en n y porcentajes, X²
[b] Los values son presentados como media y DE, t de Student
[c] Los values son presentados como mediana, P 25 y 75, U de Mann-Whitney

**Table 3 (abstract 000489)** Outcome

| Variable | N = 184 |
|---|---|
| Complicaciones QX [a] | |
| **Hemorragia mediastinal** | **17.0 (9.2)** |
| Síndrome de bajo gasto postcardiotomia | 10.0 (5.4) |
| **Síndrome vasopléjico** | **8.0 (4.3)** |
| Hipovolemia | 75.0 (40.8) |
| Complicaciones Hospitalización [a] | |
| **Delirium** | **19.0 (10.3)** |
| Enfermedad Vascular Cerebral (EVC) | 3.0 (1.6) |
| **Neumonia intrahospitalaria** | **19.0 (10.3)** |
| Mediastinitis | 10.0 (5.4) |
| **Necesidad de transfusión** | **84.0 (45.7)** |
| Lesión Renal Aguda | 47.0 (25.5) |
| **Terapia de Sustitución Renal** | **11.0 (6.0)** |
| Falla Hepática | 20.0 (10.9) |
| **Isquemia Mesentérica** | **1.0 (0.5)** |
| Fibrilación Auricular Postqx | 22.0 (12.0) |
| Estancia en la Unidad de Terapia Intensiva Cardiovascular (UTIC) [Dias] [c] | 2.0 (2.0, 3.0) |
| **Tiempo de Ventilación Mecanica Invasiva (VMI) [Dias]** [c] | **1.0 (1.0, 1.0)** |
| Tiempo total de hospitalización (Dias) [c] | 9.0 (7.0, 15.0) |
| **Mortalidad intrahospitalaria** [a] | **11.0 (6.0)** |

[a] Los values son presentados en n y porcentajes
[b] Los values son presentados como media y DE
[c] Los values son presentados como mediana, P 25 y 75

**Table 7 (abstract 000489)** Outcome with AVC

| Variable | N = 184 | | |
|---|---|---|---|
| | TAPSE/PSAP < 0.36 n = 25 | TAPSE/PSAP > 0.37 n = 159 | p < 0.05 |
| Complicaciones [a] | | | |
| Lesión Renal Aguda | 9.0 (19.1) | 38.0 (80.9) | 0.220 |
| **Síndrome de bajo gasto postcardiotomia** | **4.0 (40.0)** | **6.0 (60.0)** | **0.012** |
| Mortalidad intrahospitalaria [a] | 2.0 (18.2) | 9.0 (81.8) | 0.646 |

[a] Los values son presentados en n y porcentajes, X²

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11. Non

**Topic:** Cardiovascular issues in ICU

## 000490

### audit of diabetic ketoacidosis management patients in critical care in NHS Grampian: identifying areas for improvement in care quality and outcomes

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**Introduction:** Organisation and delivery of critical care have seen significant changes following the COVID-19 pandemic. This has meant that an increased number of diabetic ketoacidosis (DKA) cases are managed by the critical care team. At the same time we transitioned to electronic health systems whilst many treatment protocols, including the DKA pathway, remain paper based.
**Objectives:** Our goal was to evaluate trends, care quality, and outcomes for DKA admissions to our critical care unit against the national Joint British Diabetes Society (JBDS) guidelines (1), and analyse any demographic or disease patterns to identify areas for improvement in care quality or outcomes.
**Methods:** A retrospective baseline audit using electronic patient records from August 1, 2021 until June 21, 2023.
We audited the following standards:
1. Prescription of long-acting insulin within 24 h of admission to critical care
2. Prescription of thromboprophylaxis within 24 h of admission to critical care
3. Documentation of precipitating cause for DKA
4. Documentation of review by the local diabetes team within 24 h of admission to critical care

**Results:** We identified 110 patients admitted to critical care with DKA during the audit period. The mean age for patients in our audit was 42.9 years and 51% of patients were male. After examining Scottish Index of Multiple Deprivation quintiles our population came from more affluent postcodes compared to existing Scottish data on DKA (2), the majority of our patients were from urban postcodes.
82.6% of patients were prescribed insulin before their hospital admission and a significant majority (81.7%) of patients admitted had severe DKA as defined by the JBDS guidelines (1). 80% of the patients had a diagnosis of type 1 diabetes and 15.5% had a diagnosis of type 2 Diabetes.
The median length of stay was 2 days and 45.5% of patients were stepped down from critical care to the diabetes ward and 27% of patient went directly home. 26% of admissions were for patients who had repeat admissions with DKA in this audit period.
77.3% of patients had a long-acting insulin prescribed on admission and 99.1% of patients had thromboprophylaxis prescribed.
99% of patients had a precipitating cause documented, although 8% of there was documented as "unclear"; the most common precipitating cause was insulin non-compliance.
74.5% of patients had a diabetic review within 24 h of admission.
**Conclusions:** Over 95% of patients had thromboprophylaxis prescribed within 24 h of admission to critical care a similar proportion had documentation of a precipitating cause, although for 8% of patients, this was documented as "unclear". Areas need improvement including timely diabetic team reviews and prescription of long-acting insulin for patients.
Future initiatives will focus on integrating the paper-based DKA protocol into our electronic system, streamlining insulin, and fluid prescriptions, and facilitating diabetic team referrals. This digital integration will also enable the automation of audit cycles, a practice already shown to be effective at improving care in other regions of the UK (3).

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**Topic:** Metabolism, endocrinology, liver failure, and nutrition.

## 000492

### An ethnography on ICU rounds: a case of nurses being subjectified as "Invisible" and "Absent"

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**Introduction:** ICU rounds are essential components of day-to-day successful patient management [1]. The participation of nurses in these rounds is crucial for ensuring continuity of care, complete information exchange, and achieving interdisciplinary clinical decisions. Effective collaboration between physicians and nurses is linked to better patient outcomes [2]. However, reduced participation of nurses in medical rounds may lead to disruption of continuity of patient care, communication breakdowns, potential errors, missed opportunities for education, reduced nurse autonomy, and poor team dynamics [3,4]. This abstract presents part of the findings of a larger doctoral study at an ICU in Greece [5].
**Objectives:** To gain a deep, contextual understanding of the social interactions, communication patterns, and cultural dynamics that shape the practices of nurses during ICU rounds.
**Methods:** Ethnography involves long-term observation and qualitative analysis, aiming to uncover the implicit norms, values, and behaviors that may not be apparent through other research Methods: The first researcher conducted a 2-year ethnographic study at a teaching ICU in Athens and 20 semi-structured interviews with ICU staff. Data were subjected to Braun and Clarke thematic analysis and were organized with Atlas.ti v8 QDA software. Categories and themes were identified via line-to-line coding [6]. The study was completed in 2021.
**Results:** By looking at nurses' and doctors' spatial and temporal practices during medical rounds, we were able to determine if the nurses at the ethnographic setting were involved—formally and informally—in the ICU team's clinical decisions. The analysis of the data revealed three main themes: (1) the ritual of the medical rounds, (2) the body practices of nurses, and (3) clinical decision-making (Figures 1 and 2). Medical rounds were conducted in a variety of formats. The medical team would confer and discuss patient care (a) in the corridor of the unit, (b) in the doctor's office, and (c) occasionally at the beside area in front of each patient. The onset and format of the round differed day by day. During the rounds, nurses seemed to be still busy with patient care (nurse-patient ratio 1:3). Nurses reported that they felt that the heavy workload of the unit did not allow them to participate in the

rounds, so they gave up trying to participate. This led to *nurse invisibility* as nurses were not attending or participating in the rounds. The participant nurses, with very few exceptions, abstained from the rounds and chose to be subjectified as *absent* rather than assume a secondary, marginal role.

**Conclusions:** In this study, the ICU rounds emerged as *points of exclusion* for nurses, as nurses seemed unable to participate in the clinical decisions of the ICU team. Considering the findings from Greece and aligning with broader literature, there is a pressing need to implement strategies that foster a culture of collaboration, communication, and shared decision-making in the ICU setting.

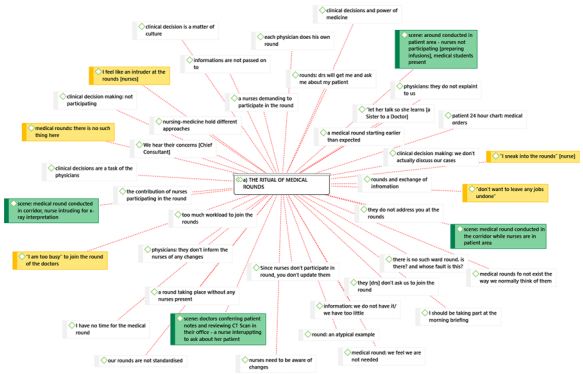

**Fig. 1 (abstract 000492)** Theme A

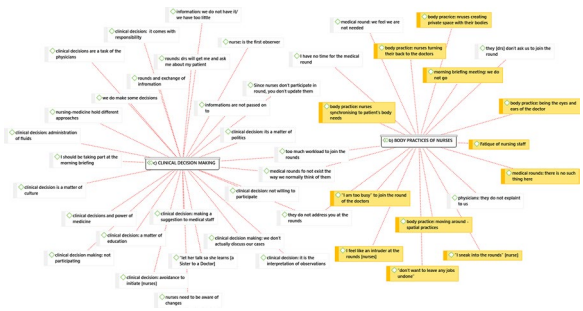

**Fig. 2 (abstract 000492)** Themes B and C

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7. This study has been partially funded by the University of West Attica, Athens, Greece

**Topic:** Nursing care and physiotherapy

## 000493

## An audit of the assessment of surgical wounds and drains in critical care

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**Introduction:** A significant number of surgical patients require postoperative monitoring and support from intensive care units (ICUs). (1) Given the high prevalence of infection in critical care, (2) surgical wounds and drain sites can be susceptible to contamination in this setting. Therefore, regular assessment of surgical sites, as advised by the National Wound Care Strategy, (3,4) is important in allowing early detection and management of these infections to improve patient outcomes. Critical care doctors are not necessarily as familiar as surgeons with monitoring surgical sites, and thus, surgical patients may not be assessed appropriately and regularly enough during their ICU stay. The purpose of this audit was to evaluate the extent of this issue and identify potential solutions.

### Objectives:

- To assess the regularity of surgical site assessments by critical care doctors during ICU daily reviews.
- To evaluate the quality of surgical site assessments by critical care doctors during ICU daily reviews.

**Methods:** Data were collected from the Stoke Mandeville Hospital (SMH) ICU electronic patient notes via the IntelliSpace Critical Care and Anaesthesia (ICCA) platform. A search was performed on ICCA for all patients admitted to SMH ICU during October 2023. The admission documentation for each patient was reviewed and all patients that were admitted with a surgical wound ± drain were included. For each patient, the proportion of pre-ward round morning reviews with a documented surgical site assessment was calculated. The comprehensiveness of these assessments was also evaluated.

After the initial round of data collection, an infographic was designed to educate ICU junior doctors on the important aspects of a surgical site assessment (Figure 1). Additionally, modifications were made to the ICCA morning review template with the aim of prompting ICU doctors to perform a comprehensive surgical site assessment (Figure 2). A second cycle of the audit is being performed to evaluate the impact of these interventions.

**Results:** At baseline, 55% of morning reviews for patients with a surgical wound did not comment on the wound ($n = 56$). Out of the documented surgical wound assessments, less than 40% commented on whether the wound was clean and whether there was any surrounding erythema, and only 20% assessed for the presence of discharge ($n = 25$). Furthermore, 69% of morning reviews for patients with surgical drains failed to comment on the drain ($n = 39$). Only 20% of the surgical drain assessments commented on the appearance of the surgical drain fluid ($n = 12$).

**Conclusions:** In this case example, surgical wounds and drains were not being assessed daily in sufficient detail by ICU doctors. This may be partly explained by the operating surgeons assessing the surgical sites themselves and the need to minimise distress to the patient from repeated removal of dressings.

Two interventions have been made to address this issue, and the impact of these interventions will be evaluated.


**Fig. 1 (abstract 000493)** An infographic designed to educate ICU doctors about the aspects of a surgical site assessment

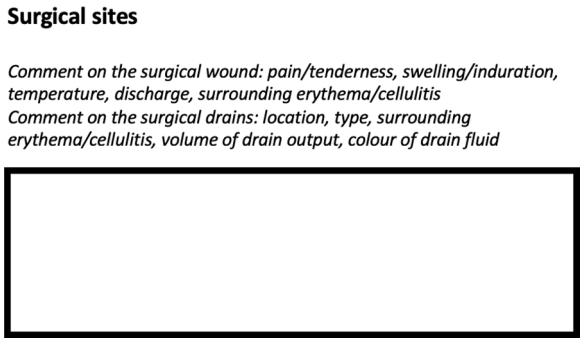


**Fig. 2 (abstract 000493)** A proposed addition to the ICCA template for SMH ICU morning reviews with prompts for a comprehensive surgical site assessment

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**Topic:** Perioperative care

## 000495

## Factors related to mortality in patients with chronic kidney disease admitted to the ICU of a county hospital

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000495

**Introduction:** Chronic kidney disease is an increasingly prevalent pathology in the Intensive Care Unit (ICU), with and important impact in the outcome.
**Objectives:** To analyze factors associated with mortality in patients with chronic kidney disease (CKD) admitted to the Intensive Care Unit (ICU) of the Hospital Universitario Punta de Europa.
**Methods:** Retrospective descriptive analysis on a prospective cohort performed in a 15-bed ICU from 2019 to 2023. Demographic outcomes, comorbidities, severity scores (APACHE II and SAPS II), treatment received, mechanical ventilation (MV), risk factors, ICU acquired infections, antibiotherapy, ICU and hospital length of stay (LOS), CKD stages, renal replacement therapy (RRT), and glomerular filtration rate (GFR). Statistical analysis: categorical variables (frequencies and percentages) and quantitative variables (mean and standard deviation or median and interquartile range). Comparisons: X2 test (percentages), Student's t test (means), and Mann–Whitney U test (medians). Multivariate logistic regression. Statistical significance at $p < 0.05$.
**Results:** 229 patients were included. Dead ($n = 94$) vs. survivors ($n = 135$) were compared. On admission: SAPS II (48.4 [32.8; 59] vs. 35.4 [24; 44], $p < 0.001$), APACHE II (19.3 [13; 25] vs. 13.8 [9;17], $p < 0.001$). GCS (11.5 [8; 15] vs. 13.9 [15; 15], $p < 0.001$). Type of admission ($p = 0.003$): scheduled surgery 3.2% vs. 3.7%, urgent surgery 15.9% vs. 5.9%, coronary 11.7% vs. 28.1%, non-coronary medical 68.1% vs. 62.2%. Risk factors: prior antimicrobial therapy (48 h) 48.9% vs. 22.9%, $p < 0.001$; total parenteral nutrition (TPN) 34.0% vs. 14.8%, $p < 0.001$; central venous catheter (CVC) 88.3% vs. 54.1%, $p < 0.001$; RRT 30.9% vs. 15.6, $p = 0.009$; MV 63.8% vs. 16.3%, $p < 0.001$; urinary catheter (UC) 94.6% vs. 74.8%, $p < 0.001$; tracheostomy 7.4% vs. 0%, $p = 0.002$. Comorbidities: chronic obstructive pulmonary disease (COPD) 21.3% vs. 7.4%, $p = 0.004$; cirrhosis 7.5% vs. 0%, $p = 0.002$. First ICU-acquired infection ($p = 0.004$): secondary bacteriemia 5.3% vs. 2.9%, catheter-related bloodstream infection (CRBSI) 15.9% vs. 3.7%, abdominal infection 4.3 vs. 2.2%, Catheter-associated urinary tract infections (CAUTI) 2.1% vs. 0.7%, ventilator-associated pneumonia (VAP) 2.1% vs. 0%. Days of MV (5.2 [0; 7] vs. 0.7 [0; 0], $p < 0.001$). Days of arterial catheter (3.6 [0; 5] vs. 0.8 [0; 0], $p < 0.001$). Days of UC (8.1 [1; 11] vs. 4.2 [1; 6], $p < 0.001$). Days of CVC (7.5 [1;11] vs. 3.2 [0;5], $p < 0.001$). Continuous infusion of furosemide 26.6% vs. 14.8%, $p = 0.041$. GFR at ICU discharge ($p < 0.001$): < 15 ml/min (51.0% vs. 21.5%), 15–30 ml/min (22.3% vs. 21.5%), 30–60 ml/min (13.8% vs. 36.3%), > 60 ml/min (13.8% vs. 20.7%). GFR at hospital discharge ($p < 0.001$): < 15 ml/min (51.0% vs. 20.7%), 15–30 ml/min (19.1% vs. 18.5%), 30–60 ml/min (15.9% vs. 37.7%), and > 60 ml/min (13.8% vs. 22.9%). Stage of CKD at ICU discharge ($p < 0.001$): I (8.5% vs 16.3%), II (6.3% vs. 10.4%), III (13.8% vs. 38.5%), IV (21.3% vs. 17.0%), V (50.0% vs. 17.7%). Multivariate logistic regression: Days of MV (OR 1.21 [1.09;

1.38], $p = 0.001$), stage V of CKD at hospital discharge (OR 6.19 [1.99; 21.54], $p = 0.002$), SAPS II (OR 1.05 [1.03;1.07], $p < 0.001$).
**Conclusions:** ICU mortality in patients with CKD is high. In our ICU, SAPS II on admission, the days of MV and stage 5 of CKD at ICU discharge were observed as independent risk factors of mortality.

**Topic:** Acute kidney injury and haemofiltration

**000496**

## Quality improvement project on the usage of proton pump inhibitors and prokinetics on ICU at Buckinghamshire Healthcare NHS Trust

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**Introduction:** Proton pump inhibitors (PPIs) are vital in the ICU due to high risk of stress ulceration (1). However, regular review and cessation of PPIs are crucial to prevent polypharmacy and minimise side effects. Long-term PPI use (>8 weeks) is generally unnecessary except for specific conditions like Barrett's esophagus, chronic NSAID use, severe esophagitis, and documented ulcers (2). Once patients are established on enteral, discontinuing PPIs is essential.
Following trust guidelines, prokinetics should be prescribed when nasogastric (NG) aspirates exceed 500 ml to reduce aspiration risk. Prescribing prokinetics is unwarranted for aspirates below this threshold, aiming to prevent unnecessary polypharmacy and multiple antibiotic usage, as erythromycin is the preferred prokinetic.
**Objectives:** Evaluate the review of PPIs on daily ward rounds and timely cessation. Evaluate whether prokinetics are prescribed appropriately for high NG aspirates.
**Methods:** We conducted an audit to assess PPI prescription upon admission and daily review of stress ulcer prophylaxis. A daily checklist exists for stress ulcer prophylaxis review, alongside a GI section examining feeding initiation, PPI use, and cessation plans. At discharge, we checked for inappropriate PPI continuation. We also assessed for prokinetic initiation and reason.
**Results:** Twenty patients were audited in the first cycle using our electronic database. Out of 77 possible daily reviews spanning the 20 patients, PPI prophylaxis was reviewed 40 times (52%), shown in image 1. Of these 77 occasions, there were 16 (21%) encounters where the patient's PPI should have been stopped as they had been established on oral feed.
Upon discharge, 1 patient was discharged with Lansoprazole when not indicated, and a further 2 patients had no medication documented on their discharge. However, their PPI had not been stopped and they had been established on feed days prior, which indicates a high likelihood of discharge with this medication.
These results were disseminated amongst the department with recommendations, and we re-audited patients.
Out of 36 possible daily encounters, PPI was reviewed 31 times, a total of 86%, shown in image 2. The patients were all being NG fed, so appropriate PPI cessation could not be assessed.
During our research, any patients started on a prokinetic were not started due to NG aspirates, so we were unable to audit this.
**Conclusions:** The initial data demonstrated 52% compliance with daily review protocol, implying inadequate compliance requiring addressing. Furthermore, despite only 3 out of 20 patients being discharged with a PPI inappropriately, any unnecessary medication can result in unwanted side effects.
The intervention improved significantly; however, there is still dimension for improvement; further avenues for research include distributing training during inductions, weekly MDT session reminders, and discharge summary notes re-iterating the importance of medication review prior to discharge.

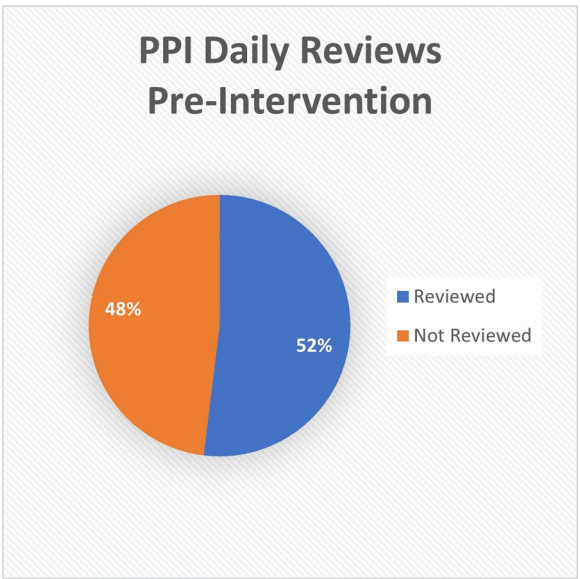


**Image 1 (abstract 000496)** Pie chart showing daily reviews pre-intervention

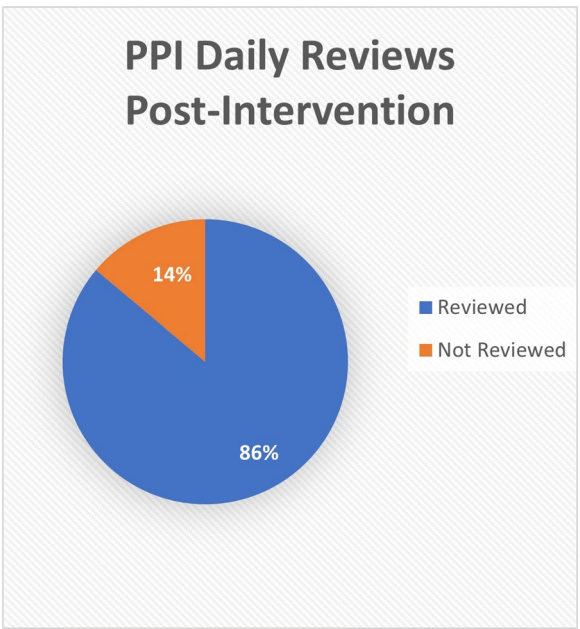


**Image 2 (abstract 000496)** Pie chart showing daily reviews post-intervention

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**Topic:** Poisoning/toxicology/pharmacology

## 000498

### Critically ill patients under thromboprophylaxis with enoxaparin: are we getting there?

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000498

**Introduction:** Critically ill patients are at increased risk of venous thromboembolism during their ICU stay, reason why a prophylactic dose of enoxaparin is commonly indicated. However, the pharmacokinetics of enoxaparin in critical ill setting is unpredictable and standard prophylactic dosing can jeopardize its efficacy.
**Objectives:** Evaluation of the adequacy of thromboprophylaxis with enoxaparin (40 mg once daily) in a population of critically ill patients.
**Methods:** Prospective and observational study, including critically ill adult patients in a tertiary hospital, between October 2022 and March 2024, who received a prophylaxis dose of 40 mg/day of enoxaparin. Anti-Xa peak activity was measured at day four (D4) and day seven (D7) after starting prophylaxis. Demographic data, and clinical variables at admission and during ICU stay were collected. Patients with renal impairment (creatinine clearance < 60 mL/min) were excluded. Statistical significance was set at $p < 0.05$.
**Results:** Sixty-four patients were included: half were surgical patients, 34.4% had a medical condition, and 15.6% had trauma. Median SOFA score at admission was 8.0 [6–10], APACHE II was 18.5 [14–24] and Charlson comorbidity index was 2 [1–4]. The most frequent comorbidities were diabetes mellitus (15.6%) and heart failure (7.8%). Median 8-h urinary creatinine clearance (CLCRD4) was 120 [84–150] mL/min and 106 [91–150] mL/min, at D4 and D7, respectively. Median anti-Xa activity in D4 was 0.26 [0.19–0.32] IU/mL and 0.31 [0.26–0.38] IU/mL in D7. At D4, 73% of patients (47 of 64) showed anti-Xa activity within desired range (0.2–0.5 IU/mL). A comparison between patients with on-target and below-target anti-Xa activity at D4 was made, with no statistical differences found between groups (Table 1). In D7, 93% of evaluable patients ($n = 29$) were on target. Hemorrhagic or thrombotic events were present in two and one patient, 3.2% and 1.6%, respectively. The ICU and intra-hospital mortality was 6.3%.
**Conclusions:** Two-thirds of the patients had adequate levels of thromboprophylaxis with enoxaparin on D4. Rate of target attainment increases between D4 and D7.

**Table 1 (abstract 000498)** Comparison between patients with on-target and below-target anti-Xa activity at D4

| | Total (N=64) | Bellow-target (N=16) | On-target (N=47) | *p* value |
|---|---|---|---|---|
| **Age (years)** | 56.5 [45-69.7] | 53.5 [45-58] | 61 [43-71] | 0.574 |
| **Male** | 40 (62.5) | 10 (62.5) | 30 (63.8) | 0.924 |
| **Body Mass Index (Kg/m²)** | 26 [23.3-28.6] | 27.6 [23.9-31.9] | 25.8[23.4-27.7] | 0.155 |
| **Charlson Score** | 2 [1-4] | 1 [1-2.8] | 2 [0-4] | 0.345 |
| **SAPS II** | 42 [33-57.8] | 39.5 [28-50.2] | 44 [33-58] | 0.251 |
| **APACHE II** | 18.5 [14.0-24.0] | 17.0 [13.2-22.8] | 19 [14-25] | 0.433 |
| **SOFA at admission** | 8 [6-10] | 8 [6.3-9] | 8.0 [6-1] | 0.618 |
| **$Cl_{CR}$ (ml/min)** | 120 [84- 150] | 124 [80- 175] | 120 [84-140] | 0.502 |
| **Septic shock** | 16 (25) | 6 (37.5) | 10 (21.3) | 0.198 |
| **Need for vasoactive drugs** | 59 (92.2) | 15 (93.8) | 43 (91.5) | 0.773 |

Data is presented in median [IQR] or N (%).

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**Topic:** Transfusion and haemostasis disorders

## 000499

### Comparative analysis of GPT-3.5 and GPT-4 in accuracy and efficiency of citation screening using large language models

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000499

**Introduction:** The development of clinical practice guidelines based on systematic reviews is an essential component for improving the quality of clinical decision-making also in the field of critical care. Large language models (LLMs) have been recognized as promising tools for citation screening in systematic reviews. However, their accuracy and efficiency between GPT-3.5 and GPT-4 have not yet been determined.
**Objectives:** To compare the accuracy and efficiency of LLMs between GPT-3.5 and GPT-4 in title/abstract literature screening.
**Methods:** We compared the efficiency and accuracy between GPT-3.5 and GPT-4 in LLM-assisted citation screening using the data from title and abstract screening process for five clinical questions (CQs) in the development of the Japanese Clinical Practice Guidelines for Management of Sepsis and Septic Shock. The LLM determined the relevance of each reference by considering criteria, such as patient characteristics, interventions, comparisons, and study designs of the selected CQs. We compared the accuracy of the LLM-assisted citation screening by measuring its sensitivity and specificity, using the final list of included studies in the conventional review as the reference standard in our primary analysis. Subsequently, we integrated these measures to estimate the pooled sensitivity and specificity for the LLM-assisted procedure. We also compared the screening times between GPT-3.5 and GPT-4 in LLM-assisted screening.
**Results:** In the conventional citation screening process, 8 of 5634 publications in CQ1 (0.14%), 4 of 3418 in CQ2 (0.12%), 4 of 1038 in CQ3 (0.39%), 17 of 4326 in CQ4 (0.39%), and 8 of 2253 in CQ5 (0.36%) were selected in the second session of full-text evaluation within each systematic review as the standard reference for the primary analysis in this study. In the primary analysis, the integrated sensitivity and specificity were 0.84 (95% confidence interval [CI], 0.69–0.93) and 0.50 (95% CI, 0.38–0.63) in GPT-3.5 and 0.89 (95% CI, 0.74–0.95) and 0.98 (95% CI, 0.97–0.99) in GPT-4 (Fig. 1). Additionally, the time required to process 100 studies was shorter in GPT-3.5 (1.0 min) than in GPT-4 (1.5 min) (mean difference 0.45 min, 95% CI, 0.33 to 0.58, $p < 0.001$) (Fig. 2).
**Conclusions:** Our study demonstrated that the specificity of LLM-assisted citation screening using GPT-3.5 was remarkably lower than that of GPT-4, with comparable sensitivity between the two models in the primary analysis. In addition, GPT-3.5 had a significantly shorter processing time than GPT-4. GPT-4 may be the more optimal LLM for citation screening in systematic reviews given the higher specificity and the negligible small difference in processing time between the two models.

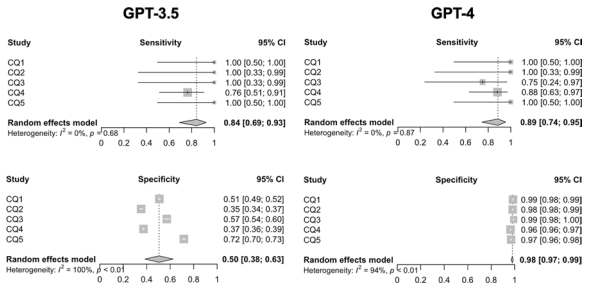


**Fig. 1 (abstract 000499)** Comparison of GPT-3.5 and GPT-4 in accuracy of large language model-assisted citation screening in the primary analysis

The primary analysis used results of the included publications for qualitative analysis, using the conventional method as the standard reference. In the upper panel, the individual sensitivity for each clinical question (CQ) and integrated sensitivities across CQ1-5 are compared between GPT-3.5 and GPT-4, with confidence intervals and inconsistency values (I2). In the lower panel, the individual specificity for each CQ and integrated specificities across CQ1-5 are compared between GPT-3.5 and GPT-4, with confidence intervals and inconsistency values (I2).

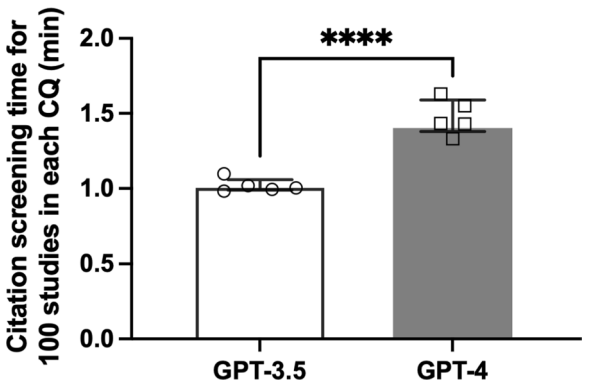


**Fig. 2 (abstract 000499)** Comparison of citation screening time for 100 studies using the large language models between GPT-3.4 and GPT-4

The difference in processing time was 0.45 min (95% confidence interval [0.33 to 0.58], $p < 0.001$). An unpaired $t$ test was used for the analysis.

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**Topic:** Information systems and data science

## 000500

### Assessment of platelet inhibition secondary to antiplatelet therapy in patients with spontaneous intracranial haemorrhage (sICH) in Singapore: a feasibility observational study using thromboelastography–platelet mapping (TEG-PM)

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000500

**Introduction:** In patients with acute sICH while on antiplatelet therapy, it is essential to identify the platelet dysfunction in a timely manner in the setting of urgent neurosurgical intervention. TEG-PM is designed to assess platelet inhibition due to antiplatelet therapy in a quick and reliable way. We do not have local data for our patients with sICH on aspirin and/or clopidogrel.
**Objectives:** We aimed to assess the ability of TEG-PM to detect platelet dysfunction accurately in patients with sICH on aspirin and/or clopidogrel.
**Methods:** This is a prospective observational study in patients presenting with sICH in Neuroscience Intensive Care Unit (NICU) in Singapore. Patients admitted to NICU from August 2022 to December 2023 were categorized into those on antiplatelet therapy (aspirin and/or clopidogrel prior to admission) and those without (control group). Patients on anticoagulants were excluded. TEG-PM was performed within 6 h after symptom onset and repeated within 1 h in those patients who received platelet transfusion. The clinicians were blinded to the TEG-PM results and the results were not used to determine the need for platelet transfusion.
**Results:** A total of 45 patients consented to participate in the study. They had a median age of 63 years, and majority were male ($n = 31$, 69%). Twenty-four patients (53.3%) received antiplatelet therapy and 21 patients (46.7%) were in control group. Patients on antiplatelet therapy were on average older, more males in proportion, had significantly higher percentage of patients with ischaemic heart disease, arterial hypertension, stroke, and on statin than the control group (Table 1).
Twenty-nine patients (17 on antiplatelet, 77% and 12 control, 60%) were found to have platelet dysfunction as defined by the Arachidonic Acid Inhibition Rate, AAIR > 50% on presentation. There was a statistically significant difference in prevalence of platelet dysfunction (AAIR > 50%) between antiplatelet and control group (Chi-squared test $p$ value < 0.01). Five patients in antiplatelet group (22.7%) were found to be non-responders to aspirin with AAIR < 50%.
Antiplatelet group had higher inhibition to Arachidonic Acid (AA) and Adenosine Diphosphate (ADP) than control group (Table 2). Median AAIR for antiplatelet group was 92.1 (IQR 65.0–94.4) and 56.45 (IQR 11.8–92.1) in control [$p$ value 0.022], whereas median ADPIR were 38.65 and 11.6, respectively [$p$ value 0.069]. There is a trend towards a lower maximum amplitude (MA) in the antiplatelet group compared to the control group but this did not reach statistical significance.
**Conclusions:** This is the first prospective study using TEG-PM to determine platelet dysfunction in our local population in Singapore. TEG-PM is able to accurately detect platelet inhibition in our local cohort of sICH patients on antiplatelet therapy. This allows us to rapidly diagnose, correct platelet dysfunction, and optimize patients for neurosurgical intervention as needed. The use of TEG-PM in other neurosurgical diagnosis and other patient population warrants further investigation.

**Table 1 (abstract 000499)** Distribution of demographic and clinical characteristics of the study sample

| Characteristics | Total cohort (n = 45) | Either aspirin or clopidogrel (n = 24) | No anti-platelet therapy (n = 21) | P value |
|---|---|---|---|---|
| Age, mean (SD) | 63.2 (12.6) | 66.7 (11.8) | 59.3 (12.7) | 0.051 |
| Gender male, n (%) | 31 (68.9) | 20 (83.3) | 11 (52.4) | 0.055 |
| Weight, mean (SD) | 64.1 (14.7) | 61.9 (15.2) | 66.6 (14.1) | 0.306 |
| Presence of co-morbidities, n (%) | | | | |
| Ischaemic Heart Disease | 10 (22.2) | 8 (33.3) | 2 (9.5) | 0.077 |
| Arterial Hypertension | 38 (84.4) | 23 (95.8) | 15 (71.4) | **0.039** |
| Hyperlipidaemia | 33 (73.3) | 20 (83.3) | 13 (61.9) | 0.176 |
| Smoking | 5 (11.1) | 2 (8.3) | 3 (14.3) | 0.652 |
| Chronic Pulmonary Disease | 2 (4.4) | 2 (8.3) | 0 | 0.491 |
| Chronic Liver Disease | 1 (2.2) | 0 | 1 (4.7) | 0.467 |
| Stroke | 20 (44.4) | 16 (66.7) | 4 (19.0) | **0.002** |
| Diabetes Mellitus | 18 (40.0) | 11 (45.8) | 7 (33.3) | 0.543 |
| Chronic Kidney Disease | 7 (15.5) | 5 (20.8) | 2 (9.5) | 0.422 |
| Malignant neoplasm | 2 (4.4) | 1 (4.2) | 1 (4.8) | 0.999 |
| Medication history, n (%) | | | | |
| Angiotensin-Converting Enzyme Inhibitor (ACEI) | 7 (15.6) | 4 (16.7) | 3 (14.3) | 0.999 |
| Angiotensin Receptor Blocker (ARB) | 7 (15.6) | 4 (14.3) | 3 (10.0) | 0.999 |
| NSAIDs | 2 (4.4) | 2 (8.3) | 0 | 0.491 |
| Statin | 26 (57.8) | 19 (79.2) | 7 (33.3) | **0.003** |

**Table 2 (abstract 000499)** Comparison of TEG-PM parameters between study group and control

| Parameter | Either aspirin or clopidogrel (n = 24) | No anti-platelet therapy (n = 21) | P value |
|---|---|---|---|
| Maximum Amplitude (mm), median (IQR) | 63.5 (60.9 – 67.7) | 64.4 (61.7 – 67.0) | 0.389 |
| MA Fibrin, median (IQR) | 17.5 (11.6 – 19.8) | 14.4 (9.2 – 17.1) | 0.073 |
| MA ADP, median (IQR) | 45.6 (32.8 – 59.0) | 56.6 (38.3 – 63.2) | 0.287 |
| MA AA, median (IQR) | 23.6 (19.4 – 37.5) | 37.6 (18.0 – 56.9) | 0.075 |
| Arachidonic Acid Inhibition Rate AAIR, median (IQR) | 92.1 (65.0 – 94.4) | 56.5 (11.8 – 92.1) | **0.022** |
| Adenosine Diphosphate Inhibition Rate ADPIR, median (IQR) | 38.6 (17.6 – 75.5) | 11.6 (5.0 – 51.7) | 0.069 |

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3. This study is funded by a competitive grant from Ng Teng Fong Healthcare Innovation Programme.


**Topic:** Neurointensive care

## 000501

### Development and validation of a machine learning model for real-time blood glucose prediction for ICU patients


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**Introduction:** Glucose control of ICU patients is complicated due to various diseases, different patient characteristics, and divergent treatment received during ICU stay. To deal with this challenge, machine learning prediction models are emerging to forecast glucose-related events.

**Objectives:** The aim of the study was to develop a real-time blood glucose prediction model to promote the precision insulin therapy.

**Methods:** Electronic medical records (EMR) data of a tertiary hospital were collected from September 2021 to September 2022. A total of 4092 ICU patients with 60,466 BG measurements were included for modeling to predict the blood glucose level in the next 5 min to 10 h. Demographics, comorbidities, vital signs, laboratory results, previous BG measurements, records of insulin injection, nutritional intake, and vasoactive inotropic score (VIS) were included as candidate predictor variables. The prediction model was externally validated using MIMIC-IV database.

**Results:** The root-mean-square error (RMSE), mean absolute percentage error (MAPE), and median absolute deviation (MAD) of the XGBoost prediction model are 33.59 mg/dL, 15.39%, and 23.92 mg/dL. The model also achieved higher percentage of Type A prediction in CEGA (75.67%) and lower percentage of clinically inappropriate predictions (0.29%). On external validation in MIMIC IV database, the model showed satisfactory performance in in terms of RMSE, MAPE, and MAD (36.97 mg/dL, 23.04% and 22.51 mg/dL).

**Conclusions:** Our study proposes a real-time blood glucose prediction model utilizing the XGBoost machine learning framework. The model could facilitate clinicians in understanding the real-time trend of patients' glucose level and making timely therapeutic decisions.


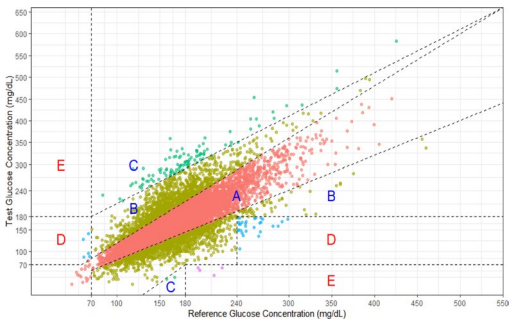


**Fig. 3 (abstract 000501)** Clarke error grid analysis (CEGA) for the XGBoost prediction model. Percentages of prediction in each region: Type A, 75.67%; Type B, 23.13%; Type C, 0.91%; Type D, 0.26%; Type E, 0.03% * Type A: predictions within 20% of the true values; Type B: predictions that are outside of 20% but would not lead to inappropriate treatment; Type C: predictions leading to unnecessary treatment; Type D: predictions that fail to identify a potentially dangerous hypoglycemic or hyperglycemic event; Type E: predictions that would confuse hypoglycemia for hyperglycemia and vice versa

**Topic:** Information systems and data science

## 000502

### The association between diabetes mellitus and complications of invasive Group A Streptococcus (iGAS): a retrospective cohort study


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**Introduction:** Group A Streptococcus (GAS) is one of the leading causes of death by a pathogen, with case fatality rates of 45% in GAS septic shock1. Since the 2022–2023 winter season, there has been a global resurgence in iGAS cases2. Several factors have been associated with increased risk of contracting iGAS such as diabetes mellitus, age older than 65 years, active wounds, malignancy, and substance use, in particular, injection drug use, alcohol, and tobacco use3. Most common and life-threatening complications of iGAS are respiratory failure requiring invasive mechanical ventilation (IMV), septic shock requiring vasopressors, necrotizing fasciitis, and in-hospital mortality (4). This retrospective cohort study aims to highlight an association between diabetic and non-diabetic populations with respect to the aforementioned iGAS complications.
**Methods:** An EPIC-powered electronic medical record database, SlicerDicer, was used to identify cases from a multi-center healthcare network throughout Illinois and Wisconsin. Inclusion criteria used were (1) age at admission greater than or equal to 18 years, (2) positive GAS blood culture, and (3) hospital admission between October 1st, 2022 and December 31st, 2023. Next, data were collected and de-identified with a secure collection system called REDCap. Data were collected by individual chart review of the 210 cases that met the inclusion criteria and stored in REDCap, where data analysis was conducted upon completion of data collection.
**Results:** The primary outcome of this study was in-hospital mortality secondary to GAS infection. Secondary outcomes included necrotizing fasciitis, septic shock, and respiratory failure requiring IMV. Of the 282,019 hospital admissions during that timeframe, 210 patients met the inclusion criteria. The diabetic (38.6%) and non-diabetic (61.4%) patients were then compared between primary and secondary outcomes. The in-hospital mortality for diabetics with iGAS was 8.6% compared to their non-diabetic counterparts (7.0%). Rates of respiratory failure requiring IMV in diabetics (9.9%) and non-diabetics (11.6%), septic shock requiring vasopressor support in diabetics (30.1%) and non-diabetics (26.4%), and necrotizing fasciitis in diabetics (6.2%) and non-diabetics (3.9%) were further analyzed.
**Conclusions:** In this multi-center study, we examined the most common iGAS complications that have been previously reviewed, with respect to diabetic and non-diabetic patient cohorts. We identified an association between having a pre-admission diagnosis of diabetes mellitus and having increased rates of iGAS complications, specifically in-hospital mortality (5), necrotizing fasciitis, and septic shock. Compared with the non-diabetic group, however, patients with diabetes had reduced respiratory failure rates requiring IMV.

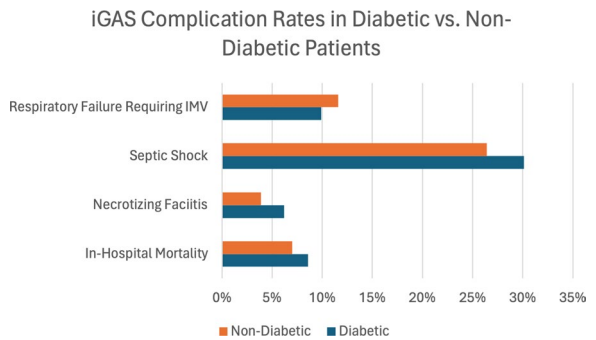


**Fig. 1 (abstract 000502)** iGAS complication rates (%) in diabetic vs. non-diabetic patients

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**Topic:** Sepsis.

## 000503

### Association between empiric multidrug-resistant (MDR) coverage and in-hospital mortality among septic patients at high risk for MRSA

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000503

**Introduction:** The Surviving Sepsis Campaign guideline recommends using empiric antimicrobials with methicillin-resistant *Staphylococcus aureus* (MRSA) coverage for adults with sepsis who are at high risk of MRSA, which is a best practice statement. Because the hosts are potentially immunocompromised, they could be vulnerable to multidrug-resistant (MDR) organisms.
**Objectives:** This study investigated the relationship between empiric MDR coverage with antipseudomonal antimicrobial agents and in-hospital mortality rates among septic patients at high risk of MRSA.
**Methods:** This was a nested case–control study using nationwide Japanese data from a medical reimbursement system from 2010 to 2017. Patients aged ≥ 18 years with new sepsis onset within 14 days of admission and using empiric antimicrobials with MRSA coverage were identified. We enrolled patients at high risk of MRSA with and without an antipseudomonal agent (MDR coverage) using propensity score matching based on baseline characteristics such as age, gender, comorbidities, ICU admission, and infection sites.

To investigate the relationship between MDR coverage and in-hospital mortality in patients at high risk of MRSA, we created a conditional logistic regression model. The model's adjusting variables included MDR coverage, the severity of acute organ dysfunction, and interaction terms.
**Results:** A total of 12,136 patients were included in this study. The median age was 74 (interquartile range, 63–82) years, and 7335 (60.4%) patients were male. The MDR coverage group experienced more acute organ dysfunction than the non-MDR coverage group (moderate: 34.0% vs. 24.3%; severe: 5.0% vs. 2.7%, $p<0.001$). The MDR coverage group had significantly higher crude in-hospital mortality compared to the non-MDR coverage group (22.9% vs. 16.7%, $p<0.001$). According to the conditional logistic regression model, MDR coverage, moderate, or severe acute organ dysfunction were significantly associated with in-hospital mortality (odds ratio [OR] [95% confidence interval (CI)] 1.49 [1.29–1.72], 2.65 [2.14–3.28], and 6.39 [3.81–10.7], respectively). The interaction between MDR coverage and severe acute organ dysfunction was statistically significant (OR [95% CI] 0.47 [0.25–0.88], $p$ for interaction = 0.02). Stratified by severity, in-hospital mortality reversed between moderate and severe (in-hospital mortality: mild 16% vs. 12%; moderate 32% vs. 27%; and 42% vs. 45%).
**Conclusions:** If an adult with sepsis is at high risk of MRSA, empiric concomitant antipseudomonal antimicrobial therapy may be beneficial if they have multiple acute organ dysfunctions.

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2. This work was supported by JSPS KAKENHI Grant Number JP 23K09618.

**Topic:** Sepsis.

## 000505

### The epidemiology of dexmedetomidine in critically ill patients: prevalence and association with the phenotypes of disturbed behaviour

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000505

**Introduction:** Dexmedetomidine is used for the sedation of critically ill patients in intensive care. Several studies have also found that treatment with dexmedetomidine may contribute to a reduction in the duration of hyperactive disturbed behaviour and delirium in critically ill patients. Other studies have reported conflicting results including a limited reduction in the severity and duration of delirium when compared with other sedatives. We hypothesised that natural language processing (NLP) could be used to detect words and phrases, thereby identifying patients who experienced natural language processing diagnosed behavioural disturbance (NLP-Dx-BD) and possible delirium. And that NLP could be used to study the association between dexmedetomidine and the phenotypes of disturbed behaviour in critically ill patients.
**Objectives:** To study the association between treatment with dexmedetomidine and the phenotypes of NLP-Dx-BD in critically ill patients.
**Methods:** We obtained demographic data, medication records, outcomes, and electronic clinical progress notes for a cohort of critically ill patients. Using a previously validated NLP methodology, we scanned the clinical notes for words that indicated a patient may have exhibited hyperactive and/or hypoactive disturbed behaviour.
**Results:** We studied a cohort of 7525 patients. We found that 549 (7.3%) patients were treated with dexmedetomidine. Patients being treated with dexmedetomidine were younger (58.2 vs 64.2 years, $p<0.001$), more likely to be male (70.5% vs 60.7%, $p<0.001$), and to have higher APACHE III scores (58.0 vs 47, $p<0.001$). They were also more likely to be medical admissions (59.5% vs 50.6%, $p<0.001$). Further, they were significantly more likely to be on vasopressors or inotropes (85.4% vs 49.0%, $p<0.001$) and to be invasively ventilated (93.7% vs 58.8, $p<0.001$). Moreover, patients being treated with dexmedetomidine were more likely to screen positive for NLP-Dx-BD and possible delirium (96.2% vs 48.3%, $p<0.001$), more likely to be identified as having the hyperactive phenotype of NLP-Dx-BD (88.2% vs 25.2%, $P<0.001$) or the hypoactive phenotype of NLP-Dx-BD (83.2% vs 37.6%, $p<0.001$). Finally, patients receiving dexmedetomidine had significantly longer ICU length of stay (7.0 days vs 1.8 days, $p<0.001$) and hospital length of stay (18.1 days vs 9.5 days, $p<0.001$). Despite the greater illness severity of dexmedetomidine-treated patients, their hospital mortality was 9.7% vs. 9.1% in control patients ($p=0.64$).
**Conclusions:** Critically ill patients being treated with dexmedetomidine are highly likely to be screened positive for NLP-Dx-BD and possible delirium. Further, most NLP-Dx-BD positive patients were also screened positive for the hyperactive phenotype of NLP-Dx-BD. Finally, despite greater severity of illness, receiving vasopressor therapy and mechanical ventilation, patients treated with dexmedetomidine had equivalent hospital mortality to the control group. Further investigation of the association between treatment of delirium with dexmedetomidine and better than expected outcomes is warranted.

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**Topic:** Information systems and data science

## 000506

### 4-Octylitaconic acid alleviates sepsis-associated encephalopathy by suppressing microglial activation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000506

**Introduction:** Sepsis-associated encephalopathy (SAE) significantly elevates ICU patient mortality rates, posing a substantial challenge to clinical management [1]. SAE, a complication affecting the central nervous system of septic patients, may cause either widespread or localized neurological dysfunction. Despite its relative commonality in ICUs, the pathophysiology of SAE remains incompletely understood. Itaconate, a metabolite with potent anti-inflammatory properties [2], its role in central nervous system diseases remains unclear.
**Objectives:** To evaluate the therapeutic potential of 4-octyl itaconate (4-OI) in treating SAE and investigate its mechanisms of action.
**Methods:** Septic encephalopathy (SAE) was induced in C57BL/6 mice using cecal ligation and puncture (CLP) surgery. Experimental animals

were randomly divided into three groups: Sham (sham surgery), sepsis (CLP), and sepsis with 4-OI treatment (CLP + 4-OI). Post-CLP surgery, the CLP + 4-OI group received immediate intraperitoneal injection of 4-OI (50 mg/kg). Brains were collected 24 h after CLP, and cognitive abilities of mice were evaluated after the 7th day using the Morris water maze (MWM), Y-maze (YM), and open-field test (OFT). Immunofluorescence staining was employed to observe the activation status of glial cells in the hippocampal region, while DHE staining was used to assess oxidative stress in the hippocampal CA1 region.

**Results:** 4-OI significantly increased the 7-day survival rate of septic mice and improved their learning and cognitive functions. In the MWM test, septic mice exhibited decreased learning and memory abilities; however, 4-OI treatment significantly shortened the latency during the training period and increased the time spent in the target quadrant and platform crossings during the testing phase. In the YM, 4-OI increased the entries and duration of exploration of new arms by septic mice. Similarly, in the OFT, 4-OI treatment increased the time spent and the number of crossings in the central zone by septic mice. Compared to septic mice, 4-OI significantly reduced the activation level of glial cells in the hippocampal CA1 region and decreased the generation of reactive oxygen species (ROS).

**Conclusions:** This study demonstrates that 4-OI significantly improves the survival rate and cognitive function of septic mice by reducing glial cell activation and oxidative stress, thereby providing a potential new strategy for the treatment of SAE. These findings underscore the importance of exploring 4-OI as a therapeutic approach for SAE and lay the foundation for future clinical research.

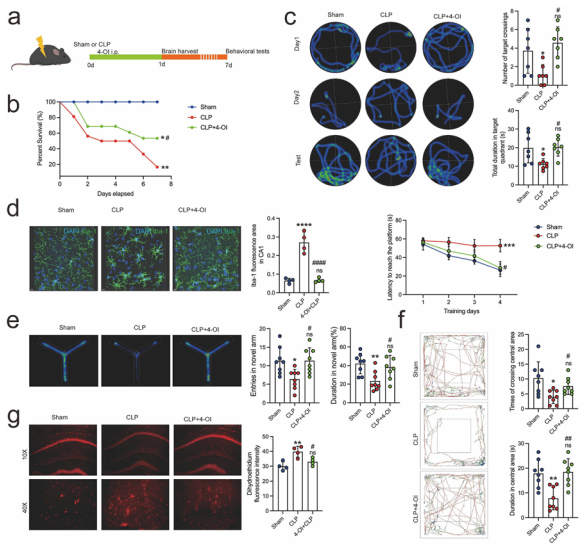


**Fig. (abstract 000506)** (a) Experimental Procedure: 4-Octyl itaconate (4-OI) was administered intraperitoneally (i.p.) to mice immediately after cecal ligation and puncture (CLP) at a dosage of 50mg/kg. Brain frozen sections were obtained 24 h post-CLP following perfusion with 4% paraformaldehyde. Behavioral assessments, including the Y-maze (YM), open-field test (OFT), and Morris water maze (MWM), were conducted 7 days post-CLP. (b) Survival Rate at Day 7 post-CLP: 4-OI significantly improved the survival rate of septic mice at day 7. (c) Comparative Analysis with CLP Group: 4-OI significantly improved mouse performance in the MWM, demonstrated by shortened latency period during the 4-day training, increased time spent in the target quadrant during testing, and increased number of platform crossings. (d) Immunofluorescence (IF) Analysis of Hippocampal CA1 Region: 4-OI significantly decreased the activation level of glial cells in the hippocampal CA1 region. (e) Increased Entries and Duration in Novel Arm in YM: 4-OI administration increased both the frequency and duration of entries into the novel arm in septic mice. (f) Increased Entries and Duration in Central Zone in OFT: 4-OI administration augmented both the frequency and duration of entries into the central zone in septic mice. (g) Decreased DHE Mean Fluorescence Intensity in Hippocampal CA1 Region of Septic Mice: Administration of 4-OI resulted in a decrease in the mean fluorescence intensity of dihydroethidium (DHE) in the hippocampal CA1 region of septic mice. Data are presented as mean ± standard deviation. Intergroup comparisons were performed using one-way analysis of variance. In comparison with the Sham group, $*p<0.05$, $**p<0.01$, $****p<0.0001$, ns: not significant; compared with the CLP group, $\#p<0.05$, $\#\#p<0.01$

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**Topic:** Sepsis.

## 000507

### When to extubate after a first failed spontaneous breathing trial?

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**Introduction:** In the last few years, several studies have questioned the role or reliability of spontaneous breathing trial (SBT) in deciding extubation. Large observational data suggest that around 30% of patients are extubated without such a test and two RCT have questioned the need to pass an SBT to later sustain a successful extubation. Patients who fail an SBT are usually kept on the ventilator until they pass the SBT.

In the subgroup of patients who failed their first SBT in the WEANSAFE cohort, we aimed at evaluating, the impact of direct extubation despite SBT failure compared to the usual management consisting of sustaining invasive ventilation until patients pass a SBT.

**Objectives:** In a cohort of patients who failed their first SBT within 7 days of invasive mechanical ventilation, to compare the group of patients who were extubated despite failing SBT vs the group of patients who were not immediately extubated in terms of:

1. reintubation rate within 7 days of extubation;
2. total days of invasive ventilation, ICU length of stay, ICU and hospital survival.

**Methods:** Patients who fulfilled weaning eligibility criteria as defined by the WEANSAFE study (PEEP < 10 cm H2O, FiO2 < 0.5 and noradrenaline less than 0.2 mcg/kg/min) and who failed a first SBT within 7 days of mechanical ventilation start were selected if they also did not present limitations for reintubation. After this step, patients were split into those who were extubated after the very same SBT and those who were not. To estimate the probability of being extubated, we performed a propensity score matching (PSM) using optimal matching (which minimizes overall distance while selecting all the cases). To adjust for potential measured confounding, variables known to

influence the probability of being extubated and the outcomes at study were selected, such as age, cause of admission, and information at SBT such as oxygenation and respiratory rate during the trial. When data were missing, multiple imputation was conducted using Markov chains. Standardized mean differences (SMD) for continuous variables and differences in proportions for categorical variables were used to assess for balance after PSM. The outcomes were later assessed in the matched population using logistic regression for reintubation and survival rates and Wilcoxon tests for days of mechanical ventilation and ICU length of stay.

**Results:** 824 patients failed a first SBT of whom 207 (25%) were extubated immediately after. Before matching, patients who were immediately extubated were younger [61 (17) vs 65 (16) years, $p = 0.006$, SMD > 0.2], had been ventilated for a shorter time [2.7 (1.8) vs 3.1 (1.9), $p = 0.003$, SMD > 0.2] and respiratory rate at SBT was lower [20 (6) vs 22 (7), $p = 0.001$, SMD > 0.2]. Main reason for intubation (non-exclusive causes) was hypoxemic respiratory failure [132 (64%) vs 370 (60%) patients, $p = 0.38$], followed by sepsis [58 (28%) vs 166 (27%), $p = 0.83$]. Matching achieved good balance for all the covariates of interest as well as for the overall distance (Figure 1 & Table 1).

In the matched cohort, reintubation rate did not differ between groups [34 (16%) vs 35 (17%) patients, OR 0.97, $p = 0.90$], while the duration of invasive mechanical ventilation and the ICU length of stay were shorter in the group of patients with immediate extubation than in the group who remained intubated [5 (IQR 3–8) vs 9 (6–13) days, $p < 0.001$ and 9 (IQR 6–15) vs 13 (IQR 9–19) days, $p < 0.001$ respectively]. Finally, extubation after a failed SBT was associated with a lower ICU mortality [18 (9%) vs 35 (17%) patients, OR 0.46 (95% CI 0.26–0.86), $p = 0.01$] as well as a lower hospital mortality [33 (16%) vs 52 (25%) patients, OR 0.57 (95% 0.35–0.95), $p = 0.02$].

**Conclusions:** In this matched analysis, extubation after a first failed SBT in patients fulfilling weaning criteria was associated with a similar reintubation rates but with shorter duration of invasive mechanical ventilation and ICU length of stay. ICU and hospital mortality were also lower in this group.

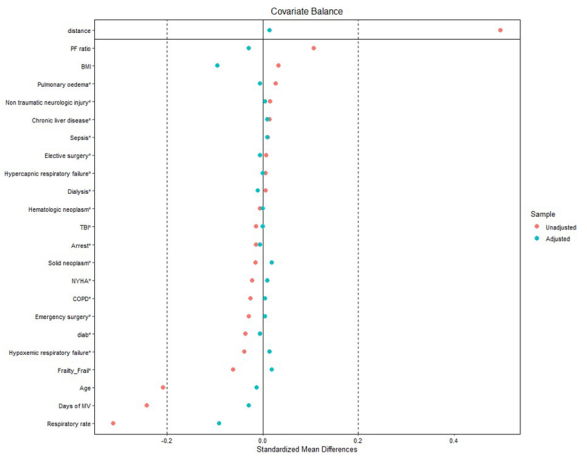


**Fig. 1 (abstract 000507)** Balance before and after propensity score matching in 207 pairs. Before optimal matching, patients who were extubated after a first failed spontaneous breathing trial were younger, had been ventilated for less time, and showed lower respiratory rate. Balance for each variable as well as overall balance was achieved with matching

**Table 1 (abstract 000507)** Characteristics of the matched population. Balance was assessed with standardized means in continuous variables and difference in proportions in categorical variables

| | 207 patients | 207 patients | SMD |
|---|---|---|---|
| Age | 61 (17) | 61 (17) | 0.01 |
| Gender | 108 (52.2) | 117 (56.5) | 0.09 |
| BMI | 27.7 (6.4) | 27.1 (7.3) | 0.10 |
| Frailty (Yes) | 42 (20.3) | 46 (22.2) | 0.05 |
| COPD | 30 (14.5) | 31 (15.0) | 0.01 |
| Heart failure | 19 (9.2) | 21 (10.1) | 0.03 |
| Diabetes | 46 (22.2) | 45 (21.7) | 0.01 |
| Chronic liver disease | 9 (4.3) | 11 (5.3) | 0.01 |
| Dialysis | 9 (4.3) | 7 (3.4) | 0.01 |
| Hypoxemic failure | 72 (34.8) | 75 (36.2) | 0.03 |
| Hypercapnic failure | 40 (19.3) | 40 (19.3) | 0.044 |
| Solid neoplasm | 13 (6.3) | 17 (8.2) | 0.08 |
| Hemato neoplasm | 6 (2.9) | 6 (2.9) | <0.001 |
| Sepsis | 56 (27.1) | 58 (28.0 | 0.02 |
| Arrest | 14 (6.8) | 13 (6.3) | 0.02 |
| Cardiopulmonary oedema | 15 (7.2) | 14 (6.8) | 0.02 |
| Emergency surgery | 21 (10.1) | 22 (10.6) | 0.02 |
| Elective surgery | 17 (8.2) | 16 (7.7) | 0.02 |
| TBI | 5 (2.4) | 5 (2.4) | <0.001 |
| Non-trauma neuro | 30 (14.5) | 31 (15.0) | 0.01 |
| Vasopressor | 28 (29.8) | 18 (19.1) | 0.249 |
| Days of MV until SBT | 2.74 (1.76) | 2.69 (1.85) | 0.03 |
| RR at SBT | 21 (7) | 20 (6) | 0.09 |
| PF at SBT | 282 (104) | 279 (99) | 0.03 |

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5. The authors want to thank all the WEAN SAFE investigators for their hard work.


**Topic:** Acute respiratory failure and mechanical ventilation

## 000508

### Association of white blood cell count with clinical outcomes in patients with type A acute aortic dissection


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000508


**Introduction:** Stanford type A acute aortic dissection (AAAD) is a life-threatening condition. It is well known that inflammation is induced by the onset of AAAD. Some easy-available inflammatory markers like D-dimers or C-reactive protein (CRP) are not shown to relation to clinical outcome. Elevated White Blood Cell (WBC) count is also the marker of inflammation of acute aortic dissection. Although the relationship between WBC count and clinical outcomes of Stanford type B acute

aortic dissection has implied in a study, its usage for AAAD has not been well studied.
**Objectives:** This study aimed to explain the association of white blood cell (WBC) count with clinical outcomes.
**Methods:** We conducted a single-center retrospective study including patients with AAAD after emergency surgery. We divided patients into two groups according to the median value of the maximum white blood cell count measured within 24 h after ICU admission (a higher and lower WBC groups). The primary outcome was in-hospital mortality. The secondary outcome was ventilator-free days at day 28.
**Results:** Of 230 patients, median WBC (IQR) was 10.9 (8.9–13.1) k/uL. The overall in-hospital mortality was 6.1% and ventilator-free days was 26 (24, 27). Patients in the higher WBC group were younger, more male, and had a higher BMI than those in the lower WBC group. A multivariate logistic analysis adjusted for APACHE III score showed that higher WBC was associated with an increased risk of in-hospital mortality (adjusted odds ratio 6.87, 95% confidence interval 1.64–43.9, *P* value 0.018). A linear regression analysis adjusted for APACHE III and BMI found that higher WBC was associated with shorter ventilator-free days (Exp (β) 0.15, 95% CI 0.03–0.82, *P* value 0.030).
**Conclusions:** Our results indicate that elevated WBC count might be used as a predictor for increased risk of in-hospital mortality and shorter ventilator free days in AAAD.

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**Topic:** Perioperative care.

## 000510

### Associations between physical, cognitive, and mental health domains of Post-Intensive Care Syndrome (PICS) and quality of life: a longitudinal prospective multicenter cohort study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000510

**Introduction:** Former Intensive Care Unit (ICU) patients frequently experience physical, mental, and cognitive health problems. Health problems that arise or worsen after critical illness and persist beyond acute care hospitalization are defined as the Post-Intensive Care Syndrome (PICS). ICU survivors indicate that physical, cognitive, and mental health problems have a major impact on their daily lives. Although the association between PICS and Health Related Quality of Life (HRQoL) appears logical, this has not been well demonstrated to date.
**Objectives:** To explore associations between the physical, cognitive, and mental PICS domains and HRQoL following an ICU admission.
**Methods:** Data were obtained from the MONITOR-IC; a longitudinal prospective multicenter cohort study including long-term outcomes of former ICU patients. At ICU admission, and 3 and 12 months post-ICU, patients completed questionnaires regarding physical problems (Physical complaints questionnaire), fatigue (Checklist Individual Strength), cognitive problems (Cognitive Failure Questionnaire), anxiety and depression (Hospital Anxiety and Depression Scale), post-traumatic stress (Impact of Event Scale), and HRQoL (European Quality of Life 5 Dimensions 5 Level Version). Composite scores were calculated for the physical domain (physical problems and fatigue), and the mental domain (anxiety, depression, and post-traumatic stress). Adjusted multivariable linear regression analyses were performed, including covariables (e.g., patient characteristics, disease severity, pre ICU HRQoL etc.) to explore associations between the physical, cognitive and mental domains of PICS, and HRQoL at 3 and 12 months post-ICU.
**Results:** Patients ($n=4092$) from seven Dutch ICUs were included between 2016 and 2020. At 3 months ($n=3368$), physical health problems ($b=-0.11$ (95% CI −0.13, 0.10), $p<0.001$), cognitive health problems ($b=-0.07$ (95% CI −0.10-, 0.05) $p<0.001$), and mental health problems ($b=-0.15$ (95% CI −0.17, −0.14) $p<0.001$) were negatively associated with HRQoL. Also at 12 months ($n=2950$), physical health problems ($b=-0.12$ (95% CI −0.13, −0.11), $p<0.001$), cognitive health problems ($b=-0.04$ (95% CI −0.06 −0.02) $p<0.001$), and mental health problems ($b=-0.14$ (95% CI −0.15, −0.12). $p<0.001$) were negatively associated with HRQoL.
**Conclusions:** PICS symptoms in all health domains (physical, cognitive, and mental) are negatively associated with a lower HRQoL 3 and 12 months post-ICU. PICS symptoms in the mental health domain seems to have the largest negative association. Daily ICU care and follow-up care should focus on preventing and mitigating health problems across all three PICS domains will improve long-term HRQoL.

**Reference(s)**

1. The authors declare they have no conflict of interest. For this study, no funding was received.

**Topic:** Health services research and outcome

## 000511

### Comparison of brain oxygenation and the BOx ratio in patients with subarachnoid hemorrhage

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000511

**Introduction:** After acute subarachnoid hemorrhage (SAH), tissue hypoxia has emerged among the factors contributing to secondary brain damage [1]. When available, brain tissue oxygenation (PbtO2) values can help clinicians tailoring the management of acute brain injured (ABI) patients.
**Objectives:** Our aim was to assess the association between arterial partial pressure of oxygen (PaO2) and PbtO2 in SAH patients.
**Methods:** A retrospective analysis of a prospectively collected cohort of all patients admitted after an aneurysmal SAH to the department of Intensive Care at Erasme Hospital (Bruxelles, Belgium) from January 2015 to October 2023, who underwent PbtO2 monitoring. The PbtO2/PaO2 ratio (BOx ratio) was calculated as previously proposed [2]. A BOx ratio below 0.15 was used to identify impaired oxygen delivery to brain tissue. Critical PbtO2 values were considered if below 20 mmHg.
**Results:** A total of 63 patients were included over the study period (mean age 55 ± 12 years—male gender 48%). Most patients exhibited severe neurological impairment, with a median Glasgow Coma Scale (GCS) score of 6 (3–13) on admission, along with higher Fisher score on initial CT scan. The median PbtO2 and BOx ratio for the entire cohort were 23 [21–26] mmHg and 0.20 [0.17–0.25], respectively. Overall, 3517 combined PbtO2 values and BOx ratios were available; 883 (25%) showed low PbtO2 values and 890 (25%) low BOx ratio (Figure 1). Cohen's k coefficient of agreement between PbtO2 and BOx ratio was 0.55, suggesting a moderate concordance [3].

**Conclusions:** Considering the BOx ratio together with absolute PbtO2 values in patients with SAH might help to better characterize tissue hypoxia.

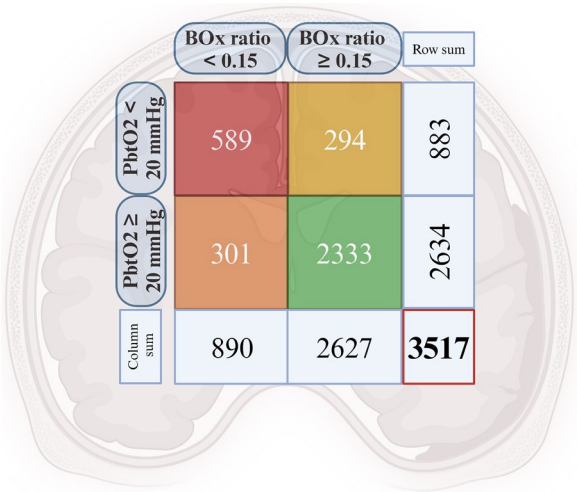


**Fig. 1 (abstract 000511)** Concordance of the BOx ratio and PbtO2 values in the study cohort

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**Topic:** Neurointensive care

## 000512

### Measurement of circulating nucleosomes in septic shock

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000512

**Introduction:** Blood nucleosome levels are commonly elevated in sepsis and can correlate with disease severity and outcome [1,2]. The primary method for quantifying circulating nucleosome levels is through Enzyme-Linked Immunosorbent Assay (ELISA). The performance of two commercially available ELISA kits in measuring circulating nucleosome concentrations was assessed in a clinically relevant septic shock model.
**Methods:** Sepsis was induced in 24 mechanically ventilated, hemodynamically monitored female sheep who underwent faecal peritonitis. The animals were randomly assigned to one of three groups: control, concurrent anti-histone treatment (CuT), and anti-histone post-treatment (PT) groups ($n=8$ each), following surgical preparation and stabilization. Anti-histone therapy involving sodium-*B*-*O*-methyl cellobioside sulfate was administered as a bolus (1 mg/kg) followed by continuous infusion (1 mL/kg/h). Treatment was started immediately after sepsis induction in the CuT group and 4 h thereafter in the PT group. The experimental period spanned 24 h. Plasma samples were collected at baseline and every 4 h for nucleosome measurements. Nucleosome levels were assessed using two commercially available ELISA kits (Nu.Q® H3.1 ELISA, Voltion, Snes, Belgium; Cell Death Detection ELISAPLUS, Roche, Mannheim, Germany) according to the respective manufacturer's protocols.
**Results:** Out of the 164 samples collected in this study, 34 samples analyzed using the Roche kit and none analyzed using the Voltion kit did not identify nucleosome. Over time, circulating nucleosome levels increased in the control group, when all measurement data were pooled together (Figure 1). Anti-histone therapy led to a significant decrease in nucleosome levels only in the CuT group as determined by the Roche kit (Figure 2). Conversely, significant decreases were observed in both treatment groups when using the Voltion kit. The coefficient of correlation between the two kits was 0.33 (95% CI: 0.19 to 0.47; $p<0.0001$).
**Conclusions:** Sepsis was associated with an increase in circulating nucleosome levels. Both the Roche and Volition ELISA kits demonstrated the potential of anti-histone therapy to reduce circulating nucleosomes in sepsis. However, the Volition kit outperformed the Roche kit, yielding more measurable samples and providing more accurate values.

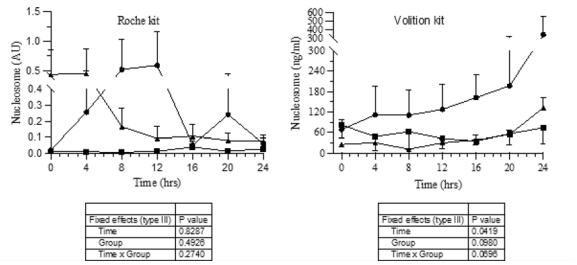


**Fig. 1 (abstract 000512)** Comparison of trends of circulating nucleosomes over time measured by Roche kit and Volition kit

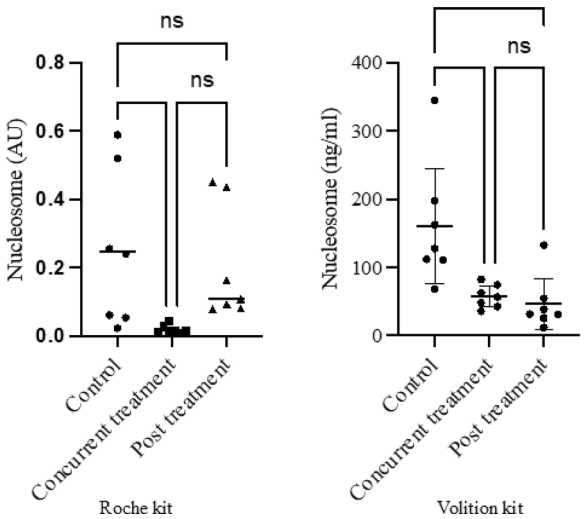


**Fig. 2 (abstract 000512)** Levels of circulating nucleosomes measured during anti-histone treatment and after treatment measured by Roche kit and Volition kit

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**Topic:** Translational biology

## 000513

## Assessing the efficacy and impact of using a simulation-based approach for rapid critical care capacity development at scale

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000513

**Introduction:** The COVID-19 pandemic in Pakistan revealed deficits in the availability of qualified critical care staff leading to the recruitment of non-traditional Intensive Care Unit (ICU) staff for patient management. High-fidelity simulation-based workshops were designed at the Aga Khan University Hospital (AKUH) to expeditiously train healthcare workers in the diagnosis, and management of COVID-19 patients.

**Objectives:** 1. To assess the baseline knowledge of physicians, nurses, and allied health workers required to work in COVID units. 2. To determine the level of subsequent improvement in knowledge after completion of the workshop using a structured pre- and post-assessment amongst the various participant groups. 3. To evaluate the impact of the course content on perception change, delivery method efficiency, teaching material efficacy, and applicability in a clinical setting.

**Methods:** Two distinct in-person workshops were developed and delivered for [1] physicians and [2] nurses and allied health workers, featuring small group lectures, case-based discussions, and simulation sessions. All participants completed pre- and post-tests comprising 30 multiple choice questions, with data analysed via paired t test comparison of pre- and post-test results. Subgroup analyses were done based on (i) designation, (ii) specialty, (iii) location, and (iv) level of care of participants' home institution. Feedback surveys, administered immediately after the course, assessed course content, delivery efficiency, and clinical efficacy. After 30 days, additional evaluation surveys were distributed among the participants to evaluate course impact, delivery efficiency, perception change, and clinical applicability.

**Results:** 569 candidates affiliated with 83 hospitals in 30 cities completed the workshops. Participants were predominantly males (65.6%), with non-trainee general physicians (30.6%) and registered nurses (24.1%) representing the largest groups.

Physicians' scores showed a 15.9% improvement from pre- to post-test (15.2 ± 4.4 (50.7%) to 20.0 ± 4.4 (66.7%) $p < 0.001$). For nurses and allied health workers, scores showed a 16.8% improvement (16.0 ± 6.0 (53.3%) to 21.2 ± 4.9 (70.1%) $p < 0.001$). The greatest improvement in mean scores by level of care was observed in secondary care (48.3%). Among designations, technicians showed the highest improvement (52.5%), followed by non-trainee general physicians (35.7%) and registered nurses (32.7%). By specialty, nephrology demonstrated the highest improvement in scores (72.2%), followed by emergency medicine (42.9%) and pediatrics (42.2%). Of 308 participants who completed the feedback form, 98.7% said that they would recommend this workshop to their peers. Of 386 participants who completed the 30-day evaluation, the topics taught on "Septic Shock" (13.3%) and "Diagnosis and Management of COVID-19 Patients" (12.6%) were stated to be the most beneficial in their clinical practice. Significant improvements were reported in knowledge (92.2%), confidence (91.7%), patient management (88.3%), and application in clinical settings (91.0%). Additionally, 366 participants reportedly managed over 7,150 COVID-19 patients after attending the workshops.

**Conclusions:** Our study underscored the impact of targeted educational interventions to tackle baseline critical care knowledge gaps among providers managing critically ill COVID-19 patients. This model can serve as a prototype for future interventions requiring rapid capacity building in similar situations.

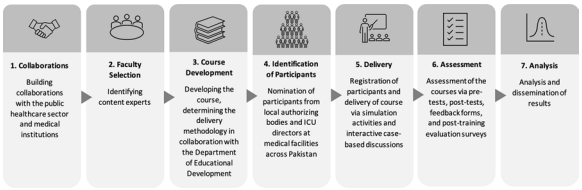


**Fig. 1 (abstract 000513)** Process flow of developing and delivering the simulation-based workshops

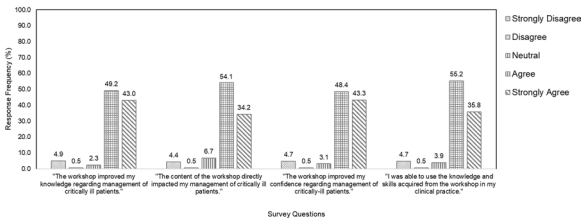


**Fig. 2 (abstract 000513)** Participant perceptions from the evaluation survey distributed 30 day post-course completion. $N = 386$ participants responded to these questions

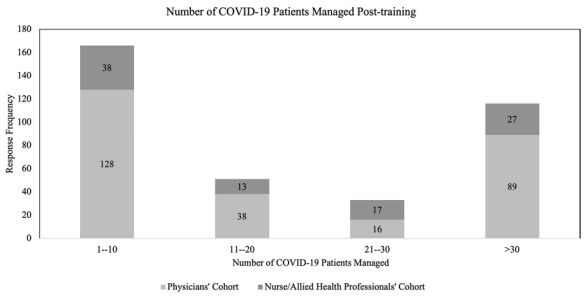


**Fig. 3 (abstract 000513)** Participant responses regarding the clinical impact of the simulation-based trained as found in the 30-day evaluation survey results. $N = 366$ participants responded to this question

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### Reference(s)

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5. We gratefully acknowledge the generous support provided by the Dawood Hercules Corporation Ltd. for this research project.

**Topic:** Health services research and outcome.

## 000514

### Typical lung ultrasound findings in invasively ventilated critically ill patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000514

**Introduction:** As lung ultrasound emerges as a standard tool to diagnose and monitor critically ill patients, it becomes imperative to gain insights into lung ultrasound appearances across patient with different characteristics in the Intensive Care Unit (ICU)[1]. The aim of this study is to describe lung ultrasound findings in various patient categories of invasively ventilated ICU patients within the first 24 h of starting mechanical ventilation. By delineating these typical ultrasound findings, we aim to assist clinicians in understanding typical lung ultrasound findings, which could aid in early recognition of pulmonary complications.
**Methods:** This is a post hoc analysis of a prospective observational study in invasively mechanically ventilated patients, the DARTS study [2]. Patients received a standard 12-region lung ultrasound examination within 48 h after initiation of mechanical ventilation.
For this analysis, patients were grouped based on reason for intubation: 'definite pulmonary problem' (pneumonia, ARDS, heart failure, asthma, COPD, and thoracic trauma), 'possible pulmonary problem' (sepsis, cardiac arrest, shock), or 'no pulmonary problem' (airway emergency, neurological conditions). Lung ultrasound findings, including lung aeration score and additional observations, were described for each group.
**Results:** After exclusion of two patients which did not fit any of the three categories, 322 patients were included [age: 60 (IQR: 20–90) years, 32% female, BMI 26.8 (IQR: 1.4–48.5)] in this analysis. At time of lung ultrasound examination, patients were mechanically ventilated for 20 (IQR: 11–28) hours when lung ultrasound examination was performed. Global lung aeration scores were 10 (IQR: 0–33), 6 (IQR: 0–21) and 2 (IQR: 0–19) for the definite pulmonary problem', 'possible pulmonary problem' or 'no pulmonary problem', respectively. Loss of aeration (B1, B2 or C-pattern) was most often observed in patients with 'a definite pulmonary problem', see Figure 1. Patients with 'possible pulmonary problem' and 'no expected pulmonary problem' show primarily A-pattern in the anterior and lateral regions. In all three groups, posterior C-patterns were found. In addition, pleural abnormalities were observed in all patients groups in the posterior regions. However, pleural abnormalities in the anterior and lateral regions were more prevalent in the 'definite pulmonary problem' group compared to the other two groups.
**Conclusions:** Patients who are invasively mechanically ventilated due to pulmonary pathology showed loss of aeration and pleural abnormalities in all lung regions in contrast to patients without pulmonary pathology. In addition, also patient without pulmonary pathologies frequently show loss of aeration in posterior regions. These study findings provide clinicians with a reference of typical presentations in a variety of intubated critically ill patients.

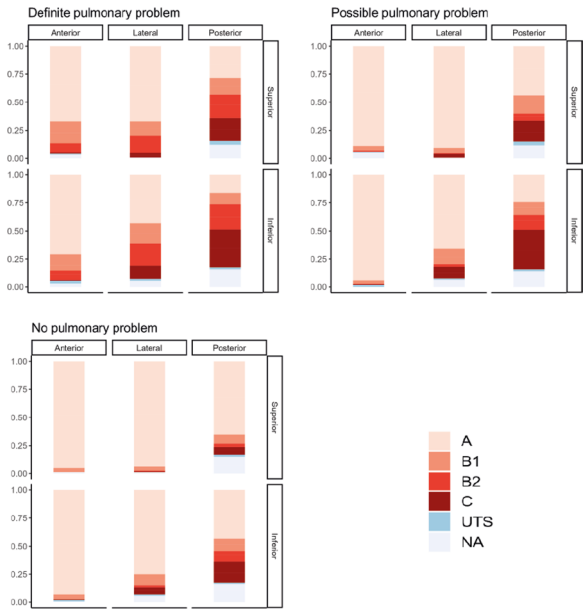


**Fig. 1 (abstract 000514)** Lung ultrasound patterns according to the lung ultrasound aeration score for different patient groups. Lung ultrasound consisted of assessment of 12 regions, six per hemithorax, of the thoracic cage. Each bar represents the superior or inferior part of the anterior, lateral and posterior regions on the thoracic cage. An "A-pattern," defined as horizontal repetitions of the pleural line (A-lines), was scored as 0. "B-patterns" were scored as 1 when more than two well-spaced B-lines were present that covered less than 50% of the pleural line or as 2 when B-lines covered more than 50% of the pleural line. A "C-pattern" was defined as an anatomical image of consolidation or as complete (or near-complete) loss of aeration that is larger than 2 cm and was scored as 3. NA: not available. UTS: unable to score

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000515

### Prediction of failure in usage of high-flow nasal cannulaes in patients with COVID-19 pneumonia applying clinical and metabolomic parameters

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000515

**Introduction:** Patients with COVID-19 pneumonia often develop acute respiratory failure (ARF) requiring respiratory support such as high-flow nasal cannula (HFNC), but some patients fail requiring invasive mechanical ventilation, what has been shown to increase mortality [1]. Metabolomic pathways related to failure in HFNC could be identified. This would allow for a better understanding of the pathophysiology of ARF due to COVID-19, as well as establishing possible therapeutic targets, guiding clinical decisions and not delaying orotracheal intubation (OTI) unnecessarily [2].
**Objectives:** To determine the metabolic alterations associated with failure in HFNC in patients with ARF due to COVID-19 and to generate a predictive model for this failure using clinical and metabolomic parameters.
**Methods:** A prospective unicentric study was carried out. Over the 1st to the 5th COVID-19 waves, critically ill patients with ARF due to COVID-19 that were admitted in the intensive care unit (ICU) and needed HFNC initial support were included. Patients were classified according to the success or failure of this therapy. The day they were admitted in the ICU, 138 biomarkers were determined for each patient and demographic, clinical, and analytical data were also recorded. The normality of the variables was verified using the K–S test; the quantitative ones were studied using the T-Student test and the qualitative ones were studied using the Chi2 test. A prediction model for HFNC failure was subsequently performed using a random forest-based analysis trying different combinations of the clinical and metabolomic parameters and obtaining different ROC curves.
**Results:** Among the 199 patients with COVID-19 who required HFNC, 118(59.3%) did not require OTI, while 81(40.7%) failed and were intubated. No significant differences were found in the demographic data or comorbidities except for age (56 ± 13 years vs. 60 ± 12 years, $p = 0.037$); in the success and failure groups, respectively. On the first day of HFNC, both groups presented differences in APACHE and SpO2/FiO2 (14 ± 6 vs. 16 ± 5, $p = 0.009$; and 168 ± 50 vs. 145 ± 66, $p = 0.009$ in these groups, respectively). Among the 111 metabolites studied, the ones that were significantly different were Octanoic (199 ± 112 µ/mL vs. 801 ± 167 µ/mL, $p = 0.003$), Anthranilic (11,918 ± 7478 vs. 16,180 ± 14,596, $p = 0.021$) and DAG180204 (290 ± 257 ng/mL vs. 385 ± 351 ng/mL, $p = 0.046$), in the group success and failure, respectively. The most accurate prediction model using fewer variables and with the possibility of clinical application was the one that included SpO2/FiO2, Octanoic and Anthranilic with an area under the curve (AUC) of 0.91(0.82–1) and a $p < 0.05$.
**Conclusions:** This predictive model for HFNC failure is accurate and could be applied in clinical practice to guide therapeutic decisions such as OTI decision. Event though, new studies using this model are needed to establish its usefulness for other causes of ARF and to validate its efficacy.

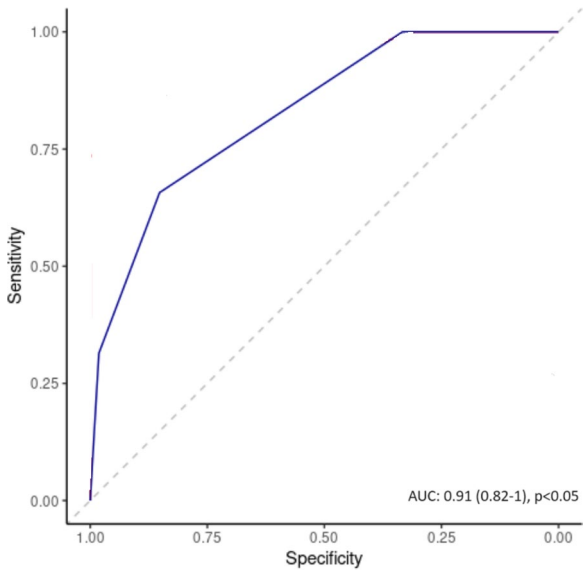


**Fig. 1 (abstract 000515)** ROC curve of the association of SpO2/FiO2, octanoic, and anthranilic parameters in relation to HFNC failure

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2. Marín-Corral J, Rodríguez-Morató J, Gomez-Gomez A, Pascual-Guardia S, Muñoz-Bermúdez R, Salazar-Degracia A, Pérez-Terán P, Restrepo MI, Khymenets O, Haro N, et al. Metabolic Signatures Associated with Severity in Hospitalized COVID-19 Patients. International Journal of Molecular Sciences. 2021; 22(9):4794. https://doi.org/10.3390/ijms22094794.
3. The grants from "La Marató de TV3" and FIS 2021 helped financing this project.

**Topic:** Acute respiratory failure and mechanical ventilation

## 000520

### Remote, video-based vital sign monitoring in ICU patients: a clinical validation study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000520

**Introduction:** New video-based technologies enable contactless continuous patient-friendly monitoring of vital signs in medical care. Both video-based heart rate (HR) and respiratory rate (RR) monitoring help to track changes in these vital signs to predict clinical deterioration earlier. These technologies are valid in controlled settings with healthy volunteers in whom the vital signs remain stable, but technical validation in clinical settings with changing trends of these vital signs remains limited (1).

**Objectives:** The objective of this study was to assess the validity of continuous video-based heart- and respiration rate monitoring in comparison with the reference standard in patients admitted to the intensive care (ICU).
**Methods:** A prospective observational study was performed in which measurements of HR and RR with a visible light (RGB) and an infrared (IR) camera were compared with continuous ECG and impedance pneumography monitoring on a standard patient monitoring system (Philips MX750) as the reference standards. Video-based HR relies on the principle of remote photoplethysmography (rPPG) by detecting subtle alterations in skin color induced by the cardiovascular pulse wave (2,3). Video-based RR analysis operates on the principle of discerning respiratory-induced motion patterns (4). The video data and reference data were synchronized to ensure alignment of their timestamps and 5-min data pairs were created for comparison. Outcome measures were the duration of valid video recordings and the agreement of HR and RR towards the reference standards reported as the bias and limits of agreement (LoA) and mean absolute error.
**Results:** In this preliminary analysis, 23 patients admitted to the ICU after cardiac surgery were included with a total video recording duration of 24.535 min. Valid video recording duration of HR and RR were 86.7% (4070 5-min data pairs) and 76,8% (3796 5-min data pairs), respectively. The bias and LoA of the video-based HR assessment were 2.73 [−24.73–19.26] with 87.7% of the 5-min data pairs falling within 5 beats/minute in comparison with the reference. Regarding RR, the bias and LoA were −0.85 [−9.84–8.14] with 81.7% of the 5-min data pairs falling within 3 breaths/minute in comparison with the reference.
**Conclusions:** These preliminary findings demonstrate the feasibility with a good agreement for continuous HR and RR measurements through video-based monitoring compared to the reference standard. Further efforts will concentrate on enhancing informative frame detection to improve coverage and validity, and continue developing more inexpensive off-the-shelf cameras as valid patient-friendly monitoring tools for clinical practice.

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3. This study was initiated from the Eindhoven MedTech Innovation Center (e/MTIC), a research collaboration of the Technical University Eindhoven, Catharina hospital in Eindhoven and Philips Research (Netherlands).
4. This study is part of the research proposal funded by ZonMw, NWO, the Hartstichting and the Dutch CardioVascular Alliance (DCVA) of the funding call "Heart for a sustainable healthcare. Medical devices for early recognition, prevention and treatment of cardiovascular diseases contributing to sustainable healthcare".
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**Topic:** Perioperative care

## 000521

### Prediction of successful mechanical ventilator weaning by the interpretation of hemodynamic changes during weaning trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000521

**Introduction:** There are several recommendations how to perform weaning from mechanical ventilation (MV). However, such are not providing how to interpret hemodynamic changes during MV weaning.
**Objectives:** We evaluated hemodynamic changes during MV weaning including echocardiographic evaluation, and evaluated which parameters are significantly related with the result of MV weaning.
**Methods:** MV weaning trial was performed when patients showed alert mentality and achieved PFR > 200 mmHg with the positive end expiratory pressure of 5 cmH2O or lower. Echocardiography was performed before and after 30 min from weaning trial.
**Results:** A total of 160 patients (66.5 ± 15.3 years) were enrolled. The time from intubation to weaning trial was 8.0 ± 5.2 days and PFR before MV off was 286.8 ± 82.9 mmHg. One-hundred and six patients successfully weaned off MV at first weaning trial.
When we compared the condition before and during weaning trial of all patients, systolic blood pressure (131 ± 23 versus 135 ± 23, $p = 0.007$), left-ventricular end diastolic volume (LVEDV) (78.5 ± 82.3, $p < 0.001$), and tricuspid annular posterior systolic excursion (TAPSE) (20.5 ± 4.4 versus 21.5 ± 5.3, $p = 0.007$) were significantly increased. However, when we reanalyzed those parameters between groups, the increase of TAPSE was significant only among patients successfully wean-off MV. Increases of SBP and LVEDV were more prominent among patients failed to wean-off MV.
And, lower heart rate (91 ± 17 versus 100 ± 22, $p = 0.004$) and higher stroke volume (58.0 ± 16.0 versus 50.4 ± 16.8, $p = 0.017$) during weaning trial were significantly related with failed weaning of MV.
**Conclusions:** There were serial changes of hemodynamic parameters during MV weaning with increased venous return followed by increased LVEDV. The response of heart to those changes was different by the result of weaning trial. Lower heart rate with high stroke volume during weaning was one of the most important factors related with successful weaning.

**Topic:** Acute respiratory failure and mechanical ventilation.

## 000522

### The role of intravenous albumin on fluid de-escalation in ICU patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000522

**Introduction:** Fluid resuscitation therapy for critically ill patients frequently leads to fluid accumulation [1]. Fluid accumulation with associated organ failure worsens critical care outcomes [2–4]. Fluid de-escalation aims to reduce fluid accumulation by active body fluid elimination [5,6]. Fluids can be actively removed from patients using diuretic therapy or via ultrafiltration when patients are receiving hemodialysis [1]. Intravenous albumin may augment fluid removal by increasing intravascular colloid oncotic pressure and promoting vascular refilling [7].
**Objectives:** To evaluate the impact of albumin infusion on total fluid balance during fluid de-escalation in hospitalized patients.
**Methods:** We conducted a systematic meta-analysis in alignment with the Cochrane, PRISMA, and MOOSE [8–10] guidelines (protocol registered to PROSPERO as CRD42022370029). We included randomized and non-randomized-controlled studies investigating the effect of adding Albumin to diuretic therapy or renal replacement therapy (RRT) on fluid balance during fluid de-escalation. We searched articles published on PubMed, Embase, and the Cochrane Library database until 12.12.2022. We excluded studies exclusively performed on patients with liver disease or traumatic brain injury. Two reviewers independently conducted title and abstract screenings, followed by

full-text reviews and data extraction. In case of disagreement, a third reviewer decided on inclusion. If the full text was unavailable, authors were contacted twice before their work was excluded. We calculated the effect size using the mean difference method, with the treatment effect (TE) determined as the difference in mean fluid balance between the intervention and control groups.

**Results:** We screened a total of 9225 studies and included 31 for full-text screening. Despite our repeated efforts, we could not obtain the full text for two articles. After full-text screening and data extraction, 4 studies were included in the analysis. The PRISMA flowchart is shown in Fig. 1.

All included studies examined the effect of albumin infusion in combination with furosemide. No identified study investigated the effect of added albumin during RRT on fluid balance for more than one session. The four studies (Table 1) included a total of 196 patients (118 patients in the intervention and 109 patients in the control arm). All studies were performed in the ICU setting. Two of the four studies were double-blinded randomized-controlled trials (RCT). Three out of four studies focused on patients with either hypoalbuminemia or -proteinemia.

The analysis revealed a fluid balance mean difference (MD) of −263 ml, with a 95% confidence interval (CI) spanning from −4326 ml to 3799ml ($p$ value = 0.90 for observed effect size different from zero, see Fig. 2).

Subgroup analysis of studies including only patients with hypoalbuminemia or -proteinemia ($n = 3$), as well as only RCTs ($n = 2$) showed similar Results: For the former, the fluid balance MD was-796ml (CI −6384 to 4791ml, $p$ value = 0.81). In the case of RCTs, the fluid balance MD was -1106ml (CI −7520 to 5308ml, $p$ value = 0.54).

**Conclusions:** This review indicates that the infusion of albumin alongside diuretic therapy has no discernible effect on the total fluid balance in ICU adult patients, according to the currently available evidence.

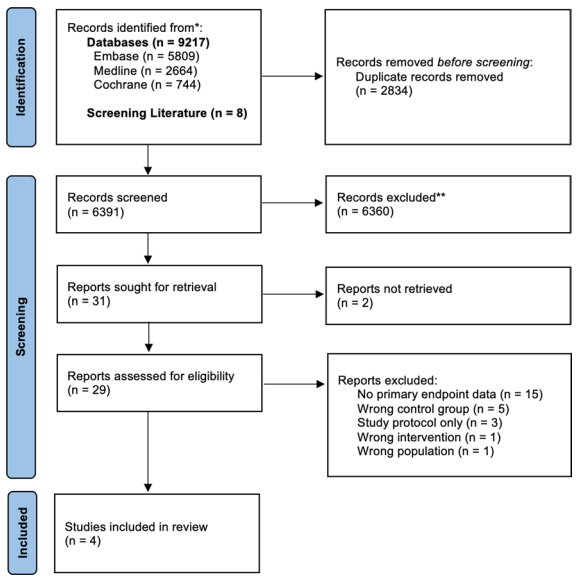


**Fig. 1 (abstract 000522)** PRISMA flow diagram

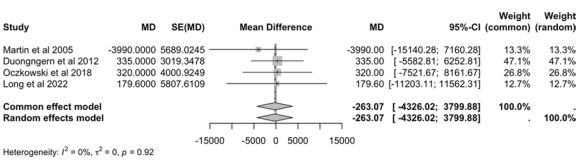


**Fig. 2 (abstract 000522)** Forest plot of the mean differences in fluid balance between intervention and control groups across included studies. The plot displays individual study estimates with their 95% confidence intervals (CIs) and the pooled estimate with their 95% CI. Each study is identified by the first author and the year of publication. The size of each square reflects the study's weight in the meta-analysis, and the diamond represents the pooled effect size

**Table 1 (abstract 000522)** List of the studies included in the meta-analysis

| Title | Author | Year of publication | Journal | Study type | Patients with hypoproteinaemia or -albuminaemia | Patient count (Control/intervention) |
|---|---|---|---|---|---|---|
| A randomized, controlled trial of furosemide with or without albumin in hypoproteinemic patients with acute lung injury | Martin et al | 2005 | Critical Care Medicine | RCT | yes | 40 (20/20) |
| Effect of albumin on diuretic response to furosemide in patients with hypoalbuminemia | Duongngern et al | 2012 | American Journal of critical care | retrospective | no | 31 (31/31) |
| Furosemide and albumin for diuresis of edema (FADE): a parallel-group, blinded, randomized controlled pilot trial | Oczkowski et al | 2018 | Journal of Critical Care | RCT | yes | 45 (21/24) |
| Albumin with furosemide versus furosemide alone for de-resuscitation after sepsis or septic shock | Long et al | 2022 | Critical Care Medicine | retrospective, abstract | yes | 80 (37/43) |

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4. 4 Messmer AS, Zingg C, Müller M, et al. Fluid Overload and Mortality in Adult Critical Care Patients-A Systematic Review and Meta-Analysis of Observational Studies. Crit Care Med. 2020;48:1862–70.
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**Topic:** Cardiovascular issues in ICU

## 000523

### Subgroup analysis of preliminary data of UCH-L1 for patients treated with intra-arterial nimodipine for highly suspected vasospasm after aneurysmal subarachnoid hemorrhage

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000523

**Introduction:** Aneurysmal subarachnoid hemorrhage (aSAH) can cause delayed cerebral ischemia (DCI), typically within the first subsequent weeks due to multifactorial causes like vasospasm of intracranial vessels and disturbances of the microcirculation (1). Nimodipine (p.o. or i.v.) is known to be an evidence-based therapy for the prevention of this ischemic damage (2). Additional individualized treatment options to prevent the development of ischemia may also include intra-arterial administration of nimodipine (3). Various methods can be used to detect the onset of DCI, such as transcranial Doppler sonography (TCD), computed tomographic angiography (CTA), and digital subtraction angiography (DSA) (3,4). The biomarkers Glial fibrillary acidic protein (GFAP) and Ubiquitin carboxyl-terminal hydrolase L1 (UCH-L1) show promise for detecting intracranial damage (5), though their role in aSAH progression is still unclear.

**Objectives:** By comparison with traditional examination methods for the assessment of DCI, the aim is to investigate whether changes in marker levels allow earlier prediction of DCI.
**Methods:** The study is being conducted at University Hospital Regensburg. 15 patients have been included and analyzed to date. The concentration of the biomarkers GFAP and UCH-L1 was measured using chemiluminescent immunoassay analysis once a day for the first 14 days after aSAH. The following data will be collected: Doppler sonography results, radiological findings, neurological exams, surgical and interventional procedures, laboratory chemistry panel, nimodipine dosage, and intensive care monitoring.
**Results:** Blood samples of 15 patients were so far analyzed. Two patients received intra-arterial nimodipine after vasospasm was confirmed by CT-A and DSA, despite standard therapy. One patient showed increased UCH-L1 levels on day 6, with CT-A and DSA on day 7 confirming vasospasm and nimodipine intra-arterial treatment starting on day 8 (Figure 1). Another patient, diagnosed with vasospasm on day 5 by CT-A and DSA, also had rising UCH-L1 levels between days 2 and 5. Intra-arterial nimodipine was administered on day 6 for this patient as well (Figure 2).
**Conclusions:** It is difficult to clearly identify the onset of DCI. Two of the patients included so far showed clear vasospasms by CT-A and DSA despite standard therapy, which led to escalation of therapy. In both cases, diagnosis of vasospasm was preceded by increases in UCH-L1 levels. With intra-arterial nimodipine administration, the UCH-L1 values fell again in each case. As only 2 out of 15 patients in the patient collective evaluated so far were treated with intra-arterial nimodipine, a larger number of cases are necessary for a better assessment and statistical evaluation of this phenomenon. These initial indications of the potential usability of the biomarkers for the diagnosis of DCI encourage us in our plan to continue and optimize the analysis of the biomarkers in a larger patient collective.

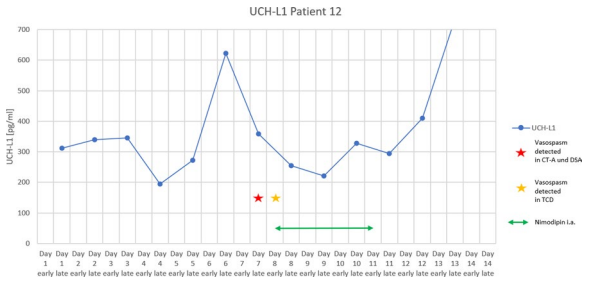


**Fig. 1 (abstract 000523)** UCH-L1 Patient 12

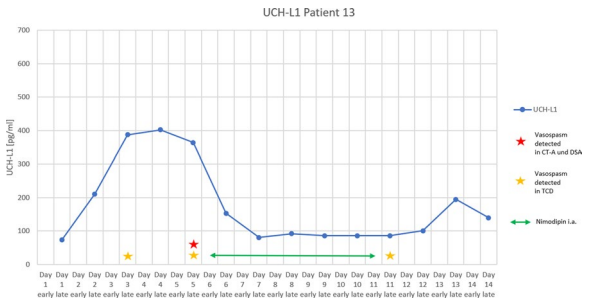


**Fig. 2 (abstract 000523)** UCH-L1 Patient 13

**Reference(s)**

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6. Some of the consumables for the measurements were provided free of charge by Abbott Laboratories.

**Topic:** Neurointensive care

## 000524

### Modification in ICU design including dynamic light therapy may influence serum acetylcholinesterase activity

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000524

**Introduction:** According to a recently published pilot study, a comprehensive change in the design of the ICU room could potentially reduce the incidence of delirium and influence circadian melatonin rhythms [1]. Changes in serum acetylcholinesterase (AChE) activity have been associated with a greater likelihood of being delirious [2]. Furthermore, AChE activity may serve as a real-time indicator of the state of the cholinergic system in these patients [3]. Basic research has shown that cholinergic markers, including AChE activity, exhibit natural fluctuations in accordance with the circadian rhythms of the body [4].
**Objectives:** To analyze if a multicomponent change in room design influences serum AChE activity in critically ill mechanically ventilated patients.
**Methods:** This is a secondary analysis of a proof-of-concept pilot study [1]. Two of the seven double bedrooms received extensive architectural modifications, including a new dynamic lighting system [5]. Patients were eligible for inclusion if they were mechanically ventilated and expected to remain in the ICU for at least 48 h. Patients with substantial recent exposure to the ICU were excluded [6]. Serum AChE activity was measured every 4 h for up to three 24-h assessment periods (AP-A, B, and C) using the *ChE check mobile* (Securetec Detektions-Systeme AG, Neubiberg, Germany). AP-B and C were initiated only if the patient's Richmond Agitation Sedation Scale (RASS) was -3 or greater. The influence of different lighting conditions (calculated as effective circadian irradiance [CEI], Ec) on serum AChE activity was analyzed using nonparametric multivariate analysis of longitudinal data.
**Results:** A total of 99 patients were enrolled. Sixty-four patients could be included in the data analysis ($n = 34$ patients in modified rooms, $n = 30$ in standard rooms). The median values of serum AChE activities in Figure 1 show different circadian behaviors between rooms with lower values for patients treated in standard rooms. The multivariate, nonparametric covariance analysis of longitudinal data revealed a significant influence of Ec on the course of serum AChE activity for AP-A, -B, and -C ($p < 0.0001$).

**Conclusions:** This preliminary analysis indicates that light therapy as part of a set of ICU room modifications may influence circadian serum AChE activity. Additional data analysis and larger studies are needed to confirm the hypothesis.

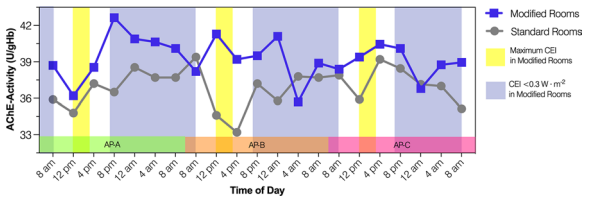


**Fig. 1 (abstract 000524)** Serum acetylcholinesterase activities presented as medians during assessment periods (AP) A, B and C. CEI, circadian effective irradiance

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7. The authors thank the nursing and medical staff for their efforts and the patient's cooperation during the study. Furthermore, the authors want to thank the ICU Design Working Group for their precious and inspiring work during the development and rebuilding process of the ICU rooms.

**Topic:** Sedation, analgesia, and delirium

## 000526

### Implementation and validation of a dashboard for real-time support of safe sedo-analgesia using data from clinical information systems in an intensive care unit

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**Introduction:** Patients admitted to intensive care units present a high level of complexity due to the severity of their pathologies and require extensive monitoring and the use of multiple therapies and treatments. This complexity represents a significant challenge for clinicians, as they must integrate a large amount of information and manage it effectively to achieve the maximum benefit for the patient.
Sedation and analgesia (SA) are both primary treatments for critically ill patients, and its correct titration plays a fundamental role in patients' progression and the potential complications they may present (1).
Secondary use of data stored in Clinical Information Systems (CIS) allows the creation of support tools as real-time dashboards that can help to personalize and adjust treatments to achieve the maximum benefit for patients (2). The use of this dashboards to adjust SA in critical care patients can improve their outcomes and reduce associated complications.
**Objectives:** Design and implement a real-time SA dashboard from SIC data and validate it through internal audit (IA).
**Methods:** This study includes the design (1), implementation (2), and validation (3) of the dashboard for two Intensive Care Units (ICU) (26 boxes).

1. Variable selection: age, sex, days of admission, body mass index (BMI), measured RASS/prescribed RASS, EVN/ESCID, presence of restraints, CAM-ICU, BIS, TOF, renal and/or hepatic function, sedative drugs, opioids, and neuromuscular blocking agents, and dose-related to patient weight.
2. Extraction, transformation, and loading (ETL) of SIC data. Consensus on limits and alarm ranges, according to Clinical Practice Guidelines, and color-coded alerts.
3. Phase 1 of IA content dashboard. Errors are classified according to validated classification in previous studies (3, 4) (Plausibility, Conformance, or Completeness). In case of error, the origin is identified as configuration failure, professional registration error, or integration failure with devices or departments. Once the errors are identified, changes are implemented in the configuration according to them.
4. Phase 2 of IA.

**Results:** For 5 days, in phase 1 of IA, 67 cases (638 variables) were audited. 615 correct transfers (96.4%) and 23 errors were found. Type of errors: 12 plausibility errors (1.9% of errors regarding all evaluated variables); 7 completeness errors (1.1%), and 4 conformance errors (0.6%). The origin of the errors was configuration in 78.3%, professional registration in 13%, and integration failures with devices and departments in 4.4%. After correcting configuration errors, 17 cases (161 variables) were audited in second phase of IA (2 days). No errors were found.
**Conclusions:** It is possible to generate a reliable sedation and analgesia real-time dashboard from SIC data Configuration, guided by internal audit of information quality.

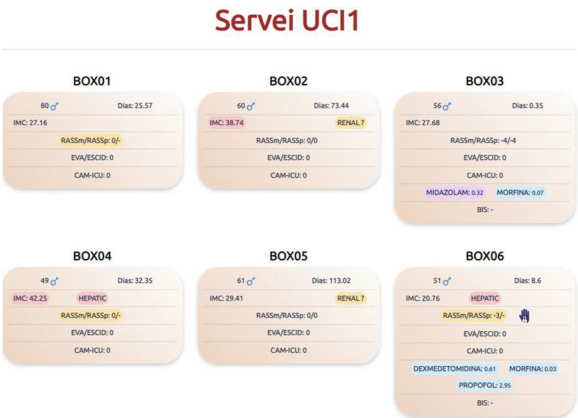


**Fig. (abstract 000526)** Dashboard generated to support safe sedo-analgesia

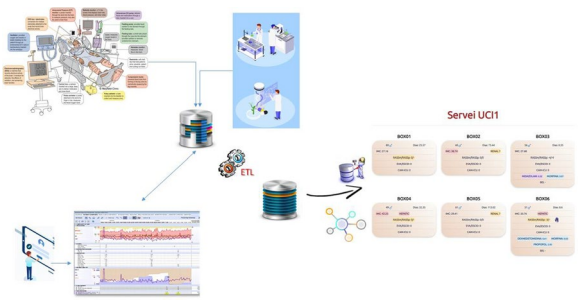


**Fig. (abstract 000526)** Process followed to generate dashboard sedo-analgesia from Clinical Information System

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**Topic:** Information systems and data science

## 000529

### Evaluation of the relationship between weaning process and delirium

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**Introduction:** The incidence of delirium in patients on mechanical ventilation may reach up to the 80% range during the hospitalization (1). Although most delirium studies have been conducted in mechanically ventilated patients, there are few studies investigating the relationship between pre- and post-extubation periods and delirium (2,3,4).
**Objectives:** In this study, we aimed to investigate and reveal at what stage of the extubation process delirium occurs, risk factors, and its association with sedation; and results of this study will offer a contribution to the prevention, treatment, and relief of symptoms.
**Methods:** The patients who were intubated and followed on a mechanical ventilator for at least 24 h in the intensive care unit, and whose extubation decision was made by the supervising physician, were enrolled in the study. The number of samples in our study was determined as 38 patients with 85% power analysis. To screen for delirium using CAM-ICU before extubation and during the 48-h period following extubation, demographic data, length of stay, duration of intubation, sedation, and results of arterial blood gas analysis were evaluated. Shapiro–Wilk test was used to investigate the suitability of the data for normal distribution and for two-way repeated-measures ANOVA test was used. IBM SPSS Statistics 21.0 program was used in the implementation of the analyses. The data were collected in three steps: pre-extubation, post-extubation at 24 h, and post-extubation at 48 h.
**Results:** Before extubation, among a total of 38 patients, 11 patients (28.95%) were identified as CAM-ICU positive. Those identified as CAM-ICU positive consist of 8 males (72.7%) and 3 females (27.3%). Patients diagnosed with delirium before extubation were generally younger (pre-extubation CAM-ICU (+) $55.18 \pm 22.44$ years; pre-extubation CAM-ICU (−) $64.89 \pm 18.46$ years), with relatively longer lengths of stay in the intensive care unit (6.15 days vs. 8.91 days) and durations of mechanical ventilation (3.96 days vs. 5.09 days) on average. Only 4 out of 19 patients (21.05%) who received sedation with dexmedetomidine were CAM-ICU positive before extubation. We observed a lower incidence of delirium in patients sedated with dexmedetomidine. We identified nine patients who were CAM-ICU(−) before extubation but became CAM-ICU (+) during the 48-h period following extubation, and it was determined that all of these patients had a PaO2/FiO2 ratio of less than 200 ($p < 0.05$). After extubation, CAM-ICU (−) was observed only in 4 patients with PaO2/FiO2 < 200. Throughout the study, we observed that 11 out of a total of 20 patients (55%) identified as CAM-ICU (+) received a negative score on the RASS, indicating a more prevalent hypoactive type of delirium.
**Conclusions:** Contrary to general literature data, based on the results of this study, we concluded that young male patients should be monitored more closely for delirium. The paO2/FiO2 ratio may be a suitable parameter for an objective score system that may predict delirium.

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**Topic:** Sedation, analgesia, and delirium

## 000530

### Risk factors for mortality in radiological sub-phenotypes of severe ARDS patients on veno-venous ecmo: insights from the J-CARVE registry

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000530

**Introduction:** In a recent study utilizing the J-CARVE registry [1], a large multicenter database including chest CT data at the initiation of veno-venous extracorporeal membrane oxygenation (V-V ECMO), we previously developed three novel sub-phenotypes among patients with severe acute respiratory distress syndrome (ARDS) requiring V-V ECMO. These sub-phenotypes, characterized by Dry type (minimal lung edema), Wet type (pronounced lung edema), and Fibrotic type (presence of fibroproliferative changes on chest CT), were identified through latent class analysis. The aim of this study was to identify risk factors for mortality in these sub-phenotypes.
**Methods:** We retrospectively analyzed data of 544 adult patients with severe ARDS who underwent V-V ECMO between January 2012 and December 2022 across 24 intensive care units (ICUs). We conducted multivariate logistic regression analyses for each sub-phenotype to identify potential risk factors, focusing on clinical variables obtained within the first 24 h of initiating V-V ECMO support. The primary outcome was mortality at ICU discharge.
**Results:** Across all subtypes, an increase in age was associated with increased mortality in patients with severe ARDS requiring V-V ECMO (Dry type: adjusted odds ratio (AOR) 1.05 [95% confidence interval (CI) 1.00–1.10], $p = 0.026$; Wet type: AOR 1.03 [95% CI 1.00–1.06], $p = 0.017$; Fibrotic type: AOR 1.06 [95% CI 1.02–1.10], $p = 0.003$). For the Wet type, additional risk factors included the longer days from intubation to V-V ECMO initiation, and increased lactate and blood urea nitrogen levels (AOR 1.22 [95% CI 1.08–1.38], $p < 0.001$; AOR 1.17 [95% CI 1.04–1.32], $p = 0.002$; AOR 1.03 [95% CI 1.01–1.05], $p = 0.006$, respectively). In the Fibrotic type, longer days from intubation to V-V ECMO initiation and increased white blood cell counts were identified as risk factors for higher mortality (AOR 1.08 [95% CI 1.00–1.16], $p = 0.049$; AOR 1.06 [95% CI 1.01–1.11], $p = 0.007$, respectively).

**Conclusions:** Our findings revealed different risk factors associated with mortality across the previously identified sub-phenotypes of severe ARDS patients on V-V ECMO. These insights emphasize the necessity for tailored management strategies for each sub-phenotype during V-V ECMO intervention, potentially guiding more personalized and effective treatment approaches.

**Reference(s)**

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**Topic:** Acute respiratory failure and mechanical ventilation.

## 000531

## Evaluating the impact of early vs delayed vasopressor use on clinical outcomes in trauma patients: a retrospective cohort study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000531

**Introduction:** Trauma is a leading cause of mortality and morbidity. Particularly, in cases of hemodynamic instability, the use of vasopressors and damage control surgery (DCS) are often necessary. However, the optimal timing of vasopressor use and its impact on clinical outcomes in trauma patients remains unclear.
**Objectives:** The aim of this study was to compare the clinical characteristics, hemodynamic parameters, surgical factors, and outcomes of trauma patients according to the timing of vasopressor use and the application of DCS.
**Methods:** This retrospective cohort study classified 380 trauma patients into three groups based on the timing of vasopressor use after admission: within 6 h (X1, $n=145$), 6–48 h (X2, $n=141$), and over 48 h (X3, $n=94$). Each group was further divided according to the application of DCS (X0: no DCS, X1: DCS). Demographics, injury severity, hemodynamic parameters, surgical factors, and outcomes were compared among the groups.
**Results:** The proportion of DCS was significantly different among the groups (X1: 7.2%, $n=10$; X2: 18.6%, $n=27$; X3: 41.7%, $n=40$; $p<0.001$), with the highest rate in the X3 group. Patients in the X3 group ($n=94$) had significantly higher injury severity scores (ISS) (26.0 vs 22.0 vs 22.4; $p=0.026$), lower initial systolic blood pressure (SBP) (81.4 vs 88.1 vs 82.9 mmHg; $p=0.134$), and higher 24-h transfusion requirements compared to the X1 ($n=145$) and X2 ($n=141$) groups ($p<0.001$). In the X2 group, patients who underwent DCS ($n=26$) had lower hemoglobin levels (9.1 vs 10.4 g/dL, $p=0.018$) and higher lactate levels (8.1 vs 5.6 mmol/L, $p=0.021$) compared to those who did not ($n=115$). Similar findings were observed in the X1 group (DCS, $n=10$ vs no DCS, $n=135$). The median abdominal AIS scores were 4, 3, and 2 in the X1, X2, and X3 groups, respectively ($p<0.001$). Mortality did not differ among the groups, but morbidity was slightly lower in DCS patients in the X2 (65.4% vs 61.7%) and X3 (45.0% vs 57.4%) groups.
**Conclusions:** In this study, delayed vasopressor use (> 48 h) was associated with higher injury severity, worse hemodynamic parameters, and increased need for DCS and transfusion. These findings suggest that early recognition and management of hemodynamic instability with vasopressors may be crucial in preventing the progression to more severe clinical states and the need for DCS. However, the timing of vasopressor use did not significantly impact mortality in this study. Future prospective studies are needed to establish evidence-based guidelines for the optimal timing of vasopressor use in trauma patients and its impact on clinical outcomes.

**Topic:** Trauma

## 000532 Novel subtypes and differential response to muscle relaxants in patients with severe ARDS requiring V-V ECMO: potential for individualized management during V-V ECMO

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**Introduction:** Patients with severe ARDS requiring veno-venous extracorporeal membrane oxygenation (V-V ECMO) are a population with heterogeneous respiratory physiology. AQ28
**Objectives:** The aim of this study was to identify sub-phenotypes of severe ARDS requiring V-V ECMO and to evaluate the beneficial effect of muscle relaxants across sub-phenotypes.
**Methods:** We used the data from the Japan Chest CT for ARDS Requiring V-V ECMO Registry (J-CARVE registry [1]), a retrospective multicenter registry of adult patients with severe ARDS who received V-V ECMO. We performed a latent class analysis (LCA) for identifying sub-phenotypes of severe ARDS based on radiological and clinical findings at the start of ECMO support. Multivariate Cox regression analysis was conducted to investigate the association between the use of muscle relaxants within 48 h after the start of ECMO support and mortality by the sub-phenotypes. The primary outcome was the 90-day in-hospital mortality.
**Results:** Three sub-phenotypes were identified from data of a total of 544 patients with severe ARDS treated with V-V ECMO at 24 institutions across Japan: Dry type 185 (34%), Wet type 169 (31%), and Fibrotic type 190 (35%) (Figure). Patients with Fibrotic type showed an increased risk of 90-day in-hospital mortality compared with Dry type (adjusted hazard ratio [95% confidence interval] 1.83 [1.16–2.91], $p=0.010$) and Wet type (1.53 [1.04–2.27], $p=0.033$). Among the 320 patients who did not use muscle relaxants before ECMO support, the 90-day in-hospital mortality was 8.5% (4/47) and 15.9% (10/63) for Dry type ($p=0.24$), 26.7% (12/45) and 25.5% (14/55) for Wet type ($p=0.89$), and 34.8% (16/46) and 51.6% (33/64) for Fibrotic type ($p=0.08$), respectively. The use of muscle relaxants within 48 h after the start of V-V ECMO support decreased the risk of 90-day in-hospital mortality in patients classified into Dry or Fibrotic type (0.53 [0.30–0.93], $p=0.027$), while not in those classified into Wet type.
**Conclusions:** Three sub-phenotypes in patients with severe ARDS requiring V-V ECMO were identified. The use of muscle relaxants within 48 h after the start of V-V ECMO support may be beneficial only in patients classified as Dry or Fibrotic type**.**

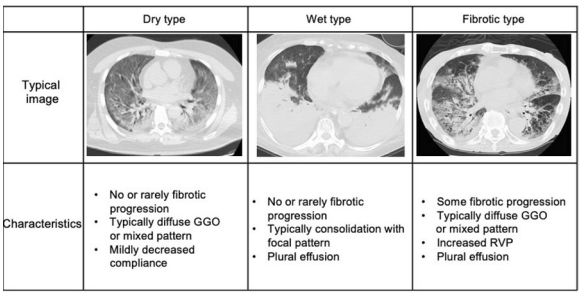


**Fig. (abstract 000532)** Typical images of each sub-phenotype. Abbreviations: GGO, ground-glass opacity

**Reference(s)**

1. Nishikimi M, Ohshimo S, Fukumoto W, et al. Chest CT findings in severe acute respiratory distress syndrome requiring V-V ECMO: J-CARVE registry. J Intensive Care 2024; 12: 5.
2. This work was supported by JSPS KAKENHI (Grant Numbers JP 22K09120) and the TSUCHIYA MEMORIAL MEDICAL FOUNDATION, a Grant-in-aid for

multicenter clinical research from Japanese Association for Acute Medicine, and Japan Agency for Medical Research and Development (AMED, Grant Numbers JP23fk0108654).

**Topic:** Acute respiratory failure and mechanical ventilation

**000533**

## Neuro-prognostication using neuron-specific enolase after out of hospital cardiac arrest: a retrospective analysis from a tertiary referral and major trauma centre

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AQ29 **Introduction:** Neuron-specific enolase (NSE) is a well-established biomarker used in multimodal neuro-prognostication following out of hospital cardiac arrest (OHCA) [1]. Despite its widespread use for outcome prediction, the recommended cut-off values and time intervals for testing NSE remain uncertain due to variation observed between studies and different immunoassay techniques [2].
**Objectives:** This study investigated the utility of NSE as a predictor of 3-month survival following all cause OHCA in a real-world clinical setting.
**Methods:** A single-centre retrospective analysis of all patients admitted to the Royal Sussex County Hospital ITU over one calendar year (September 2022 to August 2023) with a diagnosis of OHCA. Clinical and outcome data were obtained from electronic patient records. NSE levels were measured by immunoassay (F.Hoffmann-La Roche Ltd, Elecsys® NSE).
**Results:** Of 66 admissions for OHCA eligible for inclusion, NSE data were available for 32. In 5 cases patients had died before reaching the time interval for performing NSE. In 16 instances NSE was not determined due to sample haemolysis. A total of 46 successful NSE tests were carried out, of which 22 were taken at 48 h and a further 24 taken at 72 h. There was minimal difference in predictive value between tests carried out at 48 and 72 h, as shown in Fig 1. Serum NSE results from all time intervals were both sensitive and specific in predicting outcome after OHCA, as shown in Fig 2 (area under ROC 0.898). As shown in Fig 1, median and mean average NSE were higher in the 72-h samples of non-survivors and lower in the 72-h samples of survivors when compared to the 48-h samples of each respective group.
**Conclusions:** In this study, an NSE of > 50 µg/L was ubiquitous with a non-survivable outcome following OHCA; however, an NSE < 50 µg/L while suggestive of survival was less sensitive. This may be partly explained as some non-survivors succumb for reasons other than hypoxic encephalopathy (for example aspiration, cardiogenic shock, arrhythmia, etc.) and so have comparatively low NSE results. Clinically NSE results were not interpreted in isolation but rather were used in combination with electroencephalography and computed tomography findings supportive of hypoxic encephalopathy.
A rising 72-h NSE was associated with a poor outcome. Conversely, a decrementing 72-h NSE was associated with survival. There may be an element of bias with regards to which patients are selected for neuro-prognostication using NSE. Some NSE samples could not be processed due to haemolysis, to which it transpires the test is especially susceptible.

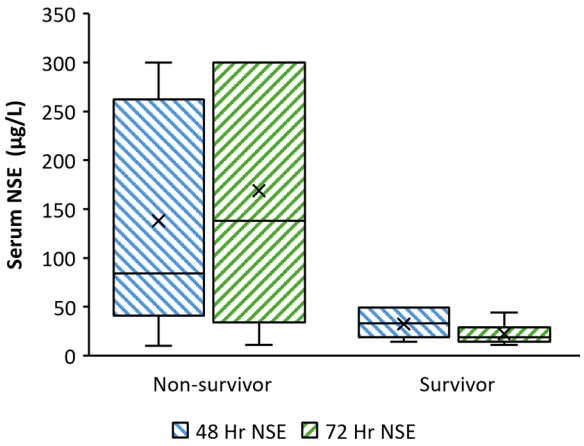


**Fig. 1 (abstract 000533)** Boxplot of serum NSE against survival outcome at 48 and 72 h intervals

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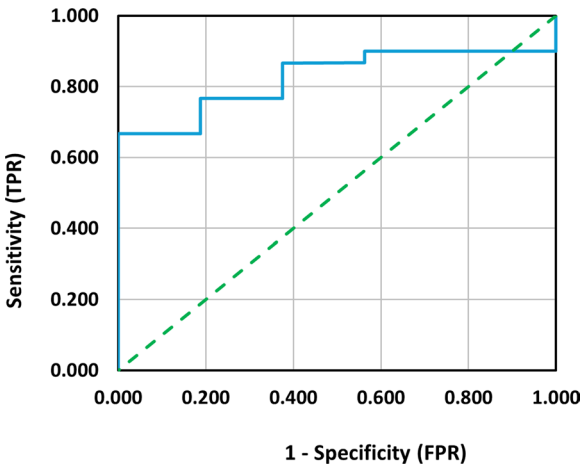


**Fig. 2 (abstract 000533)** Receiver operator characteristic of all serum NSE results ($n = 46$)

**Reference(s)**

1. None to declare
2. Maher, C., Cadd, M., Nunn, M., Worthy, J., Gray, R. and Boyd, O. (2023). The use of neuron specific enolase to prognosticate neurological recovery and long-term neurological outcomes in OOHCA patients. Journal of the Intensive Care Society, 24(4), pp.386–391. https://doi.org/10.1177/17511437231160089.
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**Topic:** Cardiac arrest

## 000535

### Efficacy of ceftaroline fosamil in the treatment on infective endocarditis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000535

**Introduction:** Infective Endocarditis (IE) is associated with significant morbidity and mortality risk, despite advances in diagnosis and treatment. The poor prognosis associated with IE is due to the complications and risk of recurrence. The prevalence of IE caused by *Staphylococcus* and *Enterococcus* has increased. Ceftaroline fosamil (CPT-F), a fifth-generation cephalosporin, has activity against Gram-positive and -negative bacteria due to its inhibition of bacterial cell wall synthesis. CPT-F has been approved for the treatment of acute skin and soft-tissue infections and community-acquired pneumonia. Although clinical experience is limited, many observational studies have shown its effectiveness in the management of bacteremia and IE caused by Gram-positive microorganisms.
**Objectives:** This study aims to assess the efficacy, and treatment outcomes of CPT-F in patients diagnosed with IE, focusing on survival rates, and recurrence rates.
**Methods:** A retrospective review on 18 cases of IE treated with CPT-F. Patient demographics, clinical characteristics, including risk factors, type and location of IE, causative agents, and treatment were analyzed. Survival rate in the ICU, 30-day mortality, and recurrence of IE were included. Statistical analysis was performed with Stata 14.2. Categorical variables were presented as absolute frequencies and percentages, while continuous variables were expressed as mean (±standard deviation) or median (interquartile range) when necessary.
**Results:** The median age was 66.5 (61.75–75) years, 50% male and a median APACHE II score of 19.5 (13.5–28). Among the patients, cardiac valve prostheses (44.4%), diabetes mellitus (33.3%), endovascular devices (16.7%), and previous episodes of IE (11.1%) were prevalent risk factors. IE affected prosthetic and native valves equally (50%). The majority of cases involved a single valve (77.8%). In 88.88% of the cases, the endocarditis was on the left side, with the mitral valve being involved in ($N=10$) 52.6% of the cases. *Staphylococcus aureus* was the predominant pathogen: methicillin-sensitive ($N=8$, 44.4%) and -resistant ($N=4$, 22.2%), followed by *Staphylococcus epidermidis* ($N=3$, 16.7%). All the patients received CPT-F combined with at least one or more antibiotics, being daptomicine the most common adjunctive therapy (72.22%). CPT-F was used as rescue therapy in 55.6% and as first-line treatment in 44.4% of cases. The ICU survival rate was 83.3%, with a 30-day mortality rate of 22.2%. Recurrence of IE was observed in a minority of patients (22.3%), indicating effective infection resolution in 77.8% of the cases. No side effects were described during treatment.
**Conclusions:** CPT-F, particularly in combination with other antimicrobial agents, offers a viable therapeutic option for treating infective endocarditis, including cases involving methicillin-susceptible and -resistant *Staphylococcus aureus*, showing high survival rates and low recurrence. The study highlights the importance of tailored therapeutic strategies to manage this complex condition. Further prospective research is needed to validate these findings and refine treatment guidelines.

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**Topic:** Infections and prevention

## 000536

### Prediction of survival and neurological outcomes in ventricular fibrillation patients treated with extracorporeal cardiopulmonary resuscitation based on the acute kidney injury biomarkers

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000536

**Introduction:** In recent years, acute kidney injury (AKI) biomarkers have been reported to be useful not only in the diagnosis of AKI and prediction of kidney replacement therapy (KRT) but also in predicting outcomes in critically ill patients. This study aimed to investigate whether prediction of survival and neurological outcomes are possible in patients with ventricular fibrillation (VF) who underwent extracorporeal cardiopulmonary resuscitation (ECPR). In Japan, only L-FABP and NGAL are covered by national insurance as AKI biomarkers.
**Methods:** This study was a monocenter retrospective observational study. Patients in ventricular fibrillation treated with ECPR admitted to our ICU and whose urinary L-FABP (uL-FABP) and urinary NGAL (uNGAL) were measured at ICU admission from July 2018 to March 2024 were selected from the medical records.
Patients were divided into two groups based on the median values of uL-FABP (μg/g.cre) and uNGAL (μg/g.cre), [L–L group (uL-FABP < 16,982.1) and L–H group (uL-FABP ≥ 16,982.1), N–L group (uNGAL < 1830) and N–H group (uNGAL ≥ 1830), respectively]. We analyzed the 28-day mortality using the log-rank test.
Furthermore, we examined the association with neurological outcomes using the Mann–Whitney U test and examined factors associated with poor neurological outcome using logistic regression analysis.
**Results:** A total of 46 patients were included in the study. The median age was 58 years, and 43 patients were male. 7 patients received KRT, 28 patients received IABP, and 6 patients received IMPELLA.
The median uL-FABP and uNGAL levels were 16,982.1μg/g.cre and 1830 μg/g.cre, respectively.
The Kaplan–Meier curves compared the 28-day prognoses of the L–L and L–H groups as well as the N–L and N–H groups are shown in Fig. 1(a,b).
No significant difference was observed between the L–L group and L–H group (Log rank $p=0.433$), whereas a significant difference was observed between the N–L group and N–H group (Log rank $p=0.046$). Both uL-FABP and uNGAL were significantly higher in the poor neurological outcome (Cerebral Performance Category = 3,4,5) group ($p=0.04$ and $<0.01$, respectively) (Fig. 2 a,b).
Factors associated with poor neurological outcomes were age (odds ratio 1.09, 95% C.I 1.01–1.18, $p=0.0223$) and uNGAL > 1830 (odds ratio 8.88, 95% C.I 1.59–49.70, $p=0.0129$).
**Conclusions:** AKI biomarkers such as uL-FABP and uNGAL may be useful in predicting survival and neurological outcomes in patients with VF treated with ECPR. However, due to the limited number of cases, further investigation is needed.

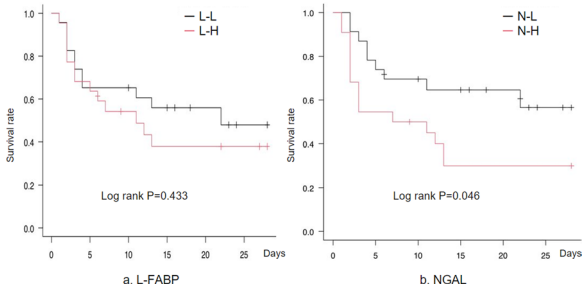


**Fig. 1 (abstract 000536)** The 28 day outcomes

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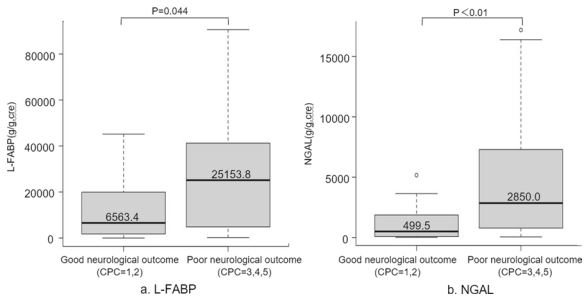


**Fig. 2 (abstract 000536)** Neurological outcomes

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3. None.


**Topic:** Cardiac arrest

## 000538

### Research capacity in Canadian community hospitals: an intrinsic descriptive case study


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**Introduction:** Canada's clinical research infrastructure is limited by a lack of community hospital (CH) engagement. CHs represent over 90% of Canadian hospitals, yet few participate in clinical research. Increasing research participation by CHs has the potential to accelerate trial enrollment, enhance study generalizability (1), and improve knowledge translation. Major barriers to CH research participation are a lack of (1) financial support and (2) mentorship (2). To address these issues, the COVID-19 Network of Clinical Trials Networks (NoN) provided 1 year of financial support to 14 CHs and recruited their research leads to participate in a CH-specific Working Group (WG).
**Objectives:** The purpose of this study was to: (1) describe the impact of NoN funding and WG on CH research participation, (2) identify actions to strengthen CH research activities, and (3) understand the impact of context on CH research participation.
**Methods:** We used an intrinsic descriptive case study methodology3 and collected data from multiple sources including WG minutes [$n=7$], email correspondence, NoN status reports [$n=21$]), and semi-structured interviews (physician leads [$n=7$] and research staff [$n=2$]). We used thematic analysis to identify themes that were mapped to the Consolidated Framework for Implementation Research (CFIR) domains, a useful framework for identifying barriers and facilitators to effective implementation.
**Results:** NoN funding enabled CHs to hire new research staff, sustain existing programs, increase active trials, and develop policies and procedures. WG membership also had a positive impact by facilitating reciprocal learning and networking (e.g., connecting with new trials and funding opportunities). Contextual factors were frequently cited as determining the success of CH research programs. These included: (1) clinical trial design, (2) health system characteristics, (3) CH context, and (4) individual team member characteristics. Themes and sub-themes aligned with all CFIR domains and many CFIR constructs, suggesting an opportunity to leverage implementation science strategies to tailor interventions to encourage CH research participation.
**Conclusions:** NoN funding and WG membership positively influenced research activities in CHs. Actions to continue this growth include: (1) identifying mechanisms to better connect CH researchers, (2) working with investigators to design clinical trials that facilitate CH participation, and (3) creating resources to support CHs in building and sustaining research programs, including in communities with low historic research participation. Our findings point to the importance of context, including local population characteristics, organizational research culture, provincial health system structures and research funding structures, that impact the success of CH research programs and should be considered in planning future interventions.


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4. COVID-19 Network of Clinical Trials Networks Postdoctoral Training Fellowship


**Topic:** Health services research and outcome

## 000539

### Quantitative Pupillometry Index (QPI) in comatose patients after cardiac arrest


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**Introduction:** The evaluation of pupillary reactivity is crucial in assessing unconscious patients following cardiac arrest (CA). Automated pupillometry is known to provide more accurate assessments compared to human observation. The Neurological Pupil Index (NPi) has been recognized as an accurate index to predict unfavourable neurological outcome (UO). A new index, called the Quantitative Pupillometry Index (QPI), has emerged; however, there are no prognostic data on its application in CA patients.
**Objectives:** This study compared the prognostic value of NPi and QPI in unconscious patients post-CA.
**Methods:** This is a prospective ongoing observational single-center study, conducted at the Erasme University Hospital in Brussels (Belgium). We collected data from patients admitted to the Intensive Care Unit after successful resuscitation from CA between April 2023 and

January 2024. The inclusion criteria were age ≥ 18 years and a Glasgow Coma Scale < 9 on admission. Exclusion criteria included facial and/or ocular trauma, not allowing pupillometry, and pregnancy. Measurements of NPi (Neuroptics, California, USA) and QPI (Neurolight, IdMed, Marseille, France) were performed once at 24, 48, and 72 h after CA. All measures were collected by medical staff not directly involved in the clinical management of patients. The follow-up was performed using a semi-structured telephone interview or evaluated during follow-up visits; UO was considered as Glasgow-Pittsburgh Cerebral Performance Category (CPC) 3–5 at 3 months.
**Results:** 42 patients have been included so far, 36 of which had available follow-up data; UO occurred in 29 (80.5%) of patients. At 24 h, patients with UO showed a lower NPi (4.0 [3.2–4.4] vs 4.4 [4.05–4.6]; $p = 0.06$) and QPI (2 [1–3] vs 3 [3–4]; $p = 0.04$). Also, at 48 and 72 h, patients with UO showed a lower NPI (3.8 [3.3–4.3] vs 4.5 [4.4–4.7]; $p = 0.02$; and 3.6 [3.22–4.27] vs 4.6 [4.5–4.65]; $p = 0.04$, respectively) and a lower QPI (2 [0–3] vs 4 [3–5]; $p = 0.01$; 0 [0–4] vs 5 [5–5]; $p = 0.009$) than those with favourable outcome. The area under receiver-operating characteristic (AUROC) of QPI to predict UO was 0.73, 0.82, and 0.82 at 24, 48, and 72 h, respectively. A QPI ≤ 2 at 72 h showed a specificity of 100% (95%CI [40–100]%) and a sensitivity of 65% (95%CI [44–84]%). QPI and NPi showed a strong correlation over time ($r = 0.69$; $r = 0.66$ and $r = 0.66$ for 24, 48, and 72 h, respectively; $p < 0.001$).
**Conclusions:** In our study, QPI showed a good prognostic value in unconscious patients after cardiac arrest.

**Topic:** Cardiac arrest

## 000540

### GPICS audit: speech and language therapy provision in a tertiary ICU setting

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000540

**Introduction:** People with intensive care needs who have difficulty with communication and/or swallowing require timely access to a Speech and Language Therapy (SLT) service. SLT assessment and intervention address the increasingly complex communication, swallowing, and tracheostomy weaning needs of patients. SLT is essential for performing instrumental assessments, such as Flexible Endoscopic Evaluation of Swallowing and videofluoroscopy, guiding timing for oral intake, early identification of laryngeal injuries, advising on speaking valve use, and contributing to weaning assessments and specialist tracheostomy tube selection.
**Objectives:** 1. To outline specific SLT standards and recommendations. 2. To measure any improvements or regression in compliance and analyse reasons for this. 3. To develop an action plan from the findings of the audit with a view to achieve overall improved compliance. 4. To motivate for additional resources and funding should the findings indicate that this would be beneficial to meeting standards and a greater compliance with recommendations.
**Methods:** Retrospective data were used in this audit to measure compliance. This included retrospective review of Careflow Connect data (a private, online robust network that stores patient information).

- The GPICS V2 Audit Toolkit was used to audit data.
- The patient list included all patients admitted to six critical care units across two hospital sites from January until August 2023.
- Information regarding availability of SLT over the audit period was established using local electronic rostering records and team annual leave calendars.
- Critical care discharge proformas were screened via Careflow to identify documentation of SLT handover when stepping down from a critical care unit.
- SLT's own clinical awareness was used to measure compliance where appropriate.

**Results:** GPICS Standards 1 and 2 were met, standard 3 was partially met, and standard 4 was not met due to the rotational aspect of one of the posts. Recommendations 2 and 3 were met due to the introduction of communication stations across our units ensuring patients and staff always have access to low-level communication resources. Recommendations 4, 5, and 6 were partially met, while recommendations 1 and 7 were not met. Without further increase in staffing levels, it is unlikely to have a positive change in the GPICS recommendations.
**Conclusions:** The outcomes of the GPICS audit 2023 conducted at BHRUT showed an overall partial compliance with standards and recommendations. This is a positive outcome overall to what is an ever-growing, evidence-based, patient-centred SLT service in our critical care and high dependency units.
Although there are greater factors out of the control of the SLT team such as financial constraints, a number of areas for service development have been identified and will be the focus with the aim of improving overall GPICS compliance and patient service provision in critical care.

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**Topic:** Health services research and outcome

## 000541

### The importance of focused organ donation education and scope for improvement: An educational quality improvement project in a single centre District General Hospital (DGH) Intensive Care Unit (ICU)

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000541

**Introduction:** Experience of training in organ donation varies greatly amongst ICU staff. Lack of education in this area has been shown to be a barrier to donation (1). By collating the views of staff on the ICU we aim to ascertain baseline understanding to tailor our education programme to the specific needs of the department.
**Objectives:** To investigate the impact of previous education and identify areas and methods of teaching to focus on in future training events.
**Methods:** An anonymous survey was sent to all nurses and doctors in ICU with a combination of multiple-choice questions, Likert scale rated questions, and free text questions.
Inferential statistics were produced using Fisher's exact test. All analyses were performed using R (version 4.3.2). Themes were extracted from the free text questions.
**Results:** 25 people responded to the questionnaire, with an even distribution of job roles and ICU experience. 48% of staff reported having had less than 2 h of formal training. This was higher for doctors than nurses (62% vs 31%, $p > 0.05$).
Respondents reported good theoretical knowledge of the donation process. Around 70% of respondents reported understanding how the 'opt out' scheme works, solid organ donation vs tissue donation, and donation after brain death vs donation after circulatory death.
60% of respondents reported feeling confident (answering agree or strongly agree) in when to refer patients for donation, with strong positive association with previous ICU experience ($p = 0.005$) and previous formal training ($p = 0.01$). Confidence was lower for management of patients after referral, with just 48% of respondents reporting feeling confident, again with strong positive association to previous formal training ($p = 0.02$). Just 24% of respondents reported feeling confident discussing donation with next-of-kin, and this was strongly associated with amount of formal training ($p = 0.0002$). For both questions with low confidence, association with training was stronger than association with ICU experience.

96% of respondents reported that they believed future training would be helpful. The most popular teaching format was interactive teaching in discussion-based sessions, with lecture-based sessions, simulation sessions and observation of the process also suggested. Popular topics were communication with next-of-kin and pre-operative optimization.
**Conclusions:** In general, the strongest association with staff confidence is with the amount of formal training received, with more training resulting in higher confidence.

Going forward, discussion-based teaching and simulation sessions should be included in the formal teaching programme. These are great methods for teaching topics, such as communication with next-of-kin and pre-operative management of patients (2).
More and consistent training is needed for all staff, but particularly doctors. It may be helpful to include a session on organ donation in departmental induction, as doctors rotate frequently and may otherwise miss formal teaching sessions.

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**Topic:** Brain death, organ donation, and transplantation

## 000542

### Hemoadsoption in rhabdomyolysis exploring the prognostic role of proenkephalin

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000542

**Introduction:** Rhabdomyolysis (RM) is a severe clinical condition characterized by the breakdown of skeletal muscle fibers, leading to the release of intracellular contents into the bloodstream, including myoglobin (Mb), creatine phosphokinase (CK), and electrolytes. The resultant systemic effects like acute kidney injury (AKI) pose a significant challenge. In acute clinical settings, assessing kidney function on urine output, creatinine clearance, or Mb can cause delays in initiation of continuous renal replacement therapy (CRRT). A lot of research has been done on proenkephalin A 119–159 (PENK) as a novel kidney function biomarker.
**Objectives:** This article aims to assess the role of PENK in initiation of hemoadsorption for RM induced AKI. PENK is a freely filtered peptide that seems to correlate with glomerular filtration rate (GFR) [1]. High plasma PENK levels can be a sensitive biomarker for AKI and a risk factor for poor outcomes in critical illness and chronic kidney disease [1]. While high-volume hemofiltration is less accessible in acute clinical settings, CRRT with the addition of a hemoadsorber is easy, readily available and more efficient in elimination of Mb or CK [2].
**Methods:** This is a case series of 4 patients admitted to the intensive care unit (ICU) with RM following either crush syndrome (2 patients) or severe electrical injury (2 patients). We wanted to assess patients with a high risk factor for AKI that may benefit from early initiation of CRRT. CRRT with CytoSorb (CS) hemoadsorption was initiated in the first 4 h after ICU admission. In individuals with severe RM, CS may have a favorable impact on renal recovery. Removing musche cell waste products is essential to reduce the frequency and severity of AKI.
**Results:** All patients were admitted to ICU with a mean CK level of 116.940 U/L (86.006–149.021U/L) and were tested for plasma PENK with values over the established cut-off [3]. Two patients required emergency surgery for lower limb fasciotomy and one for upper limb amputation, respectively. The mean duration on CRRT was 36 h and significant improvement of RM syndrome was obtained with a mean reduction in CK levels after 48 h from admission of 87.25% (CK levels at 48 h: 5.415–27.629 U/L).
**Conclusions:** In comparison with currently available biomarkers, plasma PENK may be an accurate marker for early detection of AKI and is linked to accurate prediction of decline in renal function. Plasma PENK values measured on a point-of-care device may be especially helpful for critically ill patients with swiftly altering kidney function. This study confirms our belief that the adsorber should be installed as soon as possible to remove Mb and CK, and prevent ongoing renal failure.

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4. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

**Topic:** Acute kidney injury and haemofiltration

## 000543

### Impact of ambient air pollution on COVID-19 patients with shock: a multicenter retrospective study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000543

**Introduction:** Exposure to ambient air pollution has been associated with an increased risk of pneumonia, acute respiratory failure, or mortality (1, 2). Given the global pandemic of COVID-19 and its primary manifestation as a respiratory illness, understanding the relationship between air pollution and disease outcomes is crucial.
**Objectives:** To investigate the impact of ambient air pollution on the respiratory failure and mortality of COVID-19 patients presented with shock.
**Methods:** This multicenter, retrospective study was conducted using data from the Clinical Data Warehouse (CDW) of the Catholic Medical Center. Medical records of adult COVID-19 patients admitted to 8 university hospitals between January 2020 and December 2022 were extracted. Regional air pollutant levels of sulfur dioxide (SO2), carbon monoxide (CO), nitrogen dioxide (NO2), and particulate matters (PM10 and PM2.5) in South Korea were extracted from AIRKOREA data repository (www.airkorea.or.kr). Based on the hourly measured values, 3-day, 6-week, and 3-year mean averages of each air pollutant level were calculated and were matched to the patients' data according to their residential address. Meteorological factors, such as temperature, wind speed, and humidity, which were extracted from the Open Meteorological Data Portal, provided by the Korea Meteorological Administration Weather Data Service (https://data.kma.go.kr), were adjusted in the multivariable analyses. We represented the odds ratio by comparing the 4th quartile of each air pollutant exposure to the 1st quartile.
**Results:** Among 4,103 patients, we included 502 patients with shock, which was defined as starting of vasoactive drugs within 48 h. The median age was 75 years [IQR, 64.25–82.00], and 200 (39.84%) patients were female (Table 1). Of these, 244 (48.61%) patients started mechanical ventilation within 7 days, and the 30-day mortality rate

was 41.64%. The air pollutants significantly associated with respiratory failure within 7 days were the 3-day averages of CO and NO2 (Table 2; OR 2.45, 95% CI 1.22–4.92, $p = 0.0114$, and OR 5.11, 95% CI 2.34–11.19, $p < 0.0001$, respectively), and the 3-year averages of NO2 (OR 2.99, 95% CI 1.34–6.67, $p = 0.0073$). The 3-day averages of NO2, 6-week averages of CO, and 3-year averages of PM10 were associated with an increased risk of 30-day mortality (Table 3; HR 2.34, 95% CI 1.29–4.24, $p = 0.0053$; HR 3.65, 95% CI 1.27–10.49, $p = 0.0164$; and HR 1.79, 95% CI 1.03–3.12, $p = 0.0390$, respectively).

**Conclusions:** Short-term exposure to CO and NO2 levels was associated with an increased risk of respiratory failure within the first week in COVID-19 patients with shock. Short-term NO2 and intermediate-term CO exposure levels were also associated with 30-day mortality. Higher long-term exposure to PM10 showed an association with increased 30-day mortality.

**Table 2 (abstract 000543)** The association of air pollutants with respiratory failure risk within 7 days

| | 3-day | | 6-week | | 3-year | |
|---|---|---|---|---|---|---|
| | OR (95% CI) | P-value | OR (95% CI) | P-value | OR (95% CI) | P-value |
| SO2 | 1.47 (0.74-2.92) | 0.2683 | 1.53 (0.40-5.76) | 0.5331 | 0.59 (0.26-1.35) | 0.2122 |
| CO | 2.45 (1.22-4.92) | 0.0114 | 3.01 (0.67-13.43) | 0.1486 | 1.71 (0.83-3.53) | 0.1467 |
| NO2 | 5.11 (2.34-11.19) | <0.0001 | 3.76 (0.82-17.17) | 0.0870 | 2.99 (1.34-6.67) | 0.0073 |
| PM10 | 1.36 (0.69-2.67) | 0.3714 | 1.13 (0.20-6.53) | 0.8898 | 1.62 (0.75-3.50) | 0.2240 |
| PM2.5 | 1.35 (0.70-2.63) | 0.3717 | 1.24 (0.18-8.63) | 0.8285 | 1.31 (0.62-2.79) | 0.4843 |

* covariates in multivariable logistic regression: age, sex, BMI, modified acute physiologic score (APS except for respiratory score), number of comorbidities (among hematologic/solid cancer, CAD/CVD, chronic lung disease, chronic liver disease, CKD/ESRD, DM), meteorological factors (temperature, wind speed, humidity)

**Table 3 (abstract 000543)** The association of air pollutants with 30-day mortality

| | 3-day | | 6-week | | 3-year | |
|---|---|---|---|---|---|---|
| | HR (95% CI) | P-value | HR (95% CI) | P-value | HR (95% CI) | P-value |
| SO2 | 0.86 (0.53-1.41) | 0.5498 | 0.50 (0.18-1.41) | 0.1890 | 0.80 (0.44-1.44) | 0.4507 |
| CO | 1.45 (0.83-2.53) | 0.1945 | 3.65 (1.27-10.49) | 0.0164 | 1.30 (0.76-2.23) | 0.3441 |
| NO2 | 2.34 (1.29-4.24) | 0.0053 | 1.91 (0.59-6.21) | 0.2827 | 1.60 (0.90-2.83) | 0.1096 |
| PM10 | 1.45 (0.67-1.97) | 0.6174 | 0.83 (0.21-3.32) | 0.7907 | 1.79 (1.03-3.12) | 0.0390 |
| PM2.5 | 1.33 (0.78-2.28) | 0.2936 | 0.30 (0.06-1.57) | 0.1546 | 1.44 (0.85-2.44) | 0.1730 |

* covariates in multivariable logistic regression: age, sex, BMI, acute physiologic score, number of comorbidities (among hematologic/solid cancer, CAD/CVD, chronic lung disease, chronic liver disease, CKD/ESRD, DM), meteorological factors (temperature, wind speed, humidity), COVID-19 treatment (no steroid/no remdesivir, only steroid, only remdesivir, steroid+remdesivir)

**Table 1 (abstract 000543)** Baseline characteristics of study population

| | Overall (n=502) |
|---|---|
| Age (median, [IQR]) | 75.00 [64.25-82.00] |
| Sex, female, n (%) | 200 (39.84) |
| BMI (median, [IQR]) | 22.49 [19.59-25.29] |
| Comorbidities, n (%) | |
| CAD or CVD | 172 (34.26) |
| DM | 89 (17.73) |
| Chronic lung disease | 56 (11.16) |
| Chronic liver disease | 4 (0.80) |
| Chronic renal failure | 50 (9.96) |
| Solid tumor or hematologic malignancy | 80 (15.93) |
| Vital signs (median, [IQR]) | |
| SBP | 115.00 [94.00-139.00] |
| DBP | 68.00 [57.00-81.00] |
| HR | 95.00 [79.00-111.50] |
| BT | 36.80 [36.20-37.50] |
| COVID-19 treatment | |
| No steroid, no remdesivir | 0 (0.00) |
| Steroid only | 187 (37.25) |
| Remdesivir only | 32 (6.37) |
| Steroid + Remdesivir | 283 (56.37) |
| Laboratory data | |
| White blood cell count (x $10^6$/L) | 10245.00 [6750.00-14160.00] |
| Hemoglobin (g/dL) | 11.86±2.74 |
| Hematocrit (%) | 35.83±8.06 |
| Platelet (x $10^9$/L) | 175.50 [122.00-244.50] |
| C-reactive protein (g/dL) | 8.21 [2.14-17.26] |
| Procalcitonin (ng/mL) | 1.01 [0.29-4.37] |
| Urea nitrogen (mg/dL) | 30.40 [20.00-48.80] |
| Creatinine (mg/dL) | 1.24 [0.84-2.20] |
| Sodium (mmol/L) | 137.00 [133.60-141.00] |
| Potassium (mmol/L) | 4.30 [3.90-4.90] |
| Chloride (mmol/L) | 102.00 [7.00-106.00] |
| Outcomes | |
| MV in 7 days, n (%) | 244 (48.61) |
| 30-day mortality, n (%) | 209 (41.64) |
| 15-day mortality, n (%) | 164 (32.67) |
| Hospital LOS, days, median [IQR] | 13.00 [5.00-26.00] |

*abbreviations: BMI, body mass index; CAD, cardiovascular disease; CVD, cerebrovascular disease; SBP, systolic blood pressure; DBP, diastolic blood pressure; HR, heart rate; BT, body temperature; MV, mechanical ventilation; LOS, length of stay

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**Topic:** Infections and prevention

## 000544

## Macrophage pyroptosis is a key factor underlying the reduction in the severity of Omicron infection

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**Introduction:** Compared to early strains, the Omicron variant exhibits a significant reduction in the severity [1]. Exploring the specific mechanisms behind the reduction in the severity of Omicron variant will contribute to investigating effective approaches for preventing and treating severe complications triggered by viral infections [2]. It will also provide a theoretical basis for the establishment of a real-time monitoring system for the virulence of future COVID-19 mutant strains, allowing for a more comprehensive understanding of viral

evolution and the formulation of corresponding prevention and control strategies.
**Objectives:** To clarify the cellular and molecular mechanisms underlying the reduction in the severity of Omicron infection.
**Methods:** To explore the unique immune characteristics of severe patients infected with the Omicron variant, single-cell RNA sequencing (scRNA-seq) was performed on bronchoalveolar lavage fluid (BALF) from severe Omicron patients and healthy volunteers. The sequencing data were combined with publicly available scRNA-seq data from severe patients infected with the wild-type strain to analyze the specific differences between Omicron severe patients and wild-type strain-infected severe patients. After identifying the key cells responsible for the decrease in Omicron severity, pbmc-derived macrophages and PMA-induced THP1 cell lines were infected with different titers of the wild-type strain and Omicron variant in the BSL-3 laboratory. RT-PCR, RNA-Scope, and immunofluorescence were conducted to assess the differences in infectivity of different strains in macrophages. Western Blot and Elisa were used to detect differences in pyroptosis levels in macrophages infected with different strains, and a stable cell system expressing different encoded proteins from the wild-type strain and Omicron variant was constructed to clarify the specific mechanisms underlying the differences in pyroptosis levels.
**Results:** Integrated scRNA-seq data showed that the number of macrophages in the BALF of Omicron severe patients was significantly reduced compared with the wild-type strain. The Omicron variant exhibited weakened infectivity towards macrophages compared to the wild-type strain but significantly enhanced pyroptosis levels. Further research revealed that the pyroptosis of macrophages induced by Omicron was mainly mediated by the NLRP3 inflammasome pathway. By constructing a stable cell system expressing different encoded proteins from the wild-type strain and the Omicron variant, we found that the difference in pyroptosis levels was caused by proteins other than the S protein.
**Conclusions:** The Omicron variant exhibits reduced ability to attack macrophages compared to the wild-type strain but can induce strong pyroptosis, which may be an important factor underlying the reduction in the severity among Omicron-infected patients.

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3. The present study was supported by the Special Funds of the National Natural Science Foundation of China (No. 82341032).

**Topic:** Infections and prevention

## 000545

### Neurological Pupil Index changes after osmotic therapy in acute brain injured patients

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**Introduction:** Osmotic therapy plays a crucial role in managing cerebral edema, yet optimal timing, dosage, and administration frequency lack quantitative clinical guidance. Decisions for osmotic therapy are often based on intracranial pressure (ICP) values but also on pupillary asymmetry.
**Objectives:** To investigate whether osmotic therapy improved the Neurological Pupil Index (NPi), obtained via an automated pupillometry, in acute brain injured patients.
**Methods:** Retrospective analysis of prospectively collected data of acute brain injured patients admitted to the Intensive Care Unit (ICU) and requiring ICP monitoring. The lowest NPi measured before and within 2 h after the administration of either 20% mannitol (1 g/Kg) or 4% hypertonic saline (HTS) was used for the analysis. Neurologic Pupil Index is a composite metric ranging from 0 to 5, with > 3 indicating normal. Repeated measurements were analyzed using Wilcoxon signed-rank tests.
**Results:** Among 18 patients (traumatic brain injury, $n = 10$, cerebrovascular diseases, $n = 8$—median age 42 [32–61] years), 172 osmotic therapies were administered during the ICU stay ($n = 149$, 86.6% being HTS). Median ICP values significantly decreased after osmotic therapy (from 16 [13–20] to 14 [11–18] mmHg; $p < 0.001$). Also, NPi values significantly increased after osmotic therapy (from 4.1 [3.8–4.5] to 4.2 [3.7–4.6]; $p = 0.003$). This effect was similar regardless of ICP values prior to the intervention. However, the largest improvement in NPi values was observed in patients with baseline NPi 3 (from 1.0 [0.0–2.5] to 2.3 [1.3–3.5]; $p < 0.001$).
**Conclusions:** In this study, NPi improved following osmotic therapy in acute brain injured patients, in particular when pupillary function was altered prior to the intervention.

**Topic:** Neurointensive care

## 000546

### The impact of inflammation biomarkers on the neurological outcome of non-traumatic subarachnoid hemorrhage

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000546

**Introduction:** Subarachnoid hemorrhage (SAH) is a devastating condition associated with cerebral and systemic inflammation. The prognostic role of systemic inflammatory biomarkers such as C-reactive protein (CRP) and the neutrophil-to-lymphocyte ratio (NLr) have been studied in different pathologies such as sepsis or oncological conditions, but their role as prognostication markers after SAH has been poorly studied.
**Objectives:** To assess the prognostic role of CRP and NLr in non-traumatic SAH.
**Methods:** A retrospective single-center study of adult patients admitted with non-traumatic SAH to the intensive care unit (ICU) of a University Hospital from 2007 to 2023. Baseline information, clinical data, radiologic data, the occurrence of neurological and infective complications, as well as serum CRP and NLr levels during the first 7 days of ICU stay were collected. Unfavorable neurological outcome (UO) at 3 months was defined as a Glasgow Outcome Scale (GOS) of 1–3.
**Results:** Five hundred and forty-seven patients were included; 250 (45.7%) experienced UO. The highest serum CRP values during the first 7 days of ICU stay were significantly higher in patients with UO when compared to others (130 [56–220] vs 45 [20–100] mg/dl, $p > 0.001$). The highest NLr during the first 7 days of ICU was also significantly higher in patients with UO when compared to others (12.2 [7.9–17.6] vs 8.7 [5.2–13.4], $p > 0.001$). In the multivariate logistic regression model, the highest CRP value (OR 1.003 [95% CI 1.001–1.005]) was independently associated with the occurrence of UO, while the highest NLr (OR 1.020 [95% CI 0.994–1.041]) was not.
**Conclusions:** High CRP values had a significant prognostic value in SAH patients.

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**Topic:** Neurointensive care

## 000547

### Diurnal variation of analgosedation and associated factors in mechanically ventilated ECMO and non-ECMO ICU patients: a single-centre observational cohort study

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**Introduction:** Diurnal variation of analgosedation doses may worsen patient outcomes, including poor sleep quality, increased risk of failed spontaneous breathing trials, prolonged mechanical ventilation, prolonged coma, and delirium. Limited data describe factors associated with diurnal analgosedation drug dose variations in mechanically ventilated patients, particularly for those needing extracorporeal membrane oxygenation (ECMO).
**Objectives:** Our objective was to explore such factors comparing patients receiving ECMO with patients ventilated without ECMO.
**Methods:** We conducted a retrospective observational cohort of patients admitted to 5 Intensive Care Units (ICUs) including a commissioned ECMO unit (July 2021 to July 2023) at a tertiary academic centre in London, England. We collected data on all intravenous analgosedation (fentanyl, midazolam, and propofol) dosing commencing from the next 07:00 to 19:00 (day) or 19:01 to 06:59 (night-time) timepoints (whichever earliest) excluding bolus doses in the following 48 h. We generated multi-variable linear regression models for diurnal analgosedation dose variation with demographic and clinical independent variables selected a priori based on expert opinion and existing evidence.
**Results:** We included 1277 patients. Most patients were male (63.8%), median (IQR) age 58 (42–70) years; most common diagnosis cardiovascular failure (37.9%). Of these, 166 (12.9%) received ECMO support for a median (IQR) duration of 10 (6–20) days. Median (IQR) diurnal analgosedation dosing variation in ECMO vs non-ECMO patients for fentanyl and midazolam was 0 (−350 to 450) vs −60 (−675 to 300) micrograms ($p < 0.001$); 0 (−38 to 36) vs 6 (−23 to 30) milligrams ($p = 0.123$), respectively. Median (IQR) diurnal analgosedation dosing variation in ECMO vs non-ECMO patients for propofol was 60 (−300 to 480) vs −100 (−630 to 260) milligrams ($p < 0.001$).
In our multivariable linear regression models, we observed no diurnal variation associations with fentanyl and midazolam but did identify an association with lower night-time propofol doses with ECMO (216.41; 95% CI 108.45, 324.36). We also observed that higher night-time fentanyl doses was associated with older age (−5.17; 95% CI −7.53, −2.81) and lower night-time fentanyl dose with higher APACHE II (Acute Physiology and Chronic Health Evaluation) score (9.91; 95% CI 3.73, 16.07); higher night-time midazolam dose with higher admission SOFA (Sequential Organ Failure Assessment) score (−1.59; 95% CI −2.92, −0.25); lower night-time propofol dose with higher APACHE II score (6.35; 95% CI 0.56, 12.14). ICU mortality was 19.7%.
**Conclusions:** This study confirmed that there was no diurnal variation associated with ECMO for fentanyl and midazolam dosing but did identify an association with lower propofol dosing overnight in ECMO patients. Other variables associated with diurnal drug dose variation were age, APACHE II score, and SOFA score.

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12. Dr McKenzie declares research funding from the Southampton Research Leaders Programme.

**Topic:** Sedation, analgesia, and delirium

## 000549

### RésiRéa study: identifying the factors involved in the resilience of intensive care patients

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**Introduction:** The extreme intensity and suddenness of intensive care is a real somatic and psychological catastrophe for the patient and constitutes a major risk factor for psychological trauma. Resilience, which has been little studied in intensive care, is a dynamic phenomenon which involves adapting to traumatic situations by mobilising resources both internal and external to the individual to bounce back. In this context, the study of the resilience process represents a major challenge in reducing psychotraumatic disorders and improving patient support.
**Objectives:** The aim of this study is to gain a better understanding of the factors that promote or inhibit the resilience process in patients during and following their stay in intensive care.
**Methods:** In addition to the NUTRIREA-3 study, RésiRéa is a prospective, longitudinal study involving 42 intensive care units in France. At two different moments (3 months and 1 year after resuscitation),

patients hospitalised in a critical condition were asked to respond to 5 scales, including one assessing post-traumatic stress (IES-R) and resilience (CD RISC). Of the 380 patients included, 42 randomly identified patients underwent a semi-structured interview recorded by telephone 1 year after their hospitalisation. The interviews addressed 3 main themes: the experience of resuscitation and post-resuscitation, the difficulties encountered throughout the care pathway, and the coping skills and solutions found to overcome the difficulties. The interviews were transcribed and analysed using Nvivo software to produce a thematic analysis.
**Results:** The sample of 42 patients was made up of 19 women and 23 men. Of these patients, 52% presented significant psycho-traumatic symptoms between 3 months and 1 year after discharge. The patient's resilience is built up over 3 phases: resistance, reconstruction of identity, and a new sense of the experience. There are also factors that favour the resilience process, such as social support, knowledge of one's pathology or fighting spirit, and others that inhibit it, such as isolation, lack of verbalization, or incomplete recovery.
**Conclusions:** These results allow us to identify a model of resilience specific to the intensive care patient. This model can be used to inform the professionals involved in the patient's care of the factors which contribute to the development of resilience and reduce the risk of the psychological trauma becoming chronic.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000550
### Clinical significance of transjugular liver biopsy in acute liver failure
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**Introduction:** Histopathological characterization obtained by transjugular liver biopsy (TJLB) may theoretically contribute to clarification of the exact aetiology of acute liver failure (ALF). However, it is unclear if the histopathological information obtained by performing TJLB is able to significantly contribute to diagnosis of ALF aetiology, therapeutic decision-making, and prediction of overall prognosis.
This study aimed to analyze safety and clinical significance of TJLB in patients with ALF.
**Methods:** This retrospective, monocentric study investigated safety and efficacy of TJLB in patients with ALF over a 10-year period at a large transplant-center. The predictive value of various clinical and laboratory characteristics as well as histopathological findings obtained by TJLB on the primary endpoint, 28-day liver-transplant-free survival, were evaluated by calculating uni- and multivariate Cox-proportional hazard regression models. Additional univariate logistic regression analyses were performed to explore the influence of degree of intrahepatic necrosis on the secondary endpoints intensive-care-unit (ICU) admission, need for endotracheal intubation, renal replacement therapy, and high-urgency listing for LTX.
**Results:** A total of 43 patients with ALF receiving TJLB were included into the study. All patients had manifest hepatic encephalopathy at the time of biopsy and 17 (39.5%) patients were already admitted to the ICU. TJLB was performed safely in all patients, but in the majority of cases, the biopsy only confirmed the initially already presumed ALF aetiology ($n = 41/43$ cases), and a change in specific therapeutic approach could be noted in none of the patients. None of the Ishak subscore categories showed a predictive value on liver transplant-free survival. While the majority of 31 patients (72%) had significant intrahepatic necrosis according to the Ishak score, the exact histopathological degree of intrahepatic necrosis in the TJLB specimen varied substantially in individual patients [Median (IQR): 60% (10–90)]. While the degree of intrahepatic necrosis showed significance in the univariate analysis ($p = 0.04$), it did not demonstrate a significant predictive effect on liver transplant-free survival in the multivariate analysis. Extent of intrahepatic necrosis was neither associated with later need for intubation and invasive ventilation, RRT or HU listing for LTX. Only consecutive ICU admission was more likely with higher extent of intrahepatic necrosis [Odds ratio (OR) 1.04 (95% CI 1–1.08), $p = 0.046$].
**Conclusions:** TJLB in ALF was safe but rarely led to a change in suspected diagnosis or significant change in therapeutic measures, suggesting that clinical assessment alone was often accurate and that additional histopathological findings served to rather confirm than substantially alter treatment planning. Future prospective studies could help to clarify the role of TJLB in the diagnostic and therapeutic approach of ALF.

**Topic:** Metabolism, endocrinology, liver failure, and nutrition.

## 000552
### Cost effectiveness of mechanical ventilation in patients older than 75 years with severe acute respiratory distress syndrome due to COVID-19
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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000552

**Introduction:** The efficacy of invasive mechanical ventilation (IMV) in managing acute respiratory distress syndrome (ARDS) secondary to COVID-19 (C-ARDS) among patients aged over 75 with severe disease remains uncertain. This study aims to assess the healthcare costs for this demographic and evaluate the effectiveness of IMV in the older population in terms of hospital mortality.
**Objectives:** To describe the costs of care for patients over 75 years old with severe ARDS and to evaluate the risk factors associated with in-hospital mortality in this population.
**Methods:** Observational retrospective cohort study, encompassing all patients aged 75 or older diagnosed with severe C-ARDS and admitted between March 2020 and July 2021. The costs were measured in Colombian pesos; results are presented in dollars (1 US dollar = $4,000 Colombian pesos, the average representative rate for the study's development stage).
**Results:** The final analysis included 530 patients, with a median age of 81 years (interquartile range [IQR] 77–85), and recorded 397 deaths (75%). The average cost per patient was $4,955 standard deviation [SD] $5,600; 95% confidence interval [CI] $4,480 to $5,430). For patients undergoing IMV, the average cost was $8,630 (SD $6,532; 95% CI $ 8,073 to $ 9,186), significantly higher than $ 2,026 (SD $1,850; 95% CI $1,868 to $ 2,183) for those managed with alternative oxygen administration systems ($p < 0.000$). The average cost difference was $ 6,604 (95% CI $5,742 to $7,465, $p < 0.000$) (Table 1). Invasive mechanical ventilation was presented as the higher risk factor for in-hospital mortality (OR 3.88 CI 1.99 to 7.57, $p < 0.000$) Figure 1. The hospital mortality rate was notably higher in the IMV group compared to the other oxygen administration system group, with a difference of 13.8% (82.6% vs. 68.8%, 95% CI 6.6% to 20.9%, $p < 0.000$) Table 2.

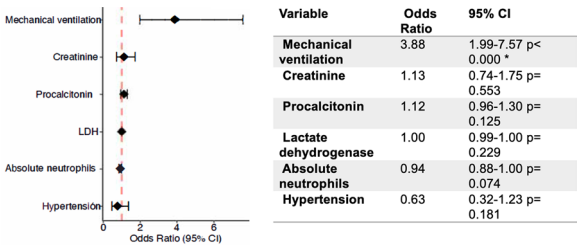
**Table 1 (abstract 000552)** Severe ARDS patient costs over 75 years in dollars

| Severe ARDS patient costs over 75 years in dollars | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Total, patients ($n=530$) | | Survivors upon discharge ($n=133$) | | Deceased ($n=397$) | | Difference |
| | Average | Standard deviation | Average | Standard deviation | Average | Standard deviation | |
| Total cost | $4.955 ([CI] 95% $4.480–$5.430) | $5.600 | $5.860 ([CI] 95% $4670–$7049) | $6.997 | $4.652 ([CI] 95% 4155–$5148) | $5.051 | $1.208 ([CI] 95% $−80.76–2496) p = 0.066 |
| Severe ARDS patient costs over 75 years in dollars | | | | | | | |
| | Total, patients ($n=530$) | | Ventilated ($n=235$) | | Non-ventilated ($n=295$) | | Difference |
| | Average | Standard deviation | Average | Standard deviation | Average | Standard deviation | |
| Total cost | $4.955 ([CI] 95% $4.480–$5.430) | $5.600 | $8.630 ([CI] 95% $8.073–$9.186) | $6.532 | $2.026 ([CI] 95% $1.868–$2.183) | $1.850 | $6.604 ([CI] 95% $ 5.742–$7.465) $p < 0.0000$ |

**Table 2 (abstract 000552)** Difference in the proportion of hospital mortality between the IMV group and the other oxygen administration system group

| | Survivors | Deceased |
|---|---|---|
| Invasive mechanical ventilation | 41 (17.4%) | 194 (82.6%) |
| Not ventilated | 92 (31.1%) | 203 (68.8%) |
| Average proportion difference | 13.7%([CI] 95% 6.5%-20.9%, $p < 0.000$) | 13.8% ([CI] 95% 6.6%-20.9%, $p < 0.000$) |

**Conclusions:** The decision to utilize IMV in severe C-ARDS patients aged over 75 should be individualized due to its potential association with increased in-hospital mortality. Moreover, IMV was found to substantially escalate healthcare costs by over fourfold.




| Variable | Odds Ratio | 95% CI |
|---|---|---|
| Mechanical ventilation | 3.88 | 1.99-7.57 p< 0.000 * |
| Creatinine | 1.13 | 0.74-1.75 p= 0.553 |
| Procalcitonin | 1.12 | 0.96-1.30 p= 0.125 |
| Lactate dehydrogenase | 1.00 | 0.99-1.00 p= 0.229 |
| Absolute neutrophils | 0.94 | 0.88-1.00 p= 0.074 |
| Hypertension | 0.63 | 0.32-1.23 p= 0.181 |

**Fig. 1 (abstract 000552)** Multivariate analysis presenting the odds ratio (OR) for each covariate showed that the only significant OR was the use of invasive mechanical ventilation, with a value of 3.88 ([CI] 95% 1.99–7.57, $p < 0.000$). LDH = Lactate dehydrogenase

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**Topic:** Health services research and outcome.

## 000553

### Influence of patient age and gender on alarm-threshold changes in the intensive care unit: a retrospective observational study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000553

**Introduction:** Bedside monitoring is crucial for the early identification of acute critical events characterised by abnormalities in vital signs, such as heart rate, blood pressure, and oxygen saturation. Alarm thresholds are set by medical personnel based on their experience and patient assessment, affecting overall alarm load [1, 2]. Nevertheless these threshold-based alarms, which are not automatically aligning with patient physiology, result in a high number of false-positive alarms. Previous research has shown that an excessive frequency of alarms contributes to "alarm fatigue" [3], which adversely affects patient safety [4]. This raises the question to which a patient's characteristics influence the threshold changes made by the operator and the resulting alarm load.
**Objectives:** Our aim is to analyze how different characteristics influence the amount of threshold changes and alarm load.
**Methods:** Following IRB approval (Ethics vote no. EA1/127/18), this retrospective analysis included adult patients admitted to a German ICU between July 2019 and June 2021, who stayed at least 24 h with annotated alarm data [5]. To ensure data quality and minimize the impact of extreme observations, we conducted outlier detection using Z-scores for the daily alarm load. Data points with a Z-score exceeding 3 or less than -3 were considered outliers and excluded from the analysis, resulting in a removal of 36 patients. In this study, we analyzed data from bedside monitors recording heart rate, blood pressure and oxygen saturation. The dataset provided details of a total of 318 180 alarm threshold changes for 1101 different patients with a total alarm load of 1 389 757 alarms. We defined 'alarm load' as the cumulative number of alarms triggered. The primary endpoint of this study is the frequency of threshold changes in different gender and age groups. In addition, the temporal pattern of these threshold adjustments in relation to patients' ICU admission were examined. Furthermore, the analysis aimed to reveal the distribution of total alarm incidence across gender and age groups compared to the threshold changes. Given the high volume of alarms, we opted for descriptive analysis over hypothesis testing, examining trends in thresholds and alarm rates by demographic and post-admission intervals.
**Results:** A breakdown of the threshold changes by physiological parameters reveals that 33 620 were related to heart rate (10.6%), 236 322 to blood pressure (74.3%) and 48 238 to oxygen saturation (15.2%). The mean age of the patient population was calculated to be 69.8 years with an average length of stay of 28.5 days. On average, each patient was associated with 1373.8 alarms and underwent 283.3 Threshold adjustments.

Further analysis reveals that older patients experience significantly more alarms and threshold adjustments. For example the age group 90–99 has on average 54.4% more threshold changes and 85.5% additional alarms compared to the age group 20–29. Furthermore, the data show a peak in both threshold changes and alarms on the second day after admission, indicating the most critical period for patient monitoring before a subsequent decline.

**Conclusions:** This study investigates the alarm load and threshold changes of blood pressure and heart rate parameters on an ICU of a large German University Medical Center. It turned out that older patients have a higher alarm load and undergo more frequent threshold changes, especially notable on the second day after admission. This indicates that the threshold values should be set more carefully, especially in older patients, to reduce the majority of the alarm load. The analysis shows that the second day after admission is particularly relevant for achieving this. Further research is needed to understand whether alarm thresholds are initially set inefficiently, particularly in older people, and whether better alarm threshold management can reduce the alarm load.

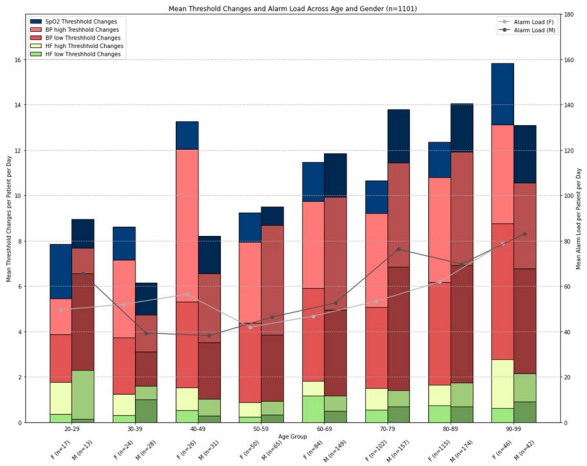


**Fig. 1 (abstract 000553)** Distribution of threshold changes and alarm load stratified by gender (F: female, M: male) and age (decade of life). Threshold changes are summarized for vital sign parameters routinely monitored on intensive care units: Blood Pressure (BP), Heart Frequency (HF), and Oxygen Saturation (SpO2). Alarm load is defined as the cumulative number of alarms triggered by deviations from preset parameter thresholds

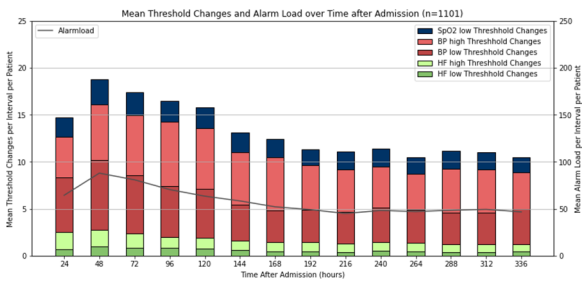


**Fig. 2 (abstract 000553)** Distribution of threshold changes and alarm load segmented into 24-h intervals following a patient's admission to the ward. Threshold changes are summarized for vital sign parameters routinely monitored on intensive care units: Blood Pressure (BP), Heart Rate (HF), and Oxygen Saturation (SpO2). Alarm load is defined as the cumulative number of alarms triggered by deviations from preset parameter thresholds

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7. Last authorship is shared by Kirsten and Flint.

**Topic:** Health services research and outcome

## 000556

### Effects of endovascular therapy in patients with massive pulmonary embolism receiving extra-corporeal membrane oxygenation (ECMO)

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**Introduction:** Extracorporeal membrane oxygenation (ECMO) is increasingly employed to support patients with massive pulmonary embolism (PE) (1,2). However, the additional role of endovascular therapies (ET) (catheter-directed thrombolysis or thrombo-aspiration) to anticoagulation alone in patients receiving ECMO is unclear (3–5).

**Objectives:** Compare patients on ECMO for massive PE receiving ET and patients managed with anticoagulation alone.

Our primary outcome was reduction in vasoactive-inotropic score. Secondary outcomes and measures were changes in lactate concentration and right-ventricular function. We also report ICU mortality and complications.

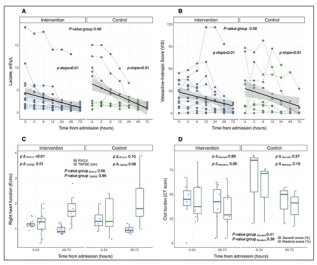
**Methods:** Retrospective cohort study of patients presenting with massive PE to two high-volume ECMO centers in London, UK between 2014 and 2024. Patients receiving ET procedures (intervention group) were compared to those receiving anticoagulation alone (control group). Longitudinal physiological, echocardiographic, and radiographic data were extracted, including lactate, vasoactive-inotropic score (VIS), echocardiographic parameters, and clot burden at CT scan (6).

**Results:** We identified 26 patients receiving ECMO for massive PE. Sixteen patients (62%) underwent ET procedures, of whom 9 (56%) received USAT (ultrasound-accelerated catheter directed

thrombolysis), 4 (25%) received thrombo-aspiration, and 3 (19%) received both. Ten patients (38%) received anticoagulation alone.
There were no significant differences in baseline characteristics between groups (Table 1). Both groups demonstrated improvement in VIS, lactate, RV:LV ratio, TAPSE, EtCO2/PaCO2, and clot burden on CT (Figures 1 and 2). There were no differences between groups in the rate of improvement for any parameter. There was no difference in mortality between groups [31% for intervention group, 40% for controls ($p = 0.69$)] or complications.
**Conclusions:** In patients receiving ECMO for massive PE, endovascular treatment did not result in faster resolution of shock of right-ventricular function. The role of ET in this population supported by ECMO warrants further investigation.

| Baseline characteristics | Control (n=10) | Intervention (n=16) | p-value |
|---|---|---|---|
| Demographics | | | |
| Age, years, median [IQR] | 49 [31–56] | 50 [40–59] | 0.56 |
| BMI, kg/m², median [IQR] | 28.4 [25 – 40.8] | 30.1 [25.9 – 36.8] | 0.86 |
| PESI, median [IQR] | 173.5 [136.3–186.3] | 148 [138.5–202.8] | 0.94 |
| Cardiac arrest prior to ECMO, n (%) | 7 (70%) | 9 (56%) | 0.68 |
| Congestive heart failure, n (%) | 1 (10%) | 0 (0%) | 0.38 |
| Previous chronic lung disease, n (%) | 3 (30%) | 3 (19%) | 0.64 |
| Previous stroke, n (%) | 0 (0%) | 1 (6.3%) | >0.99 |
| Bleeding, n (%) | 0 | 1 (6.3%) | >0.99 |
| Type of ECMO | | | |
| VA, n (%) | 3 (30%) | 4 (25%) | |
| VV, n (%) | 7 (70%) | 11 (69%) | |
| CT findings | | | |
| Main bilateral, n (%) | 1 (10%) | 8 (50%) | |
| Main unilateral, n (%) | 5 (50%) | 4 (25%) | |
| Saddle, n (%) | 1 (10%) | 0 | |
| Segmental bilateral, n (%) | 2 (20%) | 3 (19%) | |
| Segmental unilateral, n (%) | 1 (10%) | 1 (6.3%) | |
| RV strain, n (%) | 8 (80%) | 14 (88%) | |
| Quandi score (%), median [IQR] | 61% [20-83] | 50% [38-75] | 0.85 |
| Mastora score (%), median [IQR] | 50% [3-67] | 57% [34-72] | 0.39 |
| ECHO findings | | | |
| RV:LV ratio, median [IQR] | 1.20 [1.10–1.35] | 1.20 [1.10–1.20] | >0.99 |
| TAPSE, cm, median [IQR] | 1.80 [1.25–2.20] | 1.28 [0.99–1.43] | >0.063 |
| ECMO setting at admission | | | |
| BF, L/min, median [IQR] | 4 [2.9–4.4] | 4.22 [3.7–4.4] | 0.34 |
| SGF, L/min, median [IQR] | 3.3 [3–4] | 2.8 [2–4] | 0.32 |
| $FdO_2$, median [IQR] | 100 [100–100] | 100 [93–100] | 0.72 |
| $SvO_2$, median [IQR] | 77 [66–84] | 78 [73–81] | >0.99 |
| Bolus of UFH at cannulation, n (%) | 7 (70%) | 10 (63%) | >0.99 |
| Systemic thrombolysis pre-ECMO, n (%) | 5 (50%) | 7 (44%) | >0.99 |
| Physiological variable at admission | | | |
| Lactate, median [IQR] | 5.35 [2–9.78] | 2.9 [1.57–4.73] | 0.49 |
| VIS, median [IQR] | 30 [0–43] | 21 [13–33] | 0.60 |
| BE standard, median [IQR] | -5.1 [-8.6 - -3.1] | -3.2 [-6.6 - -0.1] | 0.17 |
| SID, median [IQR] | 38 [34–42] | 36 [33–39] | 0.30 |
| Creatinine, micromole/L, median [IQR] | 155 [130–173] | 138 [98–196] | 0.71 |
| Bilirubin, micromole/L , median [IQR] | 10 [7.5–14.8] | 18.5 [13.8–21.5] | 0.10 |
| ALT, micromole/L, median [IQR] | 127 [59–412] | 102 [49–509] | 0.92 |
| Albumin, micromole/L, median [IQR] | 25 [22–26] | 27 [24–30] | 0.46 |
| PLTs per microliter of blood, median [IQR] | 129 [91–170] | 176 [129–200] | 0.22 |
| Hb, g/L, median [IQR] | 90 [74–116] | 104 [97–111] | 0.13 |
| INO, n (%) | 4 (40%) | 7 (44%) | >0.99 |
| Timing | | | |
| Length of stay (LOS), days, median [IQR] | 14 [8–22] | 15 [9–29] | 0.69 |
| Length of ECMO (LOE), days, median [IQR] | 5 [3–11] | 7 [4–21] | 0.26 |
| Length of ventilation (LOV), days, median [IQR] | 7 [5–20] | 14 [5–32] | 0.41 |
| Diagnosis to ECMO, hours, median [IQR] | 16 [9–21] | 31 [21–48] | 0.027 |
| Lysis to ECMO, hours, median [IQR] | 20 [12–22] | 17 [8–52] | >0.99 |
| ECMO to Intervention Radiology, hours, median [IQR] | / | 11 [3–21] | / |
| Outcomes | | | |
| Death, N (%) | 4 (40%) | 5 (31%) | 0.69 |
| Bleeding, N (%) | 4 (40%) | 10 (63%) | 0.42 |
| Thrombosis, N (%) | 4 (40%) | 9 (56%) | 0.42 |
| RBC transfusion, Unit, median [IQR] | 6 [3–9] | 3 [1–4] | 0.079 |
| RRT requirement, n (%) | 4 (40%) | 4 (25%) | 0.66 |

Legend - Bleeding is including Gusto 1 and 2, hemodynamic bleeding with hemodynamic compromised, including ICH and bleeding that required blood transfusion. Thrombosis is including stroke, limb ischemia and other type of thrombosis.



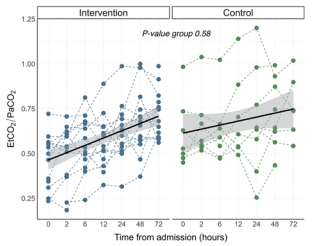




**Table 1, Figs. 1 and 2 (abstract 000556)** Table 1—Baseline characteristics of patieitns on ECMO for PE that undergone to intervention radiologist procedure versus standard teretment. Figure 1—Physiological outcomes trend in the first 72 h from ECMo cannulation. Figure—$EtCO_2/PaCO_2$ trend in the first 72 h from ECMO cannulation

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**Topic:** Cardiovascular issues in ICU.

## 000557

### Early administration of intravenous hydrocortisone prevent septic encephalopathy in patients admitted for sepsis: a randomised controlled study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000557

**Introduction:** Some authors [1] investigated the effect of intravenous hydrocortisone (HC) on rats with septic encephalopathy (SE) and observed a significant improvement of brain injury. Therefore, we hypothesized that early administration of intravenous hydrocortisone in patients with sepsis [2] could prevent the incidence of SE.
**Objectives:** To evaluate the early intravenous (IV) administration of hydrocortisone on the incidence of SE, in patients with sepsis, from the first hour of ICU admission.
**Methods:** We enrolled 60 patients, 62 + −10 years old with sepsis admitted in ICU department of university hospital between 2017 and 2019.
All the patients had the same severity scores on admission, and were conscious with Glasgow score of 15, breathing spontaneously, hemodynamically stable, without signs of SE.
The patients were randomised into 2 groups of 30:
**The hydrocortisone group** (HC) receiving from the first hour of ICU admission a total dose of IV 200 mg HC spread over 24 h with boluses of 50 mg every 6 h and during 3 days.
**The control group** receiving saline as placebo with the same protocol as HC.
We recorded in the 2 groups the incidence of SE as delirium, agitation, epilepsy crisis or coma, Glasgow score every day, SOFA score day 1 and day 4, mean arterial pressure, blood lactate, C-reactive protein, the incidence of mechanical ventilation, ICU stay, hospital length of stay, and 28 day mortality.
**Results:** Statistical analysis used Mann–Whitney test and results expressed as Mean + -STD deviation.

**Table (abstract 000557)** Variables in relation with outcome in hc and control group

| Control group | | HC group | *P* |
|---|---|---|---|
| SE incidence % | 30% | 5% | 0.001 |
| MAP mmHG | 65 + −5 | 79 + −4 | 0.03 |
| LACTATE mmol/l Day1 | 3.1 + −0.2 | 2.8 + −02 | 0.12 |
| GLASGOW SCORE Day 4 | 10 + −2 | 15 + −1 | 0.001 |
| SOFA score day4 | 7 + −0.2 | 3 + −0.3 | 0.003 |
| ICU STAY (days) | 15 + −3 | 10 + −2 | 0.001 |
| 28 Day mortality | 50% | 25% | 0.001 |

**Conclusions:** We observed that hydrocortisone early administered decreases the incidence of septic encephalopathy in patients admitted

with sepsis and so improve survival. Glucorticoids could attenuate [3], and prevent the effect of cytokines on the brain.
A large randomised controlled study is needed to confirm these interesting results.

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**Topic:** Sepsis

## 000558

## Evolution of respiratory mechanics during the first five days of mechanical ventilation in patients with COVID-19 ARDS: a retrospective cohort study


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**Introduction:** Protective mechanical ventilation (PMV) is globally implemented; however, despite its application, mortality rates in COVID-19-related ARDS (C-ARDS) remain high.
**Objectives:** To describe the evolution of respiratory mechanics (RM) and ventilation parameters (VP) in patients with C-ARDS during the first 5 days of mechanical ventilation (MV).
**Methods:** A retrospective cohort study that describes the evolution of RM and VP in patients with C-ARDS during the first 5 days of MV. The evolution of VP over time was modeled using linear models fitted with generalized least-squares methods (GLS).
**Results:** A total of 995 patients were included and 664 patients died. Table 1 shows inflammatory markers, severity scores and oxygenation. The median age was 67 years [IQR 59–74]. GLS models are presented in Table 2 showing the average RM parameter on Day 0 and the average increase per follow-up day (Figure 1). Despite these differences, the observed changes in RM variables were not clinically significant.

**Table 1 (abstract 000558)** Summary of inflammatory markers, severity scores, and oxygenation index

| | Overall patients $n=995$ | Survivors $n=331$ (33.2%) | Non-survivors $n=664$ (66.7%) | *p* value |
|---|---|---|---|---|
| Median age [IQR] | 67 [59–74] | 61 [53–70] | 69 [62–76] | < 0.01* |
| PaO2/FiO2 | 59.2 [49–74.5] | 67.3 [55.9–86.1] | 55.3 [46.6–66.6] | < 0.01* |
| Leukocytes (cells × $10^6$/L) Median [IQR] | 9,335 [6832–13250] | 10,090 [7450–14140] | 9000 [6560–12535] | 0.003* |
| Procalcitonin (ng/ml) Median [IQR] | 0.55 [0.22–1.59] | 0.37 [0.16–1.04] | 0.68 [0.27–2] | < 0.01* |
| Ferritin (ng/ml) Median [IQR] | 1295 0.5 [847–2357] | 1142 [836–1569] | 1517 [860–2474] | 0.02* |
| Charlson Index Median [IQR] | 3 [2–3] | 2 [1–3] | 3 [2–4] | < 0.01* |
| SOFA Score Median [IQR] | 10 [8–10] | 9 [8–10] | 10 [9–10] | < 0.01* |

**Table 2 (abstract 000558)** Summary of GLS models. TV: Tidal volume, IBW: Ideal body weight, Cst: Static compliance, MP: Mechanical Power, ***p* < 0.05.**

| Model | TV | | TV adjusted to IBW | | DP | | Cst | | MP (Gattinoni) | | MP (Amato) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intercept | 415.24 [IC 95% (409.35–421.13)] | *p* | 7.17 [IC 95% (6.83–7.51)] | *p* | 12.00 [IC 95% (11.63–12.37)] | *p* | 37.75 [IC 95% (35.44–40.06)] | *p* | 16.46 [IC 95% (15.87–17.05)] | *p* | 65.78 [IC 95% (64.26–67.30)] | *p* |
| Coefficient 1 | 7.13 [IC95% (5.66–8.59)] | 0.00* | 0.12 [IC 95% (0.10–0.15)] | 0.00* | -0.05 [IC 95% (−0.18–0.07)] | 0.41 | 0.94 [IC 95% (0.03–1.85)] | 0.04* | 0.69 [IC 95% (0.50–0.88)] | 0.00* | 0.16 [IC 95% (−0.37–0.70)] | 0.54 |
| Coefficient 2 | −4.18 [IC95% (−11.42–3.05)] | 0.25 | 0.12 [IC 95% (−0.28–0.54)] | 0.54 | 0.34 [IC 95% (−0.11–0.79)] | 0.14 | -0.83 [IC 95% (−3.68–2.01)] | 0.56 | 0.75 [IC 95% (0.02–1.48)] | 0.04* | 1.99 [IC 95% (0.12–3.87)] | 0.03* |
| Coefficient 3 | −1.35 [IC95% (−3.17–0.46)] | 0.14 | −0.03 [IC 95% (−0.06–0.00)] | 0.05 | 0.18 [IC 95% (0.018–0.34)] | 0.02* | −0.87 [IC 95% (−1.99–0.24)] | 0.12 | −0.04 [IC 95% (−0.27–0.19)] | 0.72 | 0.57 [IC 95% (−0.09–1.23)] | 0.09 |

**Conclusions:** Differences in RM and VP are not clinically significant during the first 5 days of MV. Age, greater comorbidity burden, PaO2/FiO2, and inflammation impact mortality in C-ARDS.

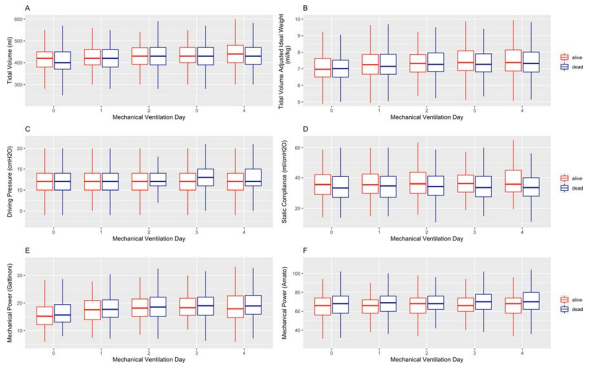


**Fig. 1 (abstract 000558)** Evolution of different mechanical ventilation parameters over time with linear models using generalized least squares

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**Topic:** Acute respiratory failure and mechanical ventilation

**000560**

## Intrapulmonary concentrations of ceftolozane/tazobactam and ceftazidime/avibactam administered by continuous infusion in critically ill patients with nosocomial pneumonia: a pharmacokinetic clinical trial

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000560
**Introduction:** Ceftazidime–avibactam (CTZ) and ceftolozane–tazobactam (CFT) are two antibiotics used in the treatment of nosocomial pneumonia (NN) caused by Gram-negative bacilli. The efficacy of these new β-lactams (BL) + β-lactamase inhibitors (BLIs) may be affected by their concentration at the site of infection.
**Objectives:** The aim was to assess the pharmacokinetics (PK) in plasma and epithelial lining fluid (ELF) of CTZ and CFT administered by continuous infusion (CI) in critically ill patients with NN, and to analyse the differences in lung penetration and clinical outcomes.
**Methods:** Randomized clinical trial conducted at the Surgical Intensive Care Unit (ICU) at the Hospital del Mar (June 2022–March 2024). Demographics, APACHE score at ICU admission, SOFA score at NN diagnoses, clinical cure, and 30-day all-cause mortality were recorded. After randomization, CTZ or CFT at conventional doses were administered by CI after an initial loading dose (LD) of 2000 mg. Plasma levels were determined at the following time points: after LD (Cmax), 1 h, 4 h, 8 h, and day 3 (Css_day3). On the third day, fibrobronchoscopy with bronchoalveolar lavage was performed once per subject, 2, 4, 6, or 8 h after the last infusion to determine drug concentrations in ELF. PK parameters were estimated from individual plasma concentrations and the composite ELF concentration–time profile. BL and BLIs levels were measured by HPLC in plasma and by mass spectrometry in ELF. The pharmacokinetic/pharmacodynamic (PK/PD) target for beta-lactams was 100% fT > 4 times the MIC (8 ceftazidime and 4 ceftolozane), and 100% fT > critical concentration, which was considered to be 1 mg/L for avibactam and 2 mg/L for tazobactam.
**Results:** Twenty patients were included, 10 in each arm. The clinical and PK characteristics of the patients are shown in Table 1. No significant differences were found in the plasma or ELF concentrations of BL or BLIs. Plasma BLs' concentrations after the LD are shown in Figure 1 and plasma BLIs concentrations after the LD are shown in Figure 2. Ceftolozane plasma and ELF AUC0-8 are 1731.6 mg*h/L and 376 mg*h/L, respectively; ceftazidime plasma and ELF AUC0-8 are 1795.2 mg*h/L and299, respectively; tazobactam plasma and ELF AUC0-8 are 225.6 mg*h/L and 38.1 mg*h/L, respectively, and avibactam plasma and ELF AUC0-8 are 242.4 mg*h/L and 39.4 mg*h/L, respectively. Pulmonary penetration is 21.7% for ceftolozane and 16.7% for ceftazidime, 16.89% for tazobactam, and 16.3% for avibactam. In both cases, concentrations of BLs in ELF remain 100% fT > 4 times the MIC for all susceptible bacteria and BLIs remain 100% fT > critical concentration in ELF in all cases.

**Table 1 (abstract 000560)**

| | Ceftolozane/tazobactam | Ceftazidime/avibactam | *p* |
|---|---|---|---|
| Gender male, *n* (%) | 6(60) | 9(90) | 0.121 |
| APACHE score* | 20.5 (17–22) | 16.5 (13–20) | 0.184 |
| SOFA score* | 4.5 (3–7) | 5 (3–8) | 0.848 |
| Estimated GFR at baseline (CKD-EPI) (mL/min/1.73 $m^2$)* | 92 (84.25–114.37) | 82 (43–86) | 0.058 |
| Mechanical ventilation, *n* (%) | 4 (40) | 5 (50) | 0.653 |
| BL plasma Css_day3 | 72.2 (61.8–104.4) | 74.8 (72.8–108.5) | 0.624 |
| BLI plasma Css_ day3 | 9.4 (7.6–17.3) | 10.1 (7.1–11.4) | 0.624 |
| BL ELF Css* | 45.8 (27.7–48.4) | 13.1 (10.8–46.7) | 0.067 |
| BLI ELF Css* | 4.46 (3.65–6.41) | 3,75 (2.28–8.04) | 0.630 |
| Clinical cure, *n* (%) | 9 (90) | 8 (80) | 0.531 |
| 30-days all-cause mortality, *n* (%) | 1 (12.5) | 2 (20) | 0.671 |

*Median (IQR). GFR, glomerular filtration rate
**Conclusions:** CTZ and CFT administered by CI achieve plasma and pulmonary levels sufficient to meet the established PKPD targets in critically ill patients with nosocomial pneumonia.
**Fig. 1 (abstract 000560)**

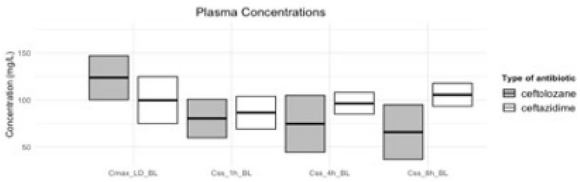
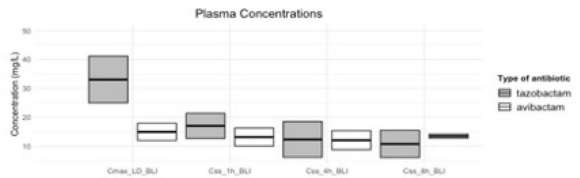



**Fig. 2 (abstract 000560)**

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**Topic:** Infections and prevention

**000561**

## Delivering critical care ultrasound training to Europe: 2 years of courses—lessons learnt and the road ahead

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000561

AQ34 **Introduction:** The use of critical care ultrasound (CCUS) is a core competencies of intensive care medicine. Whilst it has been over a decade since the key landmark publications, the most recent ESICM supported competencies for core skills for the general intensivists were published in 2021. Since then, the ESICM has conducted 2 courses (GENIUS) at the congress to educate and overcome of the barriers which have been reported by colleagues in achieving these competencies.
**Objectives:** To follow up the attendees from the 2 GENIUS ultrasound course with regards to their ongoing ultrasound skill development and progress.
To identify potential barriers for further development.
**Methods:** Online, focussed survey of all 60 participants that attended the 2022 & 2023 GENIUS course in Paris and Milan, respectively. The themes of the questions included basic demographics of the participants, professional development, and barriers since attending the course. Participants were also asked for suggestions on how the CCUS training could be improved.
**Results:** 27 participants, from all 5 continents, responded with 65% being of more than 5 years of experience in intensive care. The cardiac and lung modules were thought to be the most useful in their clinical practice and the neuro module being the least useful.
Despite having their confidence level in performing ultrasound examination improve after the course, the majority of respondents felt that their frequency of scanning was mostly unchanged.
67% of respondents continued to scan regularly as way to maintain competency. 22% have attended another ultrasound course/conference. Worryingly, 22% felt that they have not been able to maintain or develop their skills.
When asked about the barriers to developing their ultrasound skillset further, the top reasons provided were the lack of time to scan and the lack of local mentors to supervise bedside teaching.
To address these barriers, respondents felt that the ESICM could organise follow-up courses, develop a more formal pathway/certification, and provide 'observerships' in hospitals/institutions where POCUS is applied regularly.
**Conclusions:** These are the first 2 courses which incorporate the most recent ESICM competency guidelines on core CCUS. Whilst the immediate course feedback has been positive, this delayed survey provides an opportunity for responders to reflect and evaluate their clinical practice since their attendance.
It is interesting that whilst the majority felt that the course has improved their confidence in performing ultrasound scans of the heart and lung, the actual frequency of scanning did not increase. The lack of equipment, whilst mentioned was not the key determinant.
Neuro POCUS was deemed the most challenging and least useful. It would be important to highlight the utility of this modality at future educational events beyond the remits of the Neuro ICU.
The identified barriers to development are not new with participants recognising that attendance at a course merely being the first step to ongoing training/education. The lack of local mentors/trainers are significant challenges and need to be addressed. Arguably centralised courses, e.g., at conferences, may not be best placed to address this key issue.
Our survey has highlighted key areas of reflection and improvement in the delivery of European CCUS education. Importantly, it provides possible solution including use of online platforms.

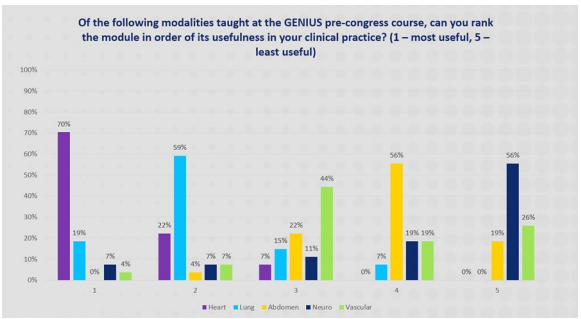


**Fig. 1 (abstract 000561)** Participants rating of usefulness of modules in their clinical practice

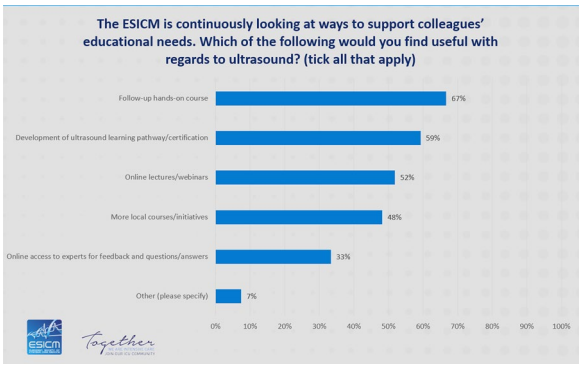


**Fig. 2 (abstract 000561)** Participants suggestion to improve ultrasound education across Europe

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5. We would like to acknowledge the support of Dr Lennie Derde (chair of the Learning and Education ESICM) and the wonderful team of both GENIUS courses.

**Topic:** Imaging in intensive care

## 000562

### Infections and antibiotic use at the end of life

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000562

**Introduction:** Infections are common at the end of life. The use of antibiotics may provide clinicians hope of a clinical resolution and significant recovery. However, in patients who are still deteriorating despite therapeutic efforts, and who have no significant hope of reversion of the clinical situation, end-of-life decisions are usually taken. Nevertheless, withdrawal of antibiotics is seldom made, and this, in addition to having side effects, may result in the emergence of multidrug-resistant microorganisms (MDR) [1]. A trial of time-limited antibiotic therapy (3 days) has been suggested as an effective alternative [2].
**Methods:** Retrospective, observational, multicenter, cohort study. Patients who were in the hospital for more than 72 h before dying were selected at a rate of 1 ICU patient per 5 Internal Medicine patients. The first 300 patients who died in the hospital during the year 2022 per center were included. Demographic, antimicrobial therapy, and microbiological data were collected.
**Results:** A total of 825 patients (54.9% men, mean age 77 years) died in one of the participating centers during the study period and were included in the study. Of these, 24% ($n=194$) were in the ICU at the time of death. Of the whole population, 17% had a clinical condition considered to be "end-of-life", before admission. Metastatic cancer was present in 15.9% and dementia in 16.6%. A Do Not Resuscitate (DNR) order was instituted before death in 73.6%, including 50.5% of ICU patients.
Only 34.2% ($n=282$) of patients were admitted because of suspected infection but as many as 609 (73.8%) patients received at least one antibiotic during hospitalization, during a mean of 9.1 days. At the time of death, 387 (46.9%) patients were still under antibiotic therapy, with a mean duration of 6 days. Among the ICU patients, these figures were even higher, and 163 (84%) received at least one antibiotic during their ICU stay, with a very high mean duration, 10.8 days; at the time of death, 133 (68.6%) were under antibiotic therapy already for a mean of 7.1 days, and more than half of the patients for more than 3 days. Large-spectrum antibiotics were used in the ICU 48% of the time (13.3% in the ward).
In only 13.1% of this population, symptom alleviation was reported.
**Conclusions:** Antibiotics, including large spectrum, are commonly used in the ICU and the ward. Even after a DNR order and in patients who are deteriorating, antibiotics are seldom withdrawn, and this seems even worse in the ICU. Time-limited antibiotic therapy is rarely used in this setting, although it may contribute to decreasing its burden without failing patients who might still benefit. This strategy should be included in stewardship programs.

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**Topic:** Infections and prevention

## 000563

### A bedside whole-body POCUS assessment at ICU admittance is associated with improved 60 days survival in critically ill patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000563

**Introduction:** Point-of-care ultrasound (POCUS) has undoubtedly revolutionized the practice of intensive care medicine (ICM), providing clinicians with a real-time diagnostic and monitoring tool. However, it remains largely unknown whether the use of POCUS is associated with improved patient outcomes. AQ35
**Objectives:** The study aimed to investigate whether incorporating a head-to-toe functional POCUS protocol, within the first 12 h from ICU admittance, could improve survival, compared to standard assessment alone. Secondary outcomes included: 1) changes in primary diagnosis, 2) need for further diagnostic investigations, 3) alterations in therapy management, and 4) changes in invasive procedures' indication.
**Methods:** This retrospective clinical study was conducted on critical care patients admitted to a mixed ICU. The control group consisted of patients admitted before the acquisition of an echograph for the department, who underwent standard assessment within 12 h from ICU admission. The treatment group comprised patients admitted after the acquisition of an echograph, who underwent a point-of-care functional ultrasound (POCUS) protocol in addition to standard assessment, within the same timeframe.
The POCUS assessment followed the "*BE SO SAFE-(D)*" protocol developed at our institution, encompassing transorbital, pulmonary, cardiac, and abdominal evaluations.
Data were propensity matched for age, sex, length of hospital stay, and SOFA, using SPSS (IBM, Armonk, NY) to ensure baseline comparability. Survival at 7 and 60 days was collected through clinical records or telephone interviews.
**Results:** After propensity matching, a total of 446 patients were evaluated, evenly divided between the control and treatment group. Mortality rates at 7 and 60 days differed significantly between the two groups: 7-day mortality was 22.3% in the treatment group versus 31.8% in the control group ($p=0.014$), while 60-day mortality was 38.1% in the treatment group versus 47.5% in the control group ($p=0.036$). Ultrasonographic findings led to changes in admitting diagnosis in 27.8% of patients, prompted further diagnostic tests in 5.6% of patients, altered medical treatment in 22.2% of patients, and changed the indication for an invasive procedure in 16% of patients (avoiding it in 1.2% and indicating it in 14.8%).
**Conclusions:** Our ultrasonographic protocol for rapid comprehensive patient assessment has improved the quality of healthcare by reducing mortality, enhancing diagnostic capability, and optimizing both medical and interventional treatment approaches. While further investigation is warranted, the systematic implementation of a POCUS protocol at ICU admission in critically ill patients may be a promising treatment option to consider.

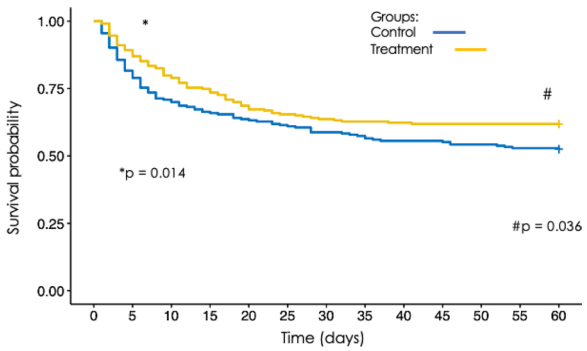


**Fig. (abstract 000563)** Kaplan–Meier 7-day and 60-day survival probabilities in the treatment group (yellow line) and control group (blue line)

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3. None

**Topic:** Imaging in intensive care.

## 000564

### Clinical outcome of ceftazidime–avibactam in critically ill oncology patients with sepsis: experience from a tertiary care cancer hospital in eastern India

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000564

**Introduction:** Sepsis with multidrug-resistant organisms cause significant morbidity & mortality in cancer patients. Ceftazidime–avibactam (CZA) has evolved as an important treatment option against resistant bacteria, but lack of data in critically ill oncology patients is of concern against its widespread usage.
**Objectives:** The aim of this prospective observational study is to evaluate the clinical outcome of oncology patients in an intensive care unit (ICU) who have received CZA either as 'targeted' therapy (T) or 'empirically' (E) due to limited treatment option. The primary outcome was in-hospital mortality. Secondary outcomes were incidence of empirical usage of CZA, ventilator days and ICU days, microbiological failure, and secondary infection while on CZA and overall antibiotic consumption.
**Methods:** All cancer patients shifted to ICU due to sepsis during March–September 2023 and who received CZA, were included in this study, and data were collected as per protocol. The decision to start CZA was either microbiological (bacteria producing OXA 48 and NDM carbapenemase) or clinical (cultures negatives and clinical deterioration while on other antimicrobials). CZA was prescribed alone or in combinations (with aztreonam, polymyxins, tigecycline, etc.).
**Results:** Out of 75 patients, 29 were from haemato-oncology (38.7%) and the rest had solid organ malignancy. 59% were older than 60 years (Figure 1). Seven patients (9.3%) were already on CZA, and for the rest, median timing of initiation of CZA was 4 days after ICU admission. In pre-CZA microbiology, *Escherichia coli, Klebsiella* sp., and *Pseudomonas* sp. comprised 34 cases (43.3%), and in 41 cases (54.7%), CZA was started empirically. Sputum & blood are most common samples (70%). Significant number of patients were having multiorgan failure (Neutropenia—26%, ventilation—66%, shock—80%, and haemodialysis—19%). OXA-48 & NDM carbapenemases were identified in 32% of all clinical samples. In-hospital mortality was 50%; while mortality in patients not requiring CZA is 32%. Patients receiving 'empirical' therapy had higher in-hospital mortality—59% (E) vs 46% (T). Average duration of CZA was 7.6 days; for other combination antibiotics, it is 7.2 days. Average ventilator days were 11 days and ICU stay was 12.4 days. Microbiological failure was minimum. Post-CZA, 17.7% of clinical samples (both sterile and nonsterile) showed CZA-resistant pathogens (e.g., *Staphylococcus* sp, *Enterococcus* sp, *Acinetobacter* sp, *Candida* sp, *Trichosporon* sp, and *Aspergillus* sp).
**Conclusions:** Our oncology patient population receiving CZA had shown a high mortality, probably due to active malignancy, immunosuppression, and multiple organ failure. Culture negative patients with empirical therapy had shown poorer outcome (i.e., higher mortality) compared to targeted therapy group. Risk of superinfection with resistant bacteria and fungus in post CZA period is of significant concern.

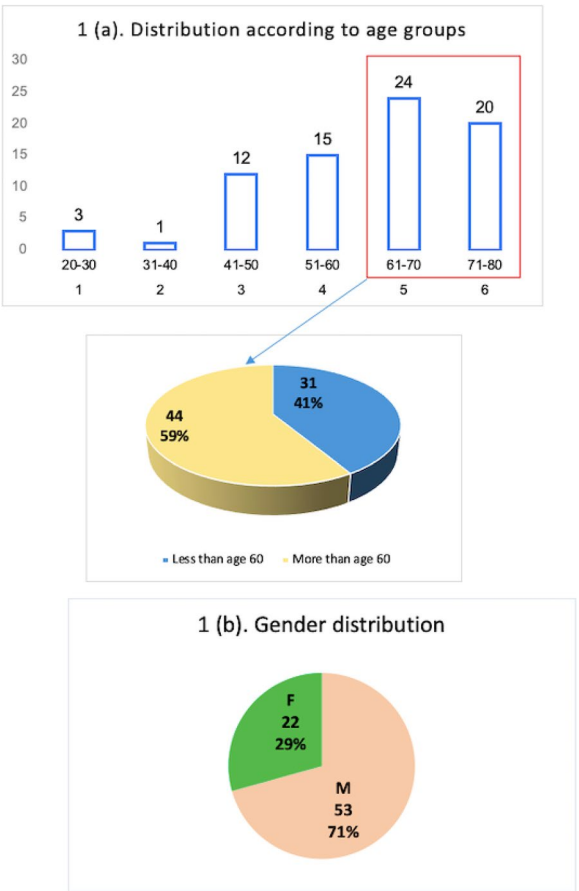


**Fig. (abstract 000564)** Demographic data of onco ICU patients—age (a) and sex (b) distribution

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5. nil

**Topic:** Sepsis

## 000566

### Microbial epidemiology and antibiotic therapy in ventriculitis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000566

**Introduction:** Most of the pathogenic agents contributing to central nervous system infections associated with external ventricular drains (EVD) are cutaneous-derived Gram-positive bacteria [1–2]. Despite this fact, recent reports indicate a change toward more Gram-negative infections and antibiotic-resistant organisms probably related to the growing complexity of neurocritical patients, prolonged hospitalization, and use of prophylactic antibiotics targeting gram-positive bacteria [1]. Additionally, the optimal duration of antimicrobial therapy in patients with ventriculitis is not well established [1,3].
**Objectives:** To characterize causative agents involved in ventriculitis associated with EVD and assess if guidelines compliance regarding antimicrobial duration impacts on outcomes.
**Methods:** We retrospectively collected data from medical files of patients with ventriculitis related to EVD admitted at a neurocritical care unit of a University Hospital from January 1st 2018 to December 31st 2023. The length of antibiotic therapy applied was compared to the one suggested by the Infectious Diseases Society of America (IDSA).
**Results:** In 28 of 54 patients with ventriculitis, a microorganism was isolated. Among microorganisms, 19 were Gram-positive and 11 Gram-negative bacteria (Fig. 1). Microorganisms most frequently found were coagulase-negative Staphylococci. Within this group, *Staphylococcus epidermidis* was the most commonly identified ($n=15$). Enterobacterales were the most common Gram-negative organisms isolated ($n=5$). In three patients, ventriculitis was attributed to polymicrobial infections and one patient had a *Candida albicans* ventriculitis.
Only 12 patients had an antibiotic time course in line with IDSA guidelines, despite similar baseline patients´ characteristics. There were no differences between the two groups regarding ICU and hospital lengths-of-stay; need and duration of invasive mechanical ventilation; ICU and hospital mortality and functional outcomes at 6 months (Table 1).

**Table 1 (abstract 000566)** Patient characteristics and outcomes according to IDSA guidelines for antibiotic duration

| Variable | Antibiotic duration according to IDSA | | *p-value* |
|---|---|---|---|
| | Yes ($n=12$) | No ($n=16$) | |
| Baseline characterization | | | |
| Age years, median (IQR) | 56 (28.5) | 68 (22) | 0.121* |
| Female, % | 42% | 31% | 0.698** |
| SAPS II, median (IQR) | 43 (20) | 50 (25) | 0.631* |
| Initial CGS, median (IQR) | 8 (3.5) | 8 (3.5) | 0.767* |
| IMV, % | 100% | 88% | 12 |
| Outcomes | | | |
| IMV days, median (IQR) | 33 (12.1) | 28.75 (41.15) | 0.609* |
| Antibiotic days, median (IQR) | 21 (7.5) | 24 (22) | 0.095* |
| ICU days, median (IQR) | 37 (24.5) | 42 (25.5) | 0.78* |
| ICU mortality, % | 0% | 13% | 0.492** |
| Hospital mortality, % | 17% | 38% | 0.236** |
| GOS 6 months, median (IQR) | 3 (2)*** | 2 (2)**** | 0.204* |

*Mann–Whitney. **Fisher's exact. ***Loss of follow up of 3 patients. ****Loss of follow up of 2 patients. *IMV* Invasive Mechanical Ventilation, *IQR* Inter Quartile Range, *GOS* Glasgow Outcome Scale

**Conclusions:** Gram-negative bacteria are responsible for more than one third of EVD-related ventriculitis. Duration of antimicrobial therapy doesn´t correlate with outcome.

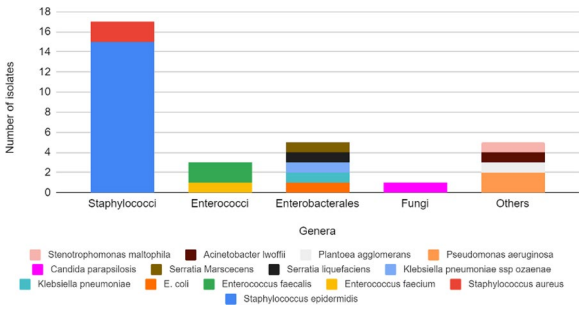


**Fig. 1 (abstract 000566)** Microorganisms isolated from CSF samples of patients with ventriculitis over 5 years

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**Topic:** Neurointensive care

## 000568

### Comparison of neurosense/neurowave and sedline/masimo for measuring depth of sedation in the intensive care unit

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000568

**Introduction:** Sedation is often necessary during the treatment of critically ill patients on intensive care. Under- and over-sedation can occur and may cause potential side effects, such as awareness, agitation, and auto-extubation. Assessment of the depth of sedation (DoS) can be either done using a validated clinical DoS scale or with brain sedation monitors. Different DoS monitors have proprietary algorithms to calculate an index based on raw electroencephalogram (EEG) values to indicate the DoS. The SedLine® DoS monitor uses the patient state index (PSI) and the NeuroSENSE® DoS monitor uses the Wavelet-based central nervous system anesthetic value (WAVCNS). It is not known which index performs best at predicting the clinical DoS.
**Objectives:** The purpose of this study is to determine which of the two indices correlates best with the clinical Richmond Agitation Sedation Scale (RASS).
**Methods:** Thirty patients admitted to the intensive care unit (ICU) of the University Hospital of Brussels and sedated with propofol and remifentanil were included in the study. After skin preparation, the two brain sedation monitors were simultaneously attached to the patient's forehead. Each monitoring session consisted of two sequential monitoring periods where the duration of one trial was 35 min. The trial began with a 30-min "no touch" period, followed by recording the indices of both devices every five seconds for one minute. For the NeuroSENSE® monitoring device, the WAVCNS indices were recorded for both the left and the right hemispheres. Finally, the RASS score was evaluated for each patient. The prediction probability (PK) was calculated for each monitoring device.
**Results:** The study population consisted of twenty-one male and nine female patients, which together provided 180 data points per device. The PK of the PSI was $0.826 \pm 0.034$. The PK of the WAVCNS was $0.795 \pm 0.033$ for the left hemisphere and $0.809 \pm 0.032$ for the right hemisphere. The absolute differences between the PK of the PSI and the WAVCNS left, and right were 0.031 (95%CI −0.062; 0.0124) and 0.017 (95%CI −0.075; 0.109) respectively. As the confidence intervals of these absolute differences both cross zero, there is no statistical significant difference between the PK of both DoS monitors.
**Conclusions:** We compared the performance of the SedLine® DoS monitor PSI and the NeuroSENSE® DoS sedation monitor WAVCNS index in critically ill sedated patients in intensive care by calculating the prediction probability (PK), and could not find a superiority of one device over the other in predicting the clinical DoS as measured by the RASS.

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**Topic:** Sedation, analgesia and delirium

## 000569

### Impact of glucose in combination with ketogenic nutrition on ketosis and muscle weakness in septic mice

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000569

**Introduction:** Intensive care unit-acquired weakness (ICUAW) develops in over 40% of critically ill patients and impairs both short- and long-term morbidity and mortality. Reversal of the suppressed ketogenic pathways during sepsis attenuated muscle weakness in preclinical studies (Goossens et al. 2019). Nonetheless, the ketogenic potential of essential long-chain triglycerides (LCTs) during sepsis and its relation to glucose, a critical suppressor of ketogenesis, have not been investigated. Therefore, this study aimed to investigate the impact of a pure LCT emulsion with and without glucose on ketogenesis and muscle weakness in a murine model of sepsis.
**Methods:** In a centrally catheterized, fluid-resuscitated, and antibiotic-treated mouse model of chronic sepsis, abdominal sepsis was induced by caecal ligation and puncture (CLP). Septic mice receiving a standard total parenteral nutrition (composed of glucose, amino acids and LCTs providing 5.3 kcal/day; considered the standard of care) (TPN, $n = 15$) were compared to septic mice receiving a pure LCT emulsion (4.8 kcal/day; LCTs, $n = 16$) and a pure LCT emulsion supplemented with glucose (5.3 kcal/day, whereof 10% provided by glucose) (LCTs + glc, $n = 15$). Healthy control (HC) mice ($n = 17$) provided healthy reference values. Ex vivo muscle force (aurora scientific®) was measured as the primary outcome after 5 days. Plasma Ketone bodies (beta-hydroxybutyrate (BHB)) and insulin were measured by commercial assays. Muscle triglycerides were analysed by a commercial kit after hexane extraction. Metabolomics was assessed by LC–MS on muscle tissue.
**Results:** The survival rate was comparable between septic groups (TPN: 71.4%; LCTs + glc: 65.2%; LCTs: 61.5%) after 5 days of sepsis. Muscle force was similarly decreased in the TPN and LCTs + glc group, but declined even further in the LCTs group (TPN: 60.9%; LCTs + glc: 60.9%; LCTs: 33.1% of HC: 128.7 mN/mm$^2$, $p < 0.0001$). In contrast, LCTs infusion increased ketosis 65-fold in the LCTs and tenfold in the LCTs + glc groups as compared to the TPN group (median of 0.02 mmol/l, $p < 0.002$). Plasma insulin was decreased in both LCT groups, irrespective of the glucose load, in comparison with the TPN group ($p < 0.02$). Muscular triglyceride content, however, was maintained in the LCTs + glc group, but decreased in the TPN and LCTs group relative to HCs mice ($p < 0.004$). The metabolomics analysis showed a stepwise decrease in the relative abundance of muscular glycolytic intermediates in the TPN, LCTs + glc and LCTs groups, respectively.
**Conclusions:** A pure LCT emulsion moderately induced ketosis, but at a cost of muscular lipid content and glycolytic intermediates, potentially explaining the worsening of muscle weakness. Adding glucose to the LCT emulsion could prevent the latter, but also partially suppressed ketosis. Higher levels of ketosis alongside elementary glucose administration might be required to attenuate muscle weakness.

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

**000570**

## Occult side effects of routinely intensive care treatment: impact of nimodipine and dexamethasone on neutrophil granulocytes

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000570

**Introduction:** Refractory cerebral vasospasms and secondary ischemia are among the major complications of aneurysmal subarachnoid hemorrhage (aSAH) [1]. In Neuro-ICUs, nimodipine (NIM), a calcium antagonist, is regularly administered to aSAH patients to diminish the occurrence of vasoconstrictions and to provide best possible protection against secondary ischemia [2]. Although the precise molecular mechanisms remain unclear, it is assumed that the interaction of NIM with neutrophil granulocytes (PMNs) also contributes to maintaining tissue perfusion and reducing the risk of further infarction [3].
Even though corticosteroids currently are not supported in routine use in aSAH patients [4], there are several (neuro)intensive care indications in which dexamethasone (DEX) is established, such as bacterial meningitis or ARDS (e.g. due to COVID) [5, 6]. One possible explanation for the positive influence on these disease patterns is the immunosuppressive effect of DEX. Moreover, in severe COVID DEX modulates immature PMNs and NETosis can even be seen as a marker for the severity of COVID progression [7, 8].
**Objectives:** This study aims to investigate the influence of NIM and DEX on neutrophil functions to uncover possible interactions. For this purpose, an established in vitro assay (3D µ-Slide chemotaxis model) is used to investigate the influence of NIM and DEX on neutrophil migration and NETosis [9].
**Methods:** PMNs were isolated from whole blood of healthy volunteer donors by centrifugation. Subsequently, live cell imaging was exerted for up to 10 h to examine PMN migration and NETosis (time for half-maximal NETosis (ET50NETosis)). Cells were investigated by light and fluorescence microscopy in type I collagen-filled (1.5 mg/mL) 3D µ-Slides. The collagen gel was blended with defined concentrations of NIM (500 ng/mL, dissolved in methanol) and DEX (75 ng/mL, dissolved in dimethyl sulfoxide) on the one hand and their drug solvents alone (methanol 3,1 ‰ and dimethyl sulfoxide 0.5 ‰) on the other hand. Due to water insolubility NIM and DEX require these specific solvents. NET formation was visualized using 4′,6-diamidino-2-phenylindole (DAPI). A chemotaxis gradient was established with N-formyl-met-leu-phe (fMLP).
**Results:** NIM prolonged neutrophil NETosis significantly ($p=0.005$; see Figure 1). Mean ET50NETosis in the presence of NIM ($n=7$) was $270\pm25.1$ min whereas mean ET50NETosis without NIM ($n=6$) was $230\pm25.1$ min. DEX prolonged NETosis, but did not reach significance ($p=0.071$; see Figure 2). Median ET50NETosis was in the presence of DEX ($n=3$) 351 min (range: 306–397 min). Median ET50NETosis without DEX ($n=6$) was 233 min (range 207–246 min). No significant influence of the selected drugs on neutrophil migration could be determined.
**Conclusions:** Nimodipine and Dexamethasone are drugs routinely used in intensive care and are associated with positive outcomes in various life-threatening conditions such as aSAH or ARDS. NETosis is more and more associated with development and worsening of such intensive care diseases [10]. Delayed NETosis observed in our study could explain molecularly why nimodipine and dexamethasone may have positive effects. Therefore, direct influence on neutrophil immune responses offers an attractive starting point for new treatment strategies and deserves attention in further research.

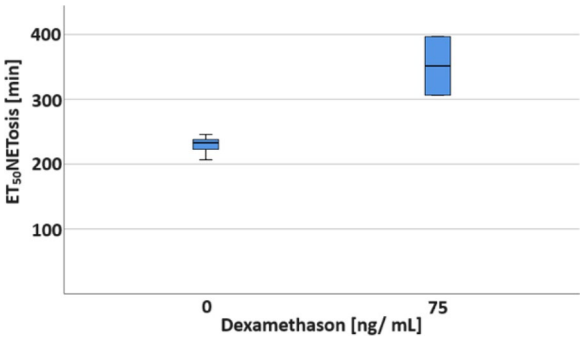


**Fig. 2 (abstract 000570)** Prolonged ET50NETosis in the presence of Dexamethasone did not reach statistical significance

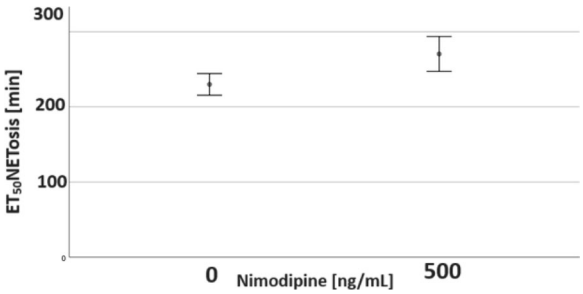


**Fig. 1 (abstract 000570)** Prolonged ET50NETosis in the presence of Nimodipine

**Reference(s)**

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**Topic:** Neurointensive care

## 000571

### Intrathecal antibiotics in ventriculitis: a valid choice?

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000571

**Introduction:** Intrathecal (IT) antibiotic administration is not a consensual procedure due to the potential harmful side effects. According to Infectious Diseases Society of America (IDSA) guidelines, IT antibiotics should be considered in cases of ventriculitis with poor response to systemic antibiotics (SA) [1]. In order to achieve adequate cerebrospinal fluid (CSF) concentrations, systemic antibiotics must cross the blood–brain, and blood-CSF barriers. Failure to achieve minimal bactericidal concentration can lead to infection persistence and the emergence of multi-resistant pathogens [2].
**Objectives:** To analyze and compare outcomes of ventriculitis associated with external ventricular drains (EVD) treated with IT antibiotics plus SA versus SA.
**Methods:** Retrospective analysis of medical record files from patients treated for EVD-associated ventriculitis admitted to a neurocritical care unit (NCCU) of a University Hospital from January 1st 2018 to December 31st 2023.
**Results:** Among the 54 EVD-related ventriculitis managed in NCCU, ten were treated with IT antibiotics. Antibiotic choice and dosage respect IDSA guidelines. Patients treated with IT antibiotics were significantly younger albeit with no other differences in baseline characteristics. Days of EVD, time under antibiotic therapy, and ICU length of stay were longer in the group of patients treated with IT antibiotics. We found no differences between groups regarding days of Invasive Mechanical Ventilation (IMV), ICU and Hospital mortality and Glasgow Outcome Scale at six months.

**Table 1 (abstract 000571)** Patient characteristics and clinical outcomes of patients treated with IT antibiotics

| Variable | Intrathecal antibiotics | | *p-value* |
|---|---|---|---|
| | **Yes (*n* = 10)** | **No (*n* = 44)** | |
| Baseline characterization | | | |
| Age years, median (IQR) | 51 (44–64.75) | 69 (52.5–75.75) | **0.024*** |
| Female, % | 30% | 24% | 0.161** |
| SOFA, median (IQR) | 7 (3.75–8.25) | 6 (5–8) | 0.991* |
| SAPS II, median (IQR) | 34 (26.75–55.25) | 45 (36.25–54) | 0.367* |
| Initial CGS, median (IQR) | 8 (7–11.25) | 8 (7–11) | 0.937* |
| IMV, % | 90% | 89% | 13 |
| Outcomes | | | |
| IMV days, median (IQR) | 41 (10.55–59.75) | 24 (14.075–37.025) | 0.22* |
| EVD duration (days), median (IQR) | 35 (26.675–49.05) | 20 (11.9–30.4) | **0.006*** |
| Total antibiotic days, median (IQR) | 30 (21–40) | 14 (7–21) | **< 0.001*** |
| Time (days) to negativation of CSF cultures, median (IQR) | 5 (3.5–14) | 7 (3–13.25) | 0.977* |
| ICU days, median (IQR) | 54 (32.5–73) | 32 (22–45) | **0.02*** |
| ICU mortality, % | 40% | 11% | 0.05*** |
| Hospital mortality, *n*(%) | 60% | 27%**** | 0.065*** |
| 6 months GOS, median (IQR) | 1 (1–3.5) | 3 (1–3.75)***** | 0.208* |

*Mann–Whitney. **Pearson Qui-square. ***Fisher test. ****Loss of follow-up of 3 patients, *n* = 41. *****Loss of follow-up of 8 patients. Abbreviation: IQR, Inter Quartile Range; GOS, Glasgow Outcome Scale

**Conclusions:** Patients treated with IT antibiotics were younger and had prolonged ICU length of stay.
IT therapy was associated with prolonged use of EVD and total antibiotic duration. No differences regarding outcome were found between the two groups.

#### Reference(s)

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**Topic:** Neurointensive care

## 000572

### Evaluation of a non-invasive cardio-pulmonary health monitor during fluid challenges in an intensive care unit

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000572

**Introduction:** Fluid management in the ICU is a cornerstone of care for mechanically ventilated patients, yet determining which patients are fluid-responsive can be difficult [1]. Hemodynamic indices such as cardiac output (CO), can provide insight into a patient's responsiveness when measured during a fluid challenge, thus guiding individual patient care. Often transthoracic echocardiography (TTE) is used to measure CO because the left ventricle outflow tract velocity time integral (LVOT VTI) correlates with stroke volume [2]. However, well-known limitations of TTE exist including the lack of continuous monitoring ability, necessary operator expertise, and potential image artifacts [1]. There remains a need for a non-invasive, operator-independent, continuous cardio-pulmonary monitoring system for mechanically ventilated patients.
**Objectives:** To evaluate non-invasive pulmonary blood flow (PBF) measurements provided by the VQm® System before and after a

passive leg raise (PLR) and a fluid bolus (FB) when compared to reference CO measurements from TTE LVOT VTI.
**Methods:** This is a single-site pilot study in Ontario Canada. The VQm® System calculates PBF through a modified differential Fick equation by administering a 3-breath inhaled bolus of CO2. The subsequent change in end-tidal CO2 is measured through a mainstream proprietary airway sensor distal to the patient's endotracheal tube, allowing for the calculation of all parameters in the differential Fick equation, including PBF, in real-time. For this study, patients started in a semi-recumbent position (torso elevated 45°) where baseline PBF and CO measurements were collected. The torso was then levelled and the legs were elevated (to 45°). Paired measurements were taken after 1 min while the legs remained elevated and again 5 min after the patient was placed back in the semi-recumbent position. Following an FB of 500 ml over 15 min a final paired measurement of PBF and CO was taken. A four-quadrant plot analysis was performed on the paired measurements to determine the concordance rate and assess the VQm® System's trending ability.
**Results:** Nine patients, 7 male/2 female, with a mean age of 60 (45–82) were recruited for this study. From the 9 patients, 13 data points fell outside of an exclusion zone of 10% and were included in the analysis. The concordance rate between the VQm® System PBF value and the TTE CO value before and after a fluid challenge was 69.2% (Fig. 1).
**Conclusions:** Results are promising for the trending ability of the VQm® System PBF value when compared to a reference CO value using TTE LVOT VTI measurements. Future work includes assessing the performance of the VQm® System as a predictor of fluid responsiveness in ICU patients.

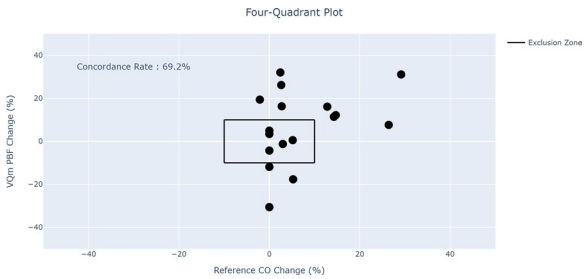


**Fig. 1 (abstract 000572)** Four-Quadrant plot of the VQm® System PBF and TTE CO

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3. Funding was provided by the OBIO Early Adopters Health Innovation Program. The VQm® System was provided by RMI Inc. (Vancouver, Canada).

**Topic:** Cardiovascular issues in ICU

## 000573 I
## Illness severity and number of patients admitted to critical care remains constant throughout the 7-day week

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000573

**Introduction:** Critical care is a 7-day service throughout the world. However, in many intensive care units (ICU) across the UK, there can be fewer medical staff present at the weekend compared to the weekday[1]. To justify this there can be the misleading assumption that patients are 'less sick' when presenting over weekend or the number of patients admitted are fewer. To investigate this, we have examined the APACHE II score[2] for patients admitted to our unit in 2023.
Since 1985, the APACHE II score is measured within 24 h of admission and incorporates physiological measurements, like age and chronic disease.2 It is a standardised score assessing patients' deviation from normal and predicts mortality risk in critically ill patients. Its global use and accessibility make it suitable for comparing data worldwide.
**Objectives:** Assess if illness severity and number of admitted patients to our ICU across the 7-day week remains constant.
**Methods:** This is a retrospective single-centre study. We examined deidentified data for 656 patients selected between 01/01/2023 and 30/11/2023.
The data is presented using box plots for each day of the week. APACHE II scores are presented using median [IQR]. Inferential statistics were performed using the Kruskal–Wallis test and Chi-squared test. All analyses were carried out using R (version 4.3.2).
**Results:** The median APACHE II score in 2023 was 18. From Figure 1, the median APACHE II score for all 7 days appears consistent. The number of patients admitted per day is shown in Table 1. There is no evidence to suggest that the APACHE II score varies significantly across different days in 2023 ($p = 0.3$).
**Table 1 (abstract 000573).**

| | Mon | Tues | Wed | Thu | Fri | Sat | Sun |
|---|---|---|---|---|---|---|---|
| Number of patients | 92 | 109 | 95 | 113 | 95 | 89 | 91 |

In Table 2, the number of patients that were above and below the median APACHE II score for 2023 are presented according to whether they were admitted during the weekday or weekend. No significant association was found between the number of patients admitted on the weekday or weekend when separated according to above or below the median APACHE II score for 2023 ($p = 0.6$).
**Table 2 (abstract 000573).**

| | Weekday | Weekend |
|---|---|---|
| APACHE II > 18 | 223 | 85 |
| APACHE II ≤ 18 | 260 | 88 |

**Conclusions:** Our retrospective single-centre study demonstrates that there are no significant differences in APACHE II score across the 7-day week in 2023, and that the number of patients presenting according to the median APACHE II score for the year between the weekday and weekend was also not significant.
We recognise that our dataset is small and based on a single centre population which might lack generalizability due to limited sample diversity.
These findings challenge assumptions regarding reduced illness severity during weekends3, highlighting the importance of consistent staffing and resources in ICU settings.

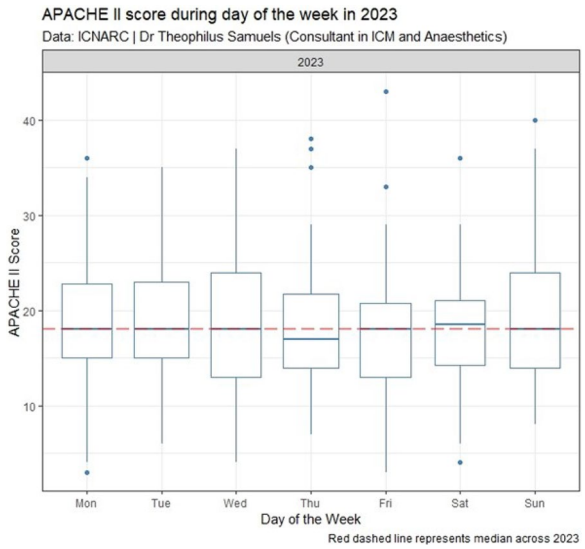


**Fig. 1 (abstract 000573).**

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**Topic:** Health Services Research and Outcome

## 000574

## Guess the weight: the accuracy of estimated weights and the implications on aspects of clinical management in critical care

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000574

**Introduction:** An accurate patient weight is a fundamental part of the initial assessment on admission to hospital, guiding therapy and progress in the ICU.
There are many challenges to weighing patients on the ICU: time constraints, unstable patients, staffing levels as well as lack and incorrect use of weighing equipment. Hence, most patient weights are estimated by the team on admission. However, published data has shown this to be grossly inaccurate, with differences of over 20% between actual and estimated weights in up to 15% of cases in critically ill patients.2
Weight is used routinely in multiple calculations; affecting many critical aspects—drug dosages, fluid balance monitoring, nutritional assessments as well as cardiac output studies.1,2
**Objectives:** 1. To identify the barriers to weighing patients on the ICU. 2. To assess the accuracy of healthcare professionals' (HCPs) estimates compared to the measured patient weight. 3. To describe the implications of therapy.

**Methods:** The study was conducted in a 16-bed mixed ICU. All patients were screened with patients excluded if they refused or the treating team judged them to be haemodynamically unstable.
Patients were weighed either using a hoist or chair device following a standardised unit weighing procedure. A diverse sample of HCPs was asked to estimate the individual patients' weight from the end of the bedspace (whilst blinded to the previously recorded or actual weight).
Descriptive analyses were performed. Bland–Altman analysis was used to assess agreement between the pooled estimated and measured weight.
**Results:** The study was conducted over 2 days and 13 patients were weighed. 8 were mechanically ventilated. 3 refused and 2 was deemed haemodynamically too unstable for weighing. Intubated patients were hoisted. There were no line dislodgement or unintended consequences of the weighing process.
30 HCPs as per Table 1 provided 297 estimations of weight.
.

**Table 1 (abstract 000574)** Breakdown of HCPs as assessors

| HCPs | No. of assessors |
|---|---|
| Nurses | 13 |
| Doctors | 6 |
| Pharmacists | 7 |
| Physiotherapists | 2 |
| Dieticians | 1 |
| Advanced clinical practitioner | 1 |

The median measured weight was 83.2kg (50.9–131kg). Figure 1 shows the percentage estimation errors for each patient. Pooled weight estimates were between 18.5% under to 16.9% over the measured weight. The differences between the pooled estimated and actual weight ranged from −22kg to + 10.3kg. Eight patients (62%) had a greater than 10% difference between the measured and estimated weight.
Figure 2 shows whether there is agreement between the measured and pooled estimated weight for each patient. The bias of 3.49 represents the mean difference between the two weights.
The measured weights led to therapy changes in 4 (30%) patients—3 had drug doses adjusted for anticoagulation and 1 had their nutrition plan revisited.
**Conclusions:** Our study shows that it is safe and feasible to weigh the majority of ICU patients and corroborates previously published work that the estimation of a patient's weight by HCPs is inaccurate. 62% of patients had a more than 10% margin of error, which has previously been shown to be the 'cut-off' of significance.2,3 30% of patients had therapies adjusted with potential avoidance of harm and/or treatment failures.
We intend to introduce a regular weighing programme in our department and acknowledge that the measured weight should also be interpreted with caution due to daily fluid shifts.

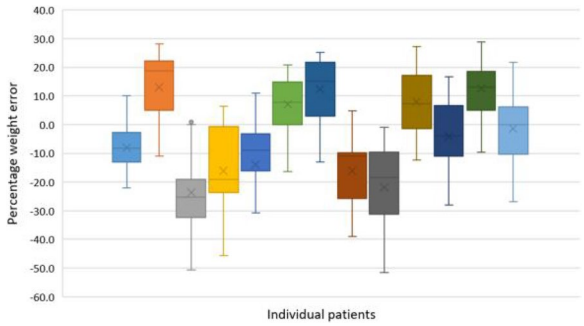


**Fig. 1 (abstract 000574)** Percentage weight errors from measured values for each patient

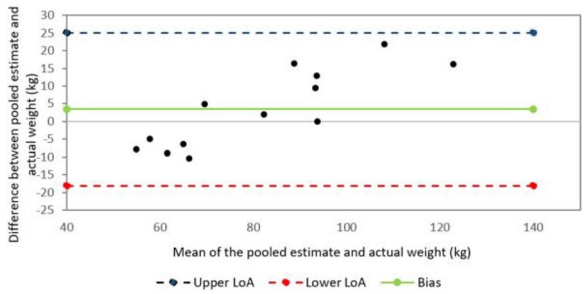


**Fig. 2 (abstract 000574)** Bland Altman plot to show agreement between the methods
(LoA = Limits of agreement (95% of samples) were specified as bias ± 1.96 SD).

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4. No grants required

**Topic:** Nursing care and physiotherapy

## 000575

### Neurological prognosis in cardiac arrest: the role of somatosensory evoked potentials

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000575

**Introduction:** Somatosensory evoked potentials (SSEPs) are a valuable tool in neurological prognosis following cardiac arrest (CA), offering significant advantages such as high specificity in diagnosing brain damage and minimal susceptibility to sedation effects. However, they have challenges such as technique availability and complexity of interpretation. Typically, the presence or absence of the N20 cranial wave is used to determine neurological prognosis in these patients.
**Objectives:** To assess the utility of SSEPs as a diagnostic tool in the neurological prognosis of CA.
**Methods:** A retrospective observational study was conducted on a prospective series of CAs treated in our centre between 2016 and 2023. SSEPs were performed on patients who remained comatose after 72 h of CA. Demographic, etiological, and outcome variables were collected, and results were presented as proportions and medians accompanied by interquartile range (IQR). Statistical analysis was performed using SPSS version 29.1.0.1.
**Results:** A total of 150 CA cases, both in-hospital and out-of-hospital, were included, of which SSEPs were conducted on 53 (35%) patients. The median age was 58 years (IQR 17), with 37 (7%) being male. 23 (43%) presented a shockable rhythm and the average time of CA until recovery of spontaneous was 25 min (IQR 18).
Among these 53 patients, 47 (89%) had poor neurological outcomes (CPC 3–5). Among those with poor neurological outcomes, 20 (43%) patients had preserved N20, 8 (17%) had unilaterally abolished N20, and 19 (40%) had abolished N20 bilaterally. Out of the 6 (11%) patients with good neurological outcomes, 5 of them (83%) had preserved N20, and only one patient had unilaterally abolished N20 (17%).
Stratifying by CPC level, among the 11 patients with CPC 1–3, 10 (91%) had preserved SSEPs and only one had a unilateral loss. In contrast, among the 39 CPC 4 patients, 15 (38%) had preserved N20, 19 (49%) had absent N20, and 5 had unilaterally absent N20 (13%). None of the 3 patients with CPC 5 had preserved SSEPs, with 2 (67%) showing bilateral absence and 1 (33%) unilateral absence.
In this series (including unilaterally abolished N20 as poor prognosis), SSEPs demonstrated a sensitivity of 60% (CI 95%: 44%-67%, specificity of 83% (CI 95%: 35–99%) (limited by the small number of patients with good prognosis), a positive predictive value (PPV) of 97%, and a negative predictive value (NPV) of 21%.
**Conclusions:** In our series, abolished SSEPs demonstrate high specificity and PPV, although sensitivity and NPV are not as high. Therefore, abolished SSEPs reliably indicate a poor prognosis, whereas preserved SSEPs do not assure a good neurological prognosis. It is noteworthy that although considered part of poor neurological prognosis, all patients with CPC 3 had preserved N20. Finally, further study is needed to explore the significance of unilaterally absent SSEPs, although in our series, they appear to be similarly associated with poor prognosis.

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**Topic:** Cardiac arrest

## 000576

### Primary immunodeficiency disease genes in critically ill COVID-19 patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000576

**Introduction:** Multiple environmental and genetic factors influence the development of COVID-19 as a complex multisystem disease. According to the omnigenic model, the disease can be associated with a large number of variants in core (causal) and peripheral genes that are tightly linked in a regulatory network [1]. Disease-associated genes tend to be expressed at higher levels in those healthy tissues where alterations in these genes cause pathology. The identification of gene sets and associated rare pathogenic variants (high-impact variants)

is important for the diagnosis, prevention and treatment of diseases. Therefore, the study of the contribution of genes and variants associated with primary immunodeficiencies (PIDs) to the development of common infectious diseases remains a relevant and interesting area of research.
**Objectives:** Investigate the contribution of PID genes in severe critically ill COVID-19 patients.
**Methods:** We used whole-exome sequencing data from ≤45-year-old patients with severe ($n=9$) and non-severe COVID-19 ($n=11$) to evaluate the collective impact of rare high-impact variants (HIs) of PID genes on disease severity. The core PID gene list was taken from the International Union of Immunological Societies (IUIS) Committee of Experts 2022 Updated Classification. We curated gene lists of functional partners (FPs) of PID genes from protein–protein interaction networks using the STRING database tool version 11.5. Expression data of PID genes were obtained from the Human Protein Atlas (HPA).
**Results:** We generated three sets of genes, including 450 core PID genes (I), 4580 FPs of PID genes with a CIS (combined interaction score) of ≥0.9 (II—near-core peripheral genes), and 6445 FPs of PID genes with a CIS of 0.4 to 0.89 (III). The gene sets overlapped, so genes from set I were excluded from sets II and III, and so on. The burden of rare HI variants in PID genes and FPs in severe versus non-severe COVID-19 decreased in the sets I + II > I + II + III > all genes with rare HI variants in the cohort of 20 patients. PID-associated genes were more highly expressed than other genes in human peripheral blood cell subpopulations.
**Conclusions:** The cumulative effect of rare HI variants of PID core genes and near-core FPs of PID gene (II) contributed to the development of severe COVID-19. The higher level of PID gene expression in blood cell subpopulations is consistent with their functional importance for immune/hematological tissues so that disruption of PID genes will lead to severe consequences for the functionality of these tissues.

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**Topic:** Sepsis

## 000577
## Early brain CT as a prognostic method for neurological outcome in cardiac arrest

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000577

**Introduction:** CT scanning is a straightforward and accessible test that can provide insight into the neurological prognosis of cardiac arrest (CA). We propose that findings indicating a poor prognosis on an early CT scan will likely correlate with a poor neurological outcome, but the absence of findings does not predict a good long-term neurological outcome, as lesions may progress over time.
**Objectives:** To assess the usefulness of performing an early CT scan for neurological prognosis in CA.
**Methods:** A retrospective observational study was conducted on a prospective series of CAs treated in our centre between 2012 and 2023. Brain CT scans without contrast were performed in the early hours, with repeat scans in patients showing poor clinical response not explained by another cause. Demographic, etiological, and outcome variables were collected, and results were presented as proportions and medians accompanied by 25th and 75th percentiles. Statistical analysis was conducted using SPSS version 29.1.0.1.
**Results:** A total of 304 CAs, both in-hospital (41) and out-of-hospital (263), were included, with brain CT scans performed on 171 (56%) of them. Of these, 127 (74%) were male with a median age of 59 [52–72] years. The median time to return of spontaneous circulation was 25 [16–33]. Repeat imaging was done in 16 (9,4%) patients with initially normal CT scans.
Among the 171 patients initially scanned, 113 (66%) showed no acute pathological findings, 23 (13.5%) showed gray-white matter dedifferentiation (GWMD), 17 (9.9%) had cerebral edema, 9 (5,3%) had acute ischemic lesions, and 9 (5.3%) had other lesions. The diffuse lesion on the initial CT scan had a specificity of 100% and a sensitivity of 36% (PPV 100% NPV 47%) in the detection of severe brain damage.
Out of the 113 patients with initially normal CT scans, 52 (46%) had a good neurological outcome (CPC 1–2), while 57 (50.4%) had a poor neurological outcome (CPC 3–5); CPC could not be determined in 4 cases. Among the 58 (34%) patients with some pathological findings on the initial CT scan, only 4 (6.9%) had a good neurological prognosis, while 53 (91,3%) had a CPC 3–5; CPC could not be determined in 1 case.
Of the 16 patients with initially normal CT scans with a second CT scan done, 4 (25%) showed no findings on repeat CT scans; all of them had a CPC 3–5. The remaining 12 (75%) patients had lesions not previously described. Three (25%) patients with acute ischemic lesions had a CPC 1–2, while 5 patients had diffuse cerebral edema and 4 had haemorrhagic lesions, all with CPC 3–5.
**Conclusions:** Obtaining a normal result on an early post-CA brain CT scan is not useful for predicting the neurological prognosis of these patients, as lesions that progress in the following days may not be visible initially. Conversely, finding lesions on an early CT scan is often associated with a worse final neurological outcome. Most patients who underwent repeat brain imaging had a poor prognosis, possibly due to repeat testing for clinical deterioration.

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1. Nolan JP, Sandroni C, Böttiger BW, Cariou A, Cronberg T, Friberg H, et al. European Resuscitation Council and European Society of Intensive Care Medicine guidelines 2021: post-resuscitation care. Intensive Care Med. 2021; 47(4): 369–421.

**Topic:** Imaging in intensive care

## 000578
## Clinical and respiratory mechanics characteristics related to mortality in patients with COVID-19 acute respiratory distress syndrome

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000578

**Introduction:** Covid-19 Associated Acute Respiratory Distress Syndrome (C-ARDS) was challenging when establishing therapeutic strategies in intensive care unit (ICU) with mortality varied among different regions of Latin America according to the progression of the pandemic [1–5]. Based on the implementation of the Protective Mechanical Ventilation Protocol (PMV), we evaluated the clinical variables associated with C-ARDS mortality in the first year of the pandemic in the ICU of a Chilean hospital.
**Objectives:** To assess the association between mortality and demographic, oxygenation and ventilatory variables in patients with C-ARDS in the ICU.
**Methods:** Causal, retrospective study. In 2020, 443 patients were admitted into ICU Guillermo Grant Benavente Hospital, in the pre-vaccination period. Inclusion criteria: C-ARDS diagnosis and PVM protocol. Non-intubated and incompletely registered patients were excluded, the final sample was 412 patients. Percentages, mean and SD are

presented for descriptive analysis. Odds Ratios(OR) are reported for qualitative association 95%CI. Significance was $p < 0.05$. Survival probabilities were estimated with a binary logistic regression, considering Driving Pressure (DP) as the principal predictor. APACHE II, PaFi, Body Mass Index (BMI) and age as secondary predictors.Ethical approval 200945 code.

**Results:** 412 patients were analyzed, 57% male, mean age 58.3 ± 13.5,BMI 31.1 ± 7.2, APACHE II 12.6 ± 6.3, 13.8 ± 6.1 days of PMV, Pafi 115 ± 29.1, DP 11 ± 1.5.51.2% required PMV in prone position with DP 11.3 ± 0.1 and Crs(static respiratory system compliance) 37.7 ± 8.7, total mortality 21.1%.Among the variables associated with mortality, DP is the most relevant(OR = 1.93, $p < 0.001$, 95% CI 1.53–2.44), followed by APACHE II (OR = 1.23, $p < 0.001$, 95% CI 1.16–1.30). Age is statistically significant (OR = 1.03, $p = 0.019$, 95% CI 1.01–1.06), PaFi index (OR = 1.00, $p = 0.94$, 95% CI 0.99–1.01) and BMI(OR = 1.01, $p = 0.58$, 95% CI 0.97–1.06) were not significant.

The logistic regression model applied corresponds to Prob(Mortality) = expM/(1 + expM),therein M = −13.24 + 0.2006 × APACHE II + 0.5879xDP-0.000457xPaFi + 0.013xBMI + 0.0329xAge. It was observed that when the DP exceeds 12cmH2O the probability of dying increases significantly ($p < 0.001$), (Figure 1; Table 1). When the Crs variable was incorporated into the formula in the prone position,did not significantly alter the predictive power of the formula($p = 0.09$).

**Table 1 (abstract 000578)** Predicted probability values for mortality according to demographics, oxygenation, and ventilatory variables

| DP Value* | 1-9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Predicted probab** | <4.1 % | 7.2 % | 12.2 % | 20.0 % | 31.0 % | 44.8 % | 59.3 % | 72.4 % | 82.5 % | 89.5 % | 93.9 % | 96.5 % |

*DP ($cmH_2O$) proposal risk categories:low(green),moderate(yellow)and high(red).

**Variables:DP,Apache II,PaFi,BMI,Age.

*DP (cmH2O) proposal risk categories:low(green),moderate(yellow) and high(red)

**Variables:DP,Apache II,PaFi,BMI,Age

**Conclusions:** The evaluation of mortality in patients with C-ARDS identified DP as a main predictive variable, particularly when it exceeds 12 cmH2O. These findings emphasize the importance of developing clinical management strategies that focus on optimizing DP values to reduce mortality.

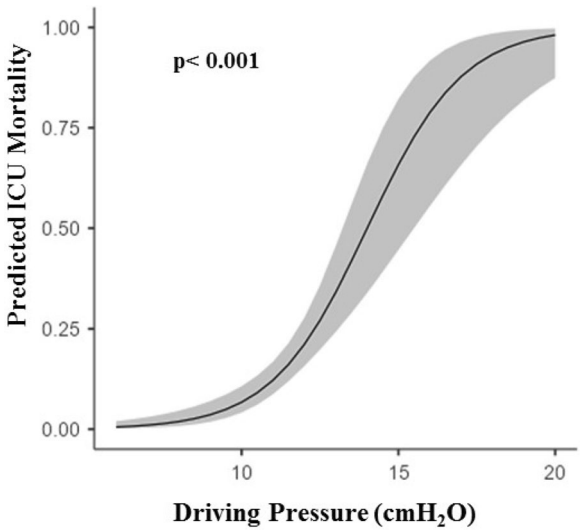


**Fig. 1 (abstract 000578)** Mortality probability predictions by DP in C-SDRA

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**Topic:** Acute respiratory failure and mechanical ventilation

**000581**

## The use of handheld devices in sustainable ultrasound training—boon or bane?

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000581

**Introduction:** Competencies in Critical Care Ultrasound (CCUS) has been accepted as part of modern intensive care practice—it is part of both the ESAIC and ESICM competency documents. Achieving competency in this skillset requires a mixture of didactice knowledge, hands on practice, building a logbook of scans as well as mentored supervision and discussion. Despite this, significant barriers exist and only a small number of European countries have mandated it as part of their national training programme. In the UK and Netherlands, non-doctors

(nurses and physiotherapists) have been trained in ultrasound to improve patient care.
Handheld ultrasound (HHUS) devices have become increasingly popular and available as a way to improve access to CCUS from both a training and clinical perspective. Such devices are often allied with online platforms which facilitate learning and governance (individualized logbooks and quality assurance tools).
**Objectives:** To assess the impact of the addition of HHUS on training completion of CCUS Lung (UK programme). These include:

- Frequency of scanning
- Quality of images in logbook
- Speed of completion of competencies
- Barriers to completion

**Methods:** Two HHUS (Butterfly) were introduced in a single-centre critical care department with an established CCUS training programme. 25 healthcare professionals (doctors and allied healthcare providers) were invited to participate and provided individualised login to the device and online platform. Participation was completely voluntary with regular reviews by mentors as needed. Training scans were completely anonymised with no patient identifiers. Basic demographic data was collected by the participants. Information on scan frequency, quality etc. were collected from the cloud platform.
**Results:** 4 out of 25 participants completed the accreditation within the maximum 1 year allowed by the programme. All were allied healthcare providers. All 4 completed it within 6 months.
All 25 participants completed at least 5 scans logged. Only 7 of the 25 logged the halfway point (15 scans) by 3 months.
The various online videos/educational resources were only minimally accessed. There was no difference between those who ultimately completed and those who did not.
Barriers to completing competencies—lack of time to scan. Access to the 2 devices was not cited as a barrier.
Regarding online platform, both participants and trainers liked the ease of use and the fact that it can be accessed anywhere. The structured rating of scans was another positive comment by the trainer.
**Conclusions:** Despite its perceived benefits in encouraging colleagues to complete CCUS training, less than 20% did. This is inline with the 10–15% completion rate published in the literature. It is feasible to train non-doctors to achieve the same CCUS Lung competencies as doctors.
The lack of trainers and equipment, often cited as barriers in the literature, can/has been addressed by the introduction of HHUS. The biggest barrier in our study was the lack of time to practice and achieve the required number of scans (all done within the participants' time ie. not protected). This raises the wider issue of mandatory vs. optional. It could be argued that only by making the competencies mandatory and protecting time for learners to scan. The UK Society of Acute Medicine has mandated such an approach (0.5 day per week for all registrars to learn).
In conclusion, HHUS did not increase the completion rate of CCUS lung training in our institution. Whilst users were positive about the online platform, this was not significantly different between the 2 groups. Trainers found the review facility on the platform useful and it may have a role in the wider governance of POCUS scans in the ICU.
Our study adds to the discussion on the role of HHUS across critical care practice and further reflection on whether its the system or the individual which determines success.


**Fig. 1 (abstract 000581)** The use of handheld ultrasound as an educational and governance tool

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**Topic:** Nursing care and physiotherapy

## 000582

## Evaluation of pharmacodynamic response with various alteplase dosages for the treatment of pulmonary embolism

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000582

**Introduction:** Pulmonary embolism (PE) is associated with significant morbidity and mortality. Several lower dose thrombolytic dosing strategies have been employed as an attempt to better balance clot dissolution benefits with major bleeding risks. However, pharmacokinetic (PK) and pharmacodynamic (PD) data comparing these strategies to full dose (FD) are lacking.
**Objectives:** We aimed to evaluate differences in PD response to FD and lower dose alteplase treatments.
**Methods:** We performed a single center prospective open-label PK/PD pilot study of adults (≥ 18 years) admitted to the University of Colorado Hospital with acute PE and prescribed intravenous alteplase at a dose of either 100 mg (FD), 50 mg (half-dose [HD]), or a catheter-directed thrombolysis (CDT) approach (~ 1 mg/hr for 12–24 h). Peripheral blood sampling occurred immediately prior to alteplase administration and at 1, 2, and 4 h after start of treatment. For CDT, samples were taken at baseline, 1, 2, 4 h, at infusion end, and 2 h after treatment end. The primary outcome was a maximum reduction in

alpha-2 antiplasmin (A2A) activity from baseline. Additionally, percentage lysis at 30 min (LY30) via thromboelastography (TEG) and change in fibrinogen and D-dimer was evaluated.
**Results:** Twelve patients were included: median (range) age 62 years (23–82), 110.1 kg (77.7–158.8), 83% white, 50% female, high-risk PE ($n=4$), and intermediate high-risk PE ($n=8$). Alteplase 100 mg ($n=6$), 50 mg ($n=4$), and CDT (0.5 mg/hr ($n=1$) and 1 mg/hr ($n=1$) × 2 catheters × 12 h; $n=2$) were the initial thrombolytic strategies. All but one FD and all HD patients received a 10 mg bolus with the remaining dose administered as an infusion. One HD patient received a second 50 mg dose and one CDT patient underwent a second CDT treatment. Median baseline A2A activity in all patients was 103 (range 74–135) and reduced to a nadir of 15 (↓84%), 30.5 (↓74%), and 48 (↓60%) after FD, HD, and CDT alteplase, respectively (FD vs. HD, $p=0.17$). TEG LY30 was increased to 94.25% in FD, 87.6% in HD, and 37.35% in CDT ($p=0.06$). Fibrinogen was reduced by 49.8%, 50.2%, and 77.9% in FD, HD, and CDT groups ($p=0.98$). Median baseline D-Dimer was 29,012 (range 1620–199760) and increased to 58,840 after FD, and 286,880 after HD, and > 400,000 after CDT ($p=$NS).
**Conclusions:** Small differences in PD response were observed with FD and HD alteplase therapy. CDT had the least effect on A2A and TEG LY30, however D-Dimer increases and fibrinogen decreases were similar. Our findings highlight the need for PK/PD evaluations of new thrombolytic dosing strategies that can better retain benefits and minimize risk.

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3. We thank the University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences for providing seed grant funding for this study.

**Topic:** Transfusion and haemostasis disorders

## 000583

## Utility of the vasopressor inotrope socre as a prognostic factor for mortality in patients with distributive shock unresponsive to noradrenaline treated with arginine-vasopressin

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**Introduction:** The use of arginine vasopressin (AVP), a non-catecholaminergic vasoconstrictor hormone, is recommended in septic shock when norepinephrine (NE) is between 0.25 and 0.5 ucg/kg/min and mean arterial pressure (MAP) ≤ 65 mmHg. The *vasopressor inotrope score* (VIS) is a score that allows us to quantify the intensity of cardiovascular support. There is no VIS to predict mortality.
**Objectives:** The objective of this study is to identify the value of VIS that is related to increased morbidity and mortality.
**Methods:** Observational and prospective study in a 24-bed 3rd level ICU, between November 2022 and September 2023. Inclusion criteria: patients ≥ 18 years old with a diagnosis of distributive shock and who met the criteria for AVP initiation were included. Variables, diastolic index shock (DIS), VIS, lactate, corticosteroid use, intra-ICU mortality and intra-ICU stay were analyzed (Table 1). Exclusion criteria: mortality during the first 24 h from ICU admission. The cut-off value of VIS with mortality was determined using ROC curves.
**Results:** 51 patients, 80.4% were men with a median age of 60 years. Intra-ICU mortality was 35.3%, and mean length of stay was 13 days. VIS values after AVP administration were statistically different at 24 and 48 h between survivor and non-survivor patients. Higher VIS clearance was observed at 24 and 48 h in survivor patients ($p<0.001$ and $p=0.002$, respectively). The cut-off point for VIS clearance at 24 h was 33.1% with a sensitivity of 77.8%, specificity of 81.8%, PPV of 87.1%, and NPV of 70%, AUC: 0.803 (image 1).The cut-off point at 48 h was 16.7%, with a sensitivity of 66.7%, specificity of 87.9%, PPV of 82.9%, NPV of 75%, AUC: 0.77 (image 2). Both at 24 h and 48 h, significant differences were observed between survivor and non-survivor patients in relation to the cut-off points found. No association between corticosteroids and VIS.

**Table 1 (abstract 000583).**

| | Evolution 24 hores | | | | Evolution 48 hours | | | |
|---|---|---|---|---|---|---|---|---|
| | Survivors | Non-survivors | Total | p-value | Survivors | Non-survivors | Total | p-value |
| AVP | 1 (0,6-1,7) | 1,3 (0,8-1,8) | 1,2 (0,6-1,8) | 0,422 | 0,96 (0-1,4) | 1,3 (0,8 - 1,8) | 1,2 (0,2-1,4) | 0,087 |
| NE | 0,4 (0,3-0,5) | 0,8 (0,6-1,4) | 0,5 (0,3-0,7) | < 0,001 | 0,3 (0,1-0,4) | 0,6 (0,4-1,1) | 0,3 (0,2-0,6) | 0,001 |
| VIS | 40 (29,6-56,9) | 78,8 (63,6-149,6) | 55,8 (33,1-76,6) | < 0,001 | 27 (13-42) | 63,5 (40-115,3) | 37 (16-58) | 0,001 |
| Δ VIS | 1,9 (-13-21,7) | -36,3 (-76,9 - -21) | -5,9 (-35,9-16,2) | < 0,001 | 15,9 (-1,2-36,2) | -17,4 (-40,3 -9,8) | 7,1 (-16,7-31,7) | 0,002 |
| % improvement VIS | 4,1 (-30,1-43,1) | -95,5 (-138,7- -31) | -18,4 (-101,9-35,5 | < 0,001 | 38,8 (-2,9-59,6) | -24,9(-102,3-20,1) | 19 (-25,6-55,5) | 0,001 |
| LACTATE | 17 (12-29,5) | 37 (16,8-91,3) | 22 (12-43) | 0,048 | 14 (8,5-24,5) | 26,5 (12,3-45,5) | 15 (9-28) | 0,016 |

**Conclusions:** A minimum increase in VIS of 33.1% at 24 h and 16.7% at 48 h identifies those patients with distributive shock at high risk of dying. Survivor patients have lower lactate, NE and VIS values at 24 and 48 h. VIS should be incorporated into hemodynamic management algorithms, allowing the identification of patients who would benefit from escalation or de-escalation of hemodynamic or mechanical circulatory support.

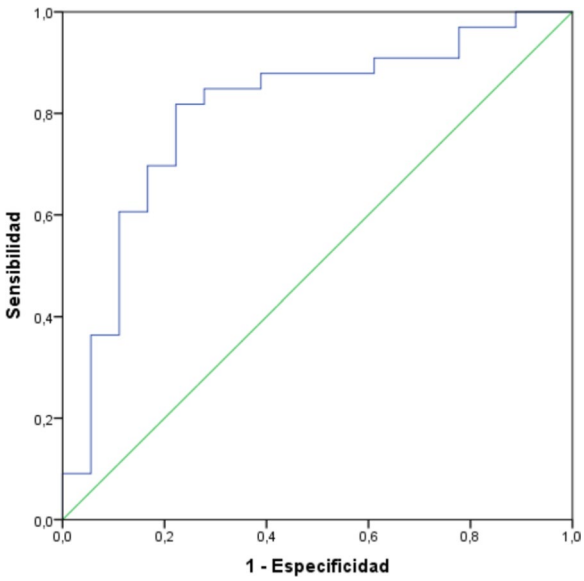


**Image 1 (abstract 000583)** ROC curve, cutt-off of the VIS at 24h

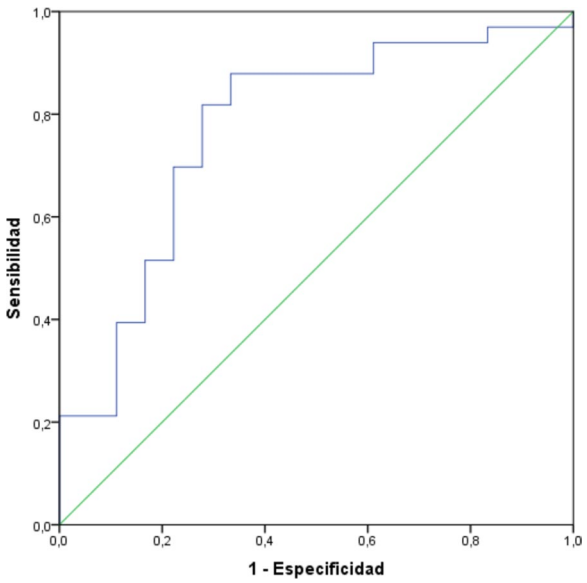


**Image 2 (abstract 000583)** ROC curve, cutt-off of the VIS at 48h

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4. NO

**Topic:** Cardiovascular issues in ICU

## 000585

### Large scale population pharmacokinetic analysis of inhaled amikacin among intubated patients: an ancillary analysis of the Amikinhal trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000585

**Introduction:** The favorable pharmacokinetic (PK) profile of inhaled antibiotics, i.e. achieving high drug concentrations at the pulmonary site of action with limited systemic diffusion and side effects, represents the principal rationale for their use. However, among patients under mechanical ventilation, numerous factors have been described influencing the drug amount actually delivered to the lungs, but clinical pharmacokinetic data is limited.

**Objectives:** To perform large-scale population PK analysis of inhaled amikacin taking advantage of a randomized trial evaluating inhaled amikacin (20 mg/kg once a day for three days) to prevent ventilator-associated pneumonia.

**Methods:** Of 420 patients randomized to receive inhaled amikacin, a subset underwent sputum and plasma sampling randomly distributed over the 24 h following each nebulization. Various PK models were tested, with or without peripheral compartments and nonlinear elimination kinetics. Inter-individual and inter-occasion variabilities were assumed to follow a lognormal distribution. Covariate effects (age, sex, weight, oxygenation, ventilation mode, and settings, type of ventilator circuit, active humidification during nebulization, …) on PK parameters were evaluated using power or exponential functions and categorical models. Model selection was based on Bayesian information criterion, residue analysis, and accuracy metrics. The final model evaluation involved goodness of fit analysis, visual predictive checks, and assessment of prediction distribution errors and shrinkage.

**Results:** One to five plasma samples (total 638 samples) and 1 to 4 sputum samples (total 526 samples) were taken among 281 patients. In the sputum, concentrations were highest at the end of nebulization. Two distinct population pharmacokinetic models were established for sputum and plasma concentrations as these were not correlated. The sputum model was bi-compartmental, and the plasma model was mono-compartmental. In sputum, inter-individual variability was very high and no covariates, including ventilation parameters, were correlated with concentrations. The median maximum concentration was 7307 µg/g (80% range: 1684–12388 µg/g). The terminal half-life calculated from the model parameters was 7.9 h (80% range 4.0–303.3 h). The median concentration in sputum predicted 24 h after nebulisation was 236 µg/g (80% range: 6–507 µg/g). Concerning plasma concentration, the median maximal concentration was 2.0 mg/L (80% range: 0.7–4.5 mg/L). The median concentration in plasma predicted 24 h after nebulisation was 0.36 mg/L (80% range: 0.04–1.57 mg/L).

**Conclusions:** This large-scale population PK analysis confirmed the strong rational for inhaled antibiotic delivery. Surprisingly, none of the covariates believed to influence inhaled drug delivery based on preclinical data and small sample size studies, significantly influenced PK parameters in this large clinical study.

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2. Programme Hospitalier de Recherche Clinique National 2015 of the French Ministry of Health (grant number PHRC-15–260) and the Association Tourangelle de Médecine Intensive Réanimation (ATOUMIR)

**Topic:** Acute respiratory failure and mechanical ventilation

## 000586

### Evaluation of AI-assisted ultrasound for muscle quality assessment in critically ill older adult trauma patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000586

**Introduction:** Sarcopenia and frailty, marked by muscle mass loss and quality decline, are pivotal factors impacting surgical outcomes. Current diagnostic approaches prioritize muscle mass assessment, often overlooking muscle quality. Ultrasound, although promising, lacks standardized criteria for sarcopenia diagnosis.
**Objectives:** This study assesses the reliability of AI-based software for ultrasound muscle quality evaluation, particularly focusing on the rectus femoris muscle. Validating AI-aided ultrasound could revolutionize sarcopenia assessment, refining surgical risk stratification and enhancing patient care.
**Methods:** In a cohort study, older adult trauma patients ($\geq 60$) underwent baseline sarcopenia evaluation using rectus femoris muscle ultrasound imaging. Transverse images were obtained on admission and discharge from 35 ICU patients, compared with age-matched healthy controls ($n = 975$). The AI software analyzed images to measure intramuscular adipose tissue (IMAT) and muscle parameters, including IMAT-index.
**Results:** IMAT-Index was measured in 29 patients (mean age: $73 \pm 1.4$), with 59% female and mean BMI of $29 \pm 1$. Cut-off IMAT-index for rectus femoris was 4.81%/cm$^2$. Frailty was observed in 44.8% ($n = 13$) and non-frailty in 55.2% ($n = 16$) of patients.
**Conclusions:** AI-assisted ultrasound presents a promising adjunct for frailty assessment and sarcopenia diagnosis in older adult trauma populations. Implementation of this technology could augment diagnostic precision and optimize patient care strategies, particularly in critical care settings.

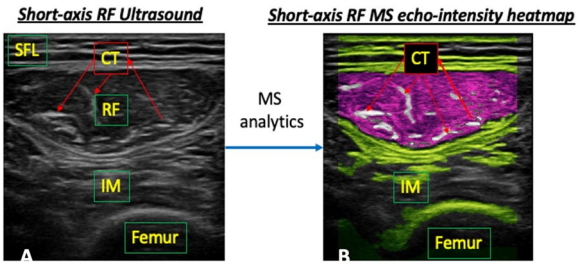


**Fig. (abstract 000586)** Short axis high-resolution B mode images of the rectus femoris muscle. A: Before image processing; B: After image processing. SFL subcutaneous fat layer; CT connective tissue; RF rectus femoris; IM vastus

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000587

### Hemophagocytic lymphohistiocytosis in adult critically ill patients in Intensive Care Unit: preliminary results from a systematic review with pooled analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000587

**Introduction:** Distributive shock burdened with Multiorgan Dysfunction (MODs) is a foremost cause of admission in the Intensive Care Unit (ICU). Hemophagocytic Lymphohistiocytosis (HLH) is a life-threatening hyperinflammatory syndrome caused by aberrantly persistently activated cytotoxic lymphocytes and macrophages with substantial clinical overlap with sepsis and MODs (1). Worldwide awareness of this condition is increasing, but currently, its overall frequency in ICU is unknown and probably underreported. Although international guidelines have been published (2), diagnosis, treatment and clinical management of this condition—especially in ICU—remain heterogeneous and inequitable.
**Objectives:** To increase awareness of HLH in ICU patients providing a pooled analysis of case reports and case series of literature.
**Methods:** We conducted a literature search of MEDLINE and EMBASE including studies, case series and case reports of adult patients diagnosed with HLH and admitted to ICU in the period 2006—January 2024. Source data of studies and case series were summarized and analyzed on an individual basis. Multivariable logistic regression analysis with use of stepwise selection was performed.
**Results:** In total, 148 patients from 128 case series and case reports were included. Population data and analysis are presented in Table 1. Overall ICU mortality was 47,5%.
The most common triggers include viral infection (52,41%) and namely EBV (19,59%) SARS cov 2 (14,86%), CMV (6,08%), disimmune disease, and hematologic malignancy.
Bone marrow biopsy (BMB) was performed in 73,97% of patients and guided treatment initiation in 83.81% of cases.
Treatment with etoposide (25,15%), tocilizumab (5,41%), Anakinra (16,33%), Penthaglobin® (2,03%), Cyclosporine (6,08%) and plasmapheresis (3,38%) didn't show a clear impact on mortality, while high-dose corticosteroids use (57,93%) showed a significative positive impact on survival in univariate analysis but did not in multivariate analysis.
**Conclusions:** Mortality of HLH in ICU is high. The most common triggers were viral infections, disimmune diseases, and hematologic malignancies. Patients with hematologic malignancies seem to represent a subgroup at higher mortality risk.
High-dose steroids appear to be the only treatment with statistically significant mortality reduction in univariate analysis but failed to obtain significance in multivariate analysis. Patients who needed invasive mechanical ventilation had a significantly higher mortality.
Early clinical suspicion of HLH during refractory distributive shock is pivotal, especially when a possible trigger is present. Although representative and widely used to guide clinical choices, BMB is not the only diagnostic tool that clinicians must consider as suggested by compound scores like HLH-2004 and HScore3.
Future studies prospectively investigating treatment tailored to critically ill HLH patients are highly warranted.

| Dependent variable | Indipedent variable | Univariate analysis | | | | | Multivariate analysis | | |
|---|---|---|---|---|---|---|---|---|---|
| | (N=148) | population | A (N=74) | D (N=67) | OR | p-value | OR | p-value | IC 95% |
| ICU mortality | Age | 45 [17] | 41 [16] | 49 [18] | 1,003 | **0.0227** | 1,010 | | |
| | Sex (M) | 82 [56,94] | 35 [44.87] | 43 [55.13] | 2.258 | 0.038 | | | |
| | EBV | 29 [19.59] | 13 [46.43] | 15 [53.57] | 1.348 | 0.4737 | | | |
| | CMV | 9 [6.08] | 7 [87.50] | 1 [12.50] | 0.143 | **0.0381** | | | |
| | SARS cov 2 | 22 [14.86] | 5 [26.32] | 14 [73.68] | 3.644 | **0.0141** | 4,947 | 0.0170 | 1.331 - 18.392 |
| | HIV | 8 [5.41] | 3 [37.50] | 5 [62.50] | 1.914 | 0.1978 | | | |
| | HSV1 | 7 [4,73] | 2 [33.33] | 4 [66.67] | 2.172 | 0.3371 | | | |
| | *H. capsulatum* | 6 [4.05] | 4 [66.67] | 2 [33.33] | 0.535 | 0.2596 | | | |
| | *M. tuberculosis* | 8 [5.44] | 7 [87.5] | 1 [12.5] | 0.142 | **0.0366** | | | |
| | Bacterial infection | 24 [16.22] | 14 [58.33] | 10 [41.67] | 0.747 | 0.5286 | | | |
| | Viral infection | 76 [52.41] | 31 [43.66] | 40 [56.34] | 2.313 | **0.0157** | | | |
| | Fungal infection | 6 [4.05] | 2 [40.00] | 3 [60.00] | 1.687 | 0.5693 | | | |
| | Pregnancy related | 7 [4.76] | 5 [71.43] | 2 [28.57] | 0.418 | 0.1849 | | | |
| | Disimmune disease | 30 [20.27] | 18 [64.29] | 10 [35.71] | 0.539 | 0.1624 | | | |
| | Hematologic malignancy | 18 [12.16] | 4 [22.22] | 14 [77.78] | 4.617 | **0.0059** | 7,070 | 0.0077 | 1.679 - 29.766 |
| | Solid neoplasm | 3 [2.03] | 1 [33.33] | 2 [66.67] | 2.242 | 0.3578 | | | |
| | Biopsy | 108 [73.97] | 62 [60.78] | 40 [39.22] | 0.312 | **0.0031** | 0,232 | 0.0036 | 0.087 - 0.620 |
| | IMV | 119 [83.80] | 53 [47.32] | 59 [52.68] | 5.376 | **0.002** | 6,746 | 0.0076 | 1.662 - 27.380 |
| | ECMO | 8 [5.97] | 6 [85.71] | 1 [14.29] | 0.204 | 0.0954 | | | |
| | CRRT | 52 [38.24] | 23 [46.00] | 27 [54.00] | 1.803 | 0.1053 | | | |
| | CRRT filter | 12 [8.11] | 6 [54.55] | 5 [45.45] | 0.911 | 0.8865 | | | |
| | High dose corticosteroid | 84 [57.93] | 49 [60.49] | 32 [39.51] | 0.413 | **0.0113** | | | |
| | Etoposide | 37 [25.17] | 20 [58.82] | 14 [41.18] | 0.700 | 0.3702 | | | |
| | Tocilizumab | 8 [5.41] | 3 [50.00] | 3 [50.00] | 1.112 | 0.901 | | | |
| | Anakinra | 11 [7.48] | 7 [63.64] | 4 [36.36] | 0.579 | 0.4266 | | | |
| | IVIG | 24 [16.33] | 14 [60.87 | 9 [39.13] | 0.611 | 0.3998 | | | |
| | Penthaglobin® | 3 [2.03] | 1 [33.33] | 2 [66.67] | 2.242 | 0.502 | | | |
| | Plasmapheresis | 5 [3.38] | 2 [40] | 3 [60] | 1.687 | 0.5693 | | | |
| | Cyclosporine | 9 [6.08] | 4 [44.44] | 5 [55.56] | 1.409 | 0.6177 | | | |

**Fig. (abstract 000587)** A: alive; D: dead; EBV: Epstein-Barr Virus; CMV: Citomegalovirus; HIV: Human Immunodeficency Virus; HSV1: Herpes Simplex Virus type 1; IMV: Invasive Mechanical Ventilation; ECMO: Extracorporeal Membrane Oxygenator; CRRT: Continuous Renal Replacement Therapy; IVIG: Intravenous Immunoglobulin

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**Topic:** Haematologic-oncologic issues in the ICU

## 000589

## Predictive value of elevated interleukin-33 levels in patients with trauma: a prospective observational study

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**Introduction:** Secondary complications accompanying severe traumatic injuries, particularly the emergence of multiorgan dysfunction syndrome (MODS), continue to be a significant and persistent cause of morbidity among hospitalized trauma patients. Interleukin-33 (IL-33) is a member of the IL-1 cytokine family and functions as an alarm signal in the immune system. The complete IL-33 protein necessitates enzymatic cleavage by proteases to produce its mature biologically active state. This active form can then bind to its specific receptor, the suppression of tumorigenicity (ST2) receptor, thereby initiating the activation of the nuclear factor kappa B (NF-κB) pathway across diverse innate and adaptive immune cell types. The elevated presence of IL-33 primarily within epithelial and endothelial cells contributes to its pro-inflammatory functions.

**Objectives:** This study aimed to evaluate the effectiveness of IL-33 as an indicator of the development of MODS in patients with trauma.

**Methods:** This study included patients with trauma admitted to our trauma center from July 2022 to July 2023. Using the Bio-Plex assay, IL-33 level was measured in blood samples over 4 days. Correlations with clinical and laboratory indicators, including initial IL-33 levels, were analyzed to identify the independent predictors of MODS in total patients and patients with injury severity score (ISS) over 16, respectively. After dividing the patients into the IL-33-positive and IL-33-negative groups, the factors showing significant differences between the 2 groups were analyzed.

**Results:** 87 patients were enrolled, 20 of whom developed MODS. The initial IL-33 levels were elevated in the MODS group compared to the non-MODS group. In the non-MODS group, IL-33 levels initially increased on the first day and then decreased, whereas the MODS group exhibited a consistent decline in IL-33 levels. In patients with detectable initial IL-33 levels, measurable levels correlated with higher abbreviated injury scale 5 scores and ISS. According to the multivariate analysis, in the entire patient cohort, ISS and DNI were identified as predictors of MODS, and in the patient cohort with an ISS greater than 16, lactate was confirmed as a predictor of MODS.

**Conclusions:** Initial IL-33 levels were higher in the MODS group and exhibited a rapid declining trend. This suggests that the net effect of the surged IL-33 at the initial presentation may act as a proinflammatory effect and that maintaining IL-33 after 1 day may have stronger anti-inflammatory effects on T regulatory cells, which may have a role in preventing MODS. The IL-33-positive group may be associated with higher ISS and AIS 5 score. Suggesting its potential as a dynamic biomarker for assessing trauma severity and the progression to MODS.

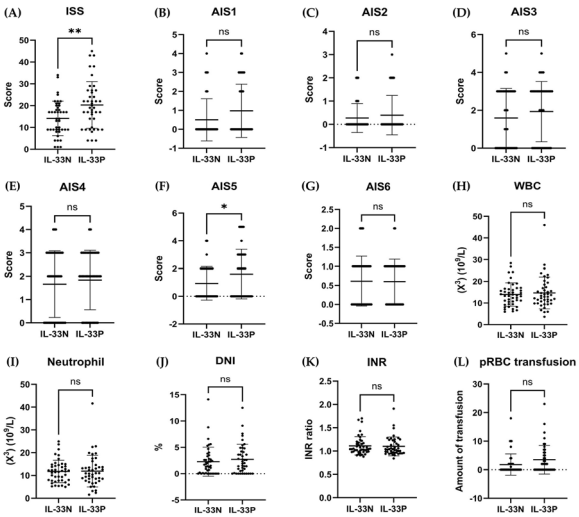


**Fig. (abstract 000589)** Injured patients stratified according to absence (IL-33N) or presence (IL-33P) at the initial presentation. Difference in (a) injury severity score, (b) abbreviated injury scale (AIS) 1 score, (c) AIS2 score, (d) AIS3 score, (e) AIS4 score, (f) AIS5 score, (g) AIS6 score, (h) white blood cell count, (i) neutrophil count, (j) delta neutrophil index, (k) international normalized ratio, and (l) amount of packed red blood cell transfusion. ns $p \geq 0.05$, *$p < 0.05$, **$p < 0.01$, *** $p < 0.001$, ****$p < 0.0001$

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4. This research was supported by the National Research Foundation of Korea (NRF) grant funded by the Ministry of Education, grant number 2022R1I1A1A01068599.

**Topic:** Trauma

## 000591

### Association between chest computed tomographic findings, prolonged corticosteroid use and mortality among critically ill patients with COVID-19

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000591

**Introduction:** Prolonged corticosteroid use is associated with a higher mortality rate among patients with COVID-19 [1]. However, the relationship between lung involvement, mortality, and duration of corticosteroid therapy use remains unexplored.
**Objectives:** To evaluate whether chest computed tomography (CT) findings are associated with prolonged corticosteroid use and mortality among critically ill patients with COVID-19.
**Methods:** Patients were randomly selected from a dataset of hospitalized patients with COVID-19. Inclusion criteria were ICU admission and corticosteroid use. Subjects were divided into two groups according to the duration of corticosteroid therapy: short corticosteroid group (up to ten days) and prolonged corticosteroid group (more than ten days). Image analysis was conducted independently by two radiologists using a semi-quantitative method that scores 0–5 points according to the percentage of involvement in each lobe for each of the three elementary lung patterns associated with COVID-19, namely, ground-glass opacities, consolidations, and crazy-paving. The total CT score was calculated through the sum of scores for each lobe, ranging from 0 to 28 points, with higher scores indicating higher lung involvement [2]. For patients who underwent a second chest CT during hospitalization, the change in CT score over time was compared between groups. The primary outcome was the difference in radiographic patterns between groups with short and prolonged corticosteroid use. The secondary outcome was the difference in radiographic patterns between survivors and non-survivors.
**Results:** A total of 110 patients were included in the analysis, of which 54 received a short corticosteroid course, and 56 a prolonged course. The mean age was 54 and 63% of participants were male. Seventy-five patients underwent a second chest CT. Overall mortality was 23%, and no difference was detected between groups. Patients in the prolonged group presented higher scores for ground-glass opacities (median 15 IQR [9–19] vs 10 [4.2–15.7], $p=0.004$) in the first chest CT. Consolidation, crazy-paving, and total CT score values did not differ between groups. For the second chest CT, there was no difference for each of the three radiologic patterns, but the total CT score was higher for the prolonged group (median 20.5 IQR [13.7–25.2] vs 13 [8.5–21], $p=0.023$). The difference in CT score between first and second chest CT did not differ between groups with short or prolonged corticosteroid use. Survivors presented more reduction in the total CT score between the first and the second CT in comparison to non-survivors (mean -3.2 95% CI [−4.6 to −1.9] vs 0.15 95%CI [−2,4 to 2.7]; $p=0.049$].
**Conclusions:** Patients with prolonged corticosteroid use had more ground-glass opacities in the first chest CT and higher total CT scores in the second chest CT. Moreover, survivors presented a more pronounced reduction in the total CT score between the first and the second chest CT.

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**Topic:** Imaging in intensive care

## 000592

### Correlation between optic nerve sheath diameter and intracranial pressure in the patients with leptomeningeal seeding

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000592

**Introduction:** Leptomeningeal seeding (LMS) refers to the metastasis of cancer to the arachnoid mater, cerebrospinal fluid (CSF), and pia mater. The tumor cell infiltration via LMS may cause hydrocephalus and increased intracranial pressure (IICP) as secondary complications. Clinical physicians often encounter the devastating results of sudden neurologic deterioration in patients with IICP signs with no radiologically definite hydrocephalus. Optic nerve sheath diameter (ONSD) is one of the useful diagnostic methods to detect IICP signs. However, the application of ONSD is not much reported in patients with LMS for diagnostic and/or prognostic purposes. We hereby share our experience with ONSD to analytically predict IICP in patients with LMS.
**Methods:** We have conducted a retrospective study of 79 patients with brain metastasis, who were admitted to our institution from 2015 to 2018. Patients with suspected LMS in the radiological findings were further selected for this study so that those who underwent ventriculo-peritoneal shunt or Ommaya catheter insertion with IICP but no definite mass effect were investigated. The study parameters were as follows: age, gender, primary tumor region, ONSD, presence of tumor cells in CSF cytology, ICP measurements, and overall survival. We analyzed the relationship between the ICP and ONSD measurements in conjunction with the findings of tumor cells in the CSF cytology. Then, we further analyzed whether there is any correlation between the actual ICP measurements and pre-operative ONSD.
**Results:** Of 79 patients, 49 patients were investigated. Those with incomplete medical records (n = 20) and ambiguous CSF cytology ($n=10$) were excluded from this study. Lung cancer was the most frequent primary tumor with brain metastasis ($n=17$, 43.6%) while the second most frequent primary tumor was breast cancer ($n=5$, 12.8%). According to the CSF cytology studies, the rate of positive findings of tumor cells was 66.7% ($n=26$). The ICP was higher in the patients with tumor cells in the CSF than those without ($25.0 \pm 15.3$ mmCSF vs. $13.46 \pm 8.0$ mmCSF, respectively; $p=0.013$). ONSD was also larger in the patients with tumor cells in the CSF than those without ($5.75 \pm 0.8$ mm vs. $5.12 \pm 0.6$ mm, respectively; $p=0.016$). According to the Pearson correlation analysis, the opening ICP and ONSD showed a positive correlation with a Pearson coefficient of 0.662 ($p=0.000$). Using the receiver operating characteristic (ROC) curve of ONSD and the positive finding rate of tumor cells in the CSF, we discovered that 100% sensitivity and 69% specificity were noted when the ONSD was 6.13 mm.
**Conclusions:** This study has demonstrated that the patients with positive findings of tumor cells in the CSF showed higher ICP. High ICP state of the patients with LMS was confirmed by the pre-operative measurement of ONSD. Indirectly, clinicians can also predict the presence of tumor cells in the CSF via the measurements of ONSD. In conclusion, the ONSD is a powerful non-invasive method to predict ICP in the patients with LMS, and this can further aid the clinicians to plan early ICP managements.

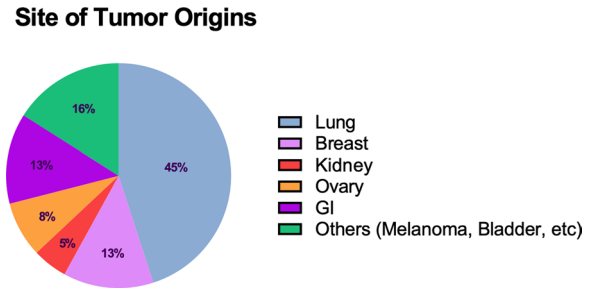


**Fig. (abstract 000592)** Of 69 patients, 39 patients were investigated. Those with incomplete medical records ($n = 20$) and ambiguous CSF cytology ($n = 10$) were excluded from this study

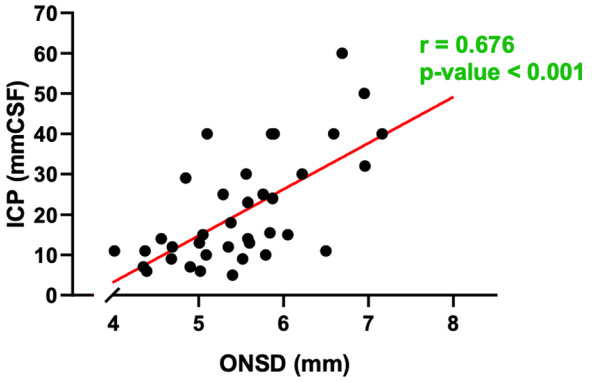


**Fig. (abstract 000592)** According to the Pearson correlation analysis, the opening ICP and ONSD showed a positive correlation with Pearson coefficient of 0.676 ($p < 0.001$)

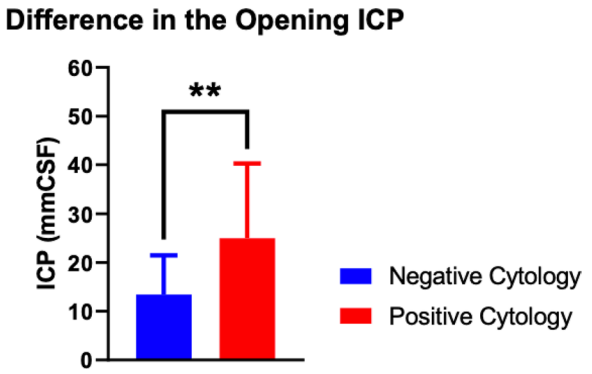


**Fig. (abstract 000592)** The ICP was higher in the patients with tumor cells in the CSF than those without (25.0 ± 15.3 mmCSF vs. 13.46 ± 8.0 mmCSF, respectively; $p = 0.013$)

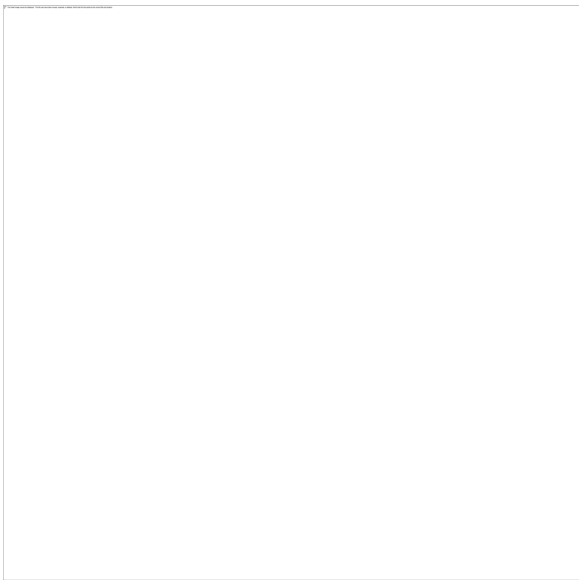

**Fig. (abstract 000592)** ONSD was also larger in the patients with tumor cells in the CSF than those without (5.75 ± 0.8 mm vs. 5.12 ± 0.6 mm, respectively; $p = 0.016$)

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5. Jong Hee Chang, Department of Neurosurgery, College of Medicine, Yonsei University
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**Topic:** Neurointensive care

## 000593

## Development of a REBOA simulator to optimise central blood pressure in patients with varying degrees of haemorrhage: an in vivo-in silico hybrid approach

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000593

**Introduction:** Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) is a balloon catheter that occludes the aorta via a transfemoral approach. It can effectively reduce bleeding and maintain central blood pressure; however, the effect on central blood pressure varies widely depending on several factors such as bleeding volume, cardiac function, and REBOA position. Optimal management of REBOA taking these factors into account is challenging even for experts. We hypothesised that a circulatory simulator could help optimise REBOA management.

**Objectives:** The aim of this study is to establish the REBOA simulator based on the fundamental REBOA characteristics from animal experiments and to investigate the influence of blood volume condition and cardiac function on central blood pressure under different REBOA placement positions.

**Methods:** In anesthetized beagle dogs ($N=11$), aortic pressure (AOP), right atrial pressure, and cardiac output were measured. REBOA was inserted through the left femoral artery. After inducing hypovolemic shock by blood withdrawal, the balloon was inflated at Zone 3 (below the renal arteries) and Zone 1 (descending aorta) to record haemodynamic changes. We used Simulink® (Mathworks Inc.) to perform the simulation. The four cardiac chambers were represented by a time-varying elastance. The systemic and pulmonary circulations were represented by resistance-compliance circuits, with the systemic circulation divided into three parallel circuits: central to Zone 1, between Zone 1 and Zone 3, and peripheral to Zone 3. Hypovolemic conditions were mimicked by blood volume loss and increased resistance. The effects of REBOA on haemodynamics were compared among baseline, Zone 1, and Zone 3 under various conditions of reduced stressed blood volume and left cardiac contractility.

**Results:** In animal experiments, the increases of AOP and vascular resistance by REBOA were significantly greater in Zone 1 than those in Zone 3 (Fig. 1A). Using the obtained data, we set the simulation parameters (Fig. 1B). The REBOA simulator demonstrated varying central blood pressure effects under different stressed blood volume, cardiac functions, and positions (Fig. 2). REBOA in normal hearts with 400 ml blood loss drastically elevated AOP (92.7, 149.3, 112.3 mmHg: Baseline, Zone 1, Zone 3). On the other hand, REBOA in hearts with low cardiac contractility and 1200 ml blood loss showed limited pressure elevation (25.3, 38.4, 29.9 mmHg: Baseline, Zone 1, Zone 3). In addition, REBOA in hearts with low cardiac contractility and 400 ml blood loss shifted the pressure–volume loop rightward (Fig. 3) and increased left atrial pressure (9.0, 15.7, 10.5 mmHg: Baseline, Zone 1, Zone 3).

**Conclusions:** The impact of REBOA on central blood pressure differs greatly depending on blood volume, cardiac function, and REBOA position. The REBOA simulator, which simulates central blood pressure effects in complex pathophysiological conditions, can help optimise REBOA management.

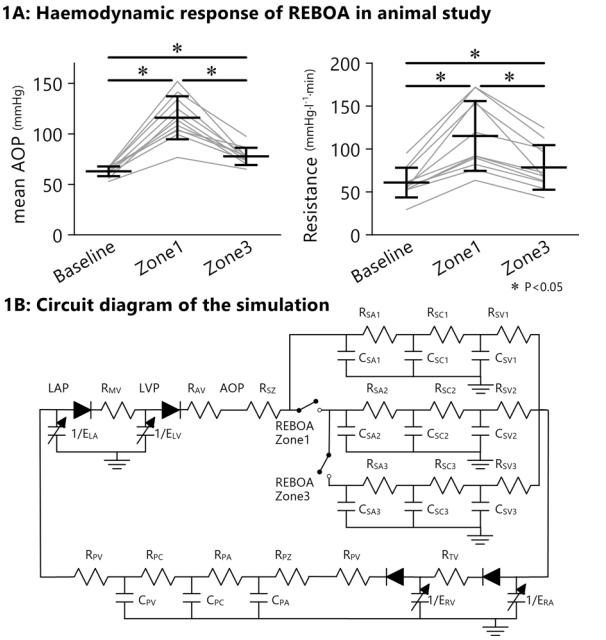


**Fig. 1 (abstract 000593)** Development of a REBOA simulator. A: Haemodynamic response of REBOA in an animal study. B: Circuit diagram of the simulation

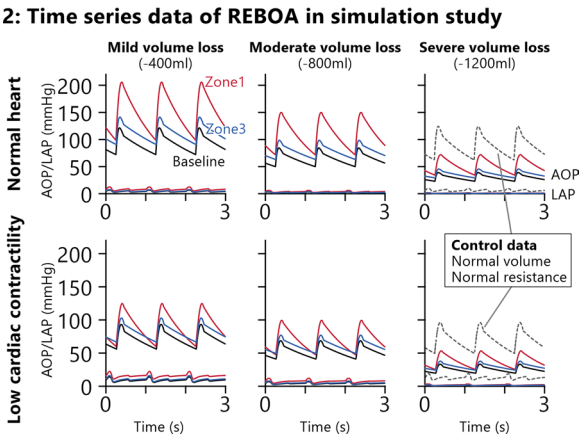


**Fig. 2 (abstract 000593)** Time series data of REBOA in a simulation study. Black, Red, and Blue lines indicated, Baseline (no REBOA), Zone 1, and Zone 3, respectively. Dash lines indicated Control data: Normal volume and normal resistance

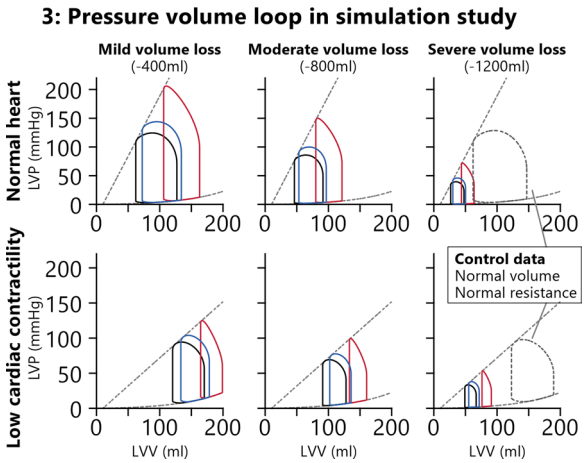


**Fig. 3 (abstract 000593)** Pressure volume loop in a simulation study. Black, Red, and Blue lines indicated, Baseline (no REBOA), Zone 1, and Zone 3, respectively. Dash lines indicated Control data: Normal volume and normal resistance

**Reference(s)**

1. Intramural Research Fund for Cardiovascular Diseases of National Cerebral and Cardiovascular Centre (21-2-7, 21-2-9)
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5. Ministry of Internal Affairs and Communications (SCOPE: JP225006004)
6. Japan Agency for Medical Research and Development (22hk0102085, 23uk1024007)

**Topic:** Trauma

## 000594

## An interim report from the ESICM endorsed international registry on acute respiratory distress syndrome– the ICU LIBERATION study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000594

**Introduction:** Acute Respiratory Distress Syndrome (ARDS) is a critical illness with high mortality and morbidity in Intensive Care Unit (ICU) on a global scale. It has been highlighted that definitive strategies have not yet been established2 and patient quality of life (QOL) in post-ARDS presented significant deterioration due to impaired physical and cognitive function and mental disorders3-6. However, detailed daily data on the systematic implementation of ventilator strategy and evidence-based ICU care (e.g., the ABCDEF bundle, nutrition, ICU diaries, etc.)7, which is essential to guide clinicians on what we aim to achieve in daily clinical practice based on the disease severity and patient conditions, are lacking in the current literature8,9.

**Objectives:** This study aims to develop an international registry with data on the epidemiology, treatments, daily ICU care, and functional outcomes after hospital discharge.

**Methods:** This is an interim report of an international prospective cohort study, entitled "The ICU LIBERATION Study" endorsed by the European Society of Intensive Care Medicine (ESICM). As of 4th of April 2024, 167 ICUs across 29 countries have participated. This report included all consecutive adult ICU patients between June 2023 and March 2024 who were on an invasive or non-invasive ventilator within 24 h of ICU admission and for more than 48 h. The following essential data are collected daily: the disease severity and patient conditions (e.g., arterial blood gas result, Sequential Organ Failure Assessment Score, and respiratory mechanics such as plateau and driving pressure), ventilator settings, the implementation of the ABCDEF bundle, the amount of nutrition provided, and the introduction of ICU diary. The preliminary outcomes were hospital mortality and the incidence of physical impairments (evaluated by Barthel Index), cognitive impairments (by Mini-Mental State Examination), and mental disorders (by any of Hospital Anxiety and Depression Scale or Impact of Event Scale-Revised) at the 3-month follow-up performed by telephone. The feasibility of the daily-based registry was shown by the percentage of completion of daily data.

**Results:** A total of 523 patients with a mean PaO2/FIO2 ratio of 124 and PEEP of 9 were enrolled. The patient characteristics are demonstrated in Table 1. Of those, 332 patients were discharged and 204 patients have completed the 3-month follow-up with 7% follow-up loss. The hospital mortality was 36% and the mortality at 3-month follow-up was 39%. Of 204 patients, the incidence of physical and cognitive impairments and mental disorders at 3-month follow-up were 34%, 44%, and 25/%, respectively. The completion of essential daily data was 89% overall.

**Conclusions:** This is the first report from the ICU LIBERATION Study endorsed by ESICM. High mortality and high incidence of functional deterioration in ICU patients with ARDS were identified. The high completion of daily data will provide a deep understanding of the relationship between daily practice and patient prognosis in future analysis.

**Table 1 (abstract 000594)** Baseline characteristics

| Item | Overall (n=523) |
|---|---|
| Age, median [IQR] | 64.0 [46.0 - 75.0] |
| Sex (Male), n (%) | 351 (7%) |
| Body Mass Index, median [IQR] | 24.2 [21.2 - 27.8] |
| Clinical Frailty Scale prior to hospital admission, median [IQR] | 2.0 [1.0 - 3.0] |
| Barthel Index prior to hospital admission, median [IQR] | 100.0 [95.0 - 100.0] |
| Dementia scale prior to hospital admission, median [IQR] | 0.0 [0.0 - 0.0] |
| Swallowing function prior to hospital admission, median [IQR] | 7.0 [7.0 - 7.0] |
| Most likely cause of ARDS, n (%) | |
| Bacterial respiratory infection, n (%) | 251 (48%) |
| COVID 19, n (%) | 98 (19%) |
| Sepsis non respiratory, n (%) | 92 (18%) |
| Other viral respiratory infections,n (%) | 77 (15%) |
| Influenza, n (%) | 68 (13%) |
| Charlson Comorbidity Index, median [IQR] | 2.0 [0.0 - 4.0] |
| APACHEII, median [IQR] | 18.0 [10.0 - 24.0] |
| SOFA Sum Score, median [IQR] | 8.0 [5.0 - 11.0] |

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000597

### Evaluation of predictive tests associated with postoperative pulmonary complications in elderly patients undergoing hip surgery under general anesthesia: a retrospective observational study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000597

**Introduction:** Postoperative pulmonary complications remain a significant problem for elderly patients undergoing hip surgery under general anesthesia. To prevent this, various lung function tests are performed before surgery, but sometimes tests are performed inaccurately due to age or cannot be performed due to the patient's condition. Therefore, it is not known which test is most meaningful in predicting pulmonary complications after surgery.
**Objectives:** The aim of this study was to evaluate the predictive preoperative test associated with postoperative pulmonary complications in elderly patients undergoing hip surgery under general anesthesia.
**Methods:** A retrospective observational study was performed of patients aged 60 years or older undergoing hip surgery under general anesthesia at a tertiary care hospital from January 2018 to December 2022. The data collected included demographic information, laboratory tests, pulmonary function tests, pulmonary imaging tests including CT and X-ray, results of preoperative consultation with a pulmonologist, and postoperative outcomes. Afterwards, the statistical difference between the group that developed pulmonary complications after surgery and the group that did not, and the relationship between preoperative tests and the occurrence of postoperative complications were analyzed through regression analysis.
**Results:** 544 patients were divided into two groups: those that developed pulmonary complications (pulmonary complications group, PCG, $n=236$) and those that did not (control group, CG, $n=308$). The PCG was significantly older, included more emergency cases, and had significantly more patients with cardiovascular and renal diseases than the CG. In preoperative consultation with a pulmonologist, there were significantly more moderate to high-risk patients in the PCG. Laboratory tests showed significantly higher WBC and bilirubin levels, and lower aPTT in the PCG. ABGAs1, PFTs2, and operation data showed no difference. A multivariate logistic regression analysis revealed that moderate or higher risk given in preoperative consultations was associated with a 204% increase in pulmonary complications [odds ratio (OR): 2.045, $P=0.012$]. Increased WBC counts (OR: 1.000), decreased aPTT (OR: 0.932), and history of cardiovascular disease (OR: 0.281), were also associated with pulmonary complications ($P=0.001$).
**Conclusions:** In conclusion, preoperative pulmonary consultation with a pulmonologist of a moderate or higher risk was the best predictor associated with postoperative pulmonary complication in elderly patients undergoing hip surgery under general anesthesia.

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**Topic:** Perioperative care

## 000598

### NEWS2 accuracy in predicting ICU admission in trauma patients based on their prehospital data set: a diagnostic study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000598

**Introduction:** National Early Warning Score (NEWS2) is a scoring system designed to evaluate patients' clinical status. Studies have demonstrated its capability in predicting trauma patients' outcomes, including death and ICU admission (1, 2). NEWS2 is a feasible and quick way to determine and predict patients' outcomes using common vital signs and clinical status.
**Objectives:** In this novel study we aim to evaluate NEWS2 accuracy in predicting ICU admission in trauma patients based on their prehospital data set in the largest trauma center in southern Iran during 2023–2024.
**Methods:** Of 6905 trauma patients, 4191 were eligible for the study. Patients were divided into ICU admissions and admissions to wards other than ICU groups. Demographic data, vital signs, and Glasgow coma scale (GCS) were obtained in a prehospital setting. NEWS2 is

then calculated (3) and the two groups are compared. Mean and standard deviation are reported for variables. Area under the receiver operator curve, sensitivity, specificity, positive and negative predictive values, and odds ratio (OR) of NEWS2 are reported. P-value under 0.05 is considered significant.

**Results:** Of the 4191 patients, 541 have been admitted to ICU. Mean, and standard deviation of age, systolic blood pressure, respiratory rate, heart rate, SpO2, temperature, and GCS are 41.6 + 20.57, 129 + 18.59, 16.55 + 3.06, 87.77 + 16.9, 94.13 + 5.92, 36.77 + 0.39, and 14.48 + 1.99, respectively. Age and gender had no significant differences between the two groups. SBP, RR, HR, temperature, and GCS were significantly different between the two groups ($p < 0.001$). NEWS2 was significantly capable of predicting ICU admission in patients based on prehospital data set with cutoff point > 3 ($p < 0.0001$, AUC = 0.806, odd ratio = 13.75, 95% CI (11.22–16.86)) (Figure 1). Its sensitivity and specificity were 60.07, 95% CI (55.8–64.2) and 90.14, 95% CI (89.1–91.1), respectively. Positive and negative predictive values are 47.4 and 93.8, respectively (Table 1).

**Table 1 (abstract 000598)** ROC characteristics of NEWS2

| Characteristics | Values |
|---|---|
| Cutoff | > 3 |
| Area under the curve | 0.806 |
| Sensitivity (95% CI) | 60.07 (55.8–64.2) |
| Specificity (95% CI) | 90.14 (89.1–91.1) |
| Positive predictive value | 47.4 |
| Negative predictive value | 93.8 |
| Odd ratio (95% CI) | 13.75 (11.22–16.86) |

**Conclusions:** As demonstrated in this novel study, NEWS2 can effectively predict the need for ICU admission in trauma patients based on their prehospital data set. Studies have indicated that it takes roughly 4 min to calculate early warning scores including NEWS2 (4). Given its proper accuracy and ease of use, it seems to be a practical tool for managing and dispositioning the patients and in turn, reducing unexpected ICU admissions. Further meta-analysis and population-based studies are required to confirm these findings. Finally, using machine learning and advanced wearable vital signs monitoring devices, it is possible to utilize this scoring system in a way that can reduce mortality and morbidity of trauma patients.

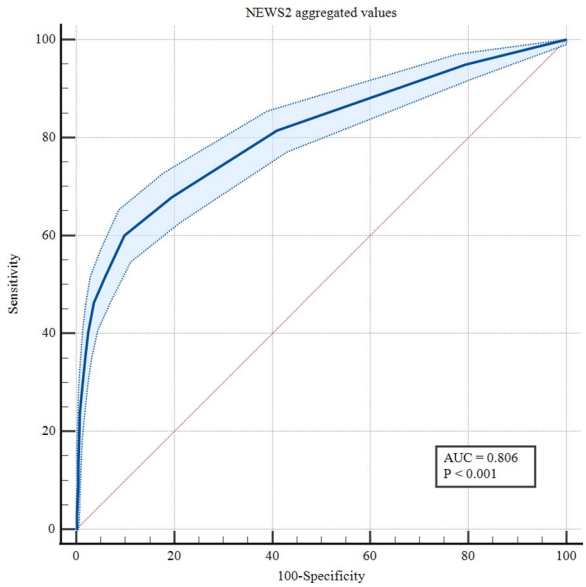


**Fig. 1 (abstract 000598)** Receiver operator curve of NEWS2 in predicting ICU admission Fig. 1 Receiver operator curve of NEWS2 in predicting ICU admission

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**Topic:** Trauma

## 000599

### Incidence of ICU unplanned readmission among trauma patients within the same hospitalization

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**Introduction:** Intensive Care Unit (ICU) readmission among trauma patients presents multifaceted challenges within healthcare systems, including prolonged hospital stays, elevated complications of

hospitalization, and increased healthcare costs. (1,2) Despite extensive research efforts, ICU readmission remains a persistent concern, necessitating further investigation to better understand its determinants and implications.
**Methods:** This retrospective cohort study conducted at Emtiaz Hospital a level I referral trauma center in Shiraz City aimed to analyze ICU readmission rates among trauma patients over a three-year-period. Data were extracted from the Iranian Intensive Care Registry (IICUR), encompassing patient demographics, injury severity, physiological parameters, and clinical outcomes. Statistical analysis was performed using SPSS version 25.0, employing a range of methodologies such as descriptive statistics, T-tests, Mann–Whitney tests, Chi-square tests, and logistic binary regression.
**Results:** Among the 5273 patients discharged from the ICU during the study period, 195 (3.7%) experienced readmission during the same hospitalization. Notably, patients readmitted to the ICU exhibited a significantly higher mean age (54.83 years) compared to those who were not readmitted (47.08 years, $P<0.001$). Factors associated with ICU readmission included lower Glasgow Coma Scale (GCS) scores at admission and discharge, suggesting a correlation between neurological status and readmission risk. Furthermore, respiratory challenges emerged as a predominant cause of unplanned readmission, encompassing respiratory failure, hypoxic respiratory failure, respiratory distress, and respiratory infections such as pneumonia. Analysis of injury patterns revealed a higher frequency of poly-trauma and head and neck injuries among patients readmitted to the ICU.
**Conclusions:** This study underscores the significance of ICU readmission among trauma patients, with a notable readmission rate during the same hospitalization. By developing comprehensive guidelines and optimizing discharge processes, healthcare providers can potentially mitigate ICU readmissions and associated complications, ultimately enhancing patient outcomes and resource utilization in trauma ICU settings. This research contributes valuable insights to inform evidence-based practices and improve the quality of care delivery for trauma patients in intensive care settings.

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**Topic:** Trauma

## 000601

### Factors associated with survival in patients with acute respiratory distress syndrome placed on prone position in a tertiary hospital in the Philippines

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**Introduction:** Acute respiratory distress syndrome (ARDS) remains to be the leading cause of mortality among critically ill patients worldwide. Lung protective ventilatory strategies are the mainstay treatment that aims to reduce the risk of ventilator-induced lung injury (VILI) by preventing overdistention and optimizing ventilation. Placing patients in the prone position is a well-studied approach to improve mortality among ARDS patients but despite evidence, it remains to be underutilized. At present, there are limited studies investigating the association of factors that affect survival among ventilated patients placed on prone and this study aims to determine these factors.
**Methods:** All mechanically ventilated ARDS patients that were placed on prone during a 5-year period were retrospectively reviewed. Baseline demographics, severity of illness, etiology of pneumonia, prone and ventilator strategies and respiratory mechanics were collected. Primary outcome was recorded as survival on the 28th day after the first prone. Adverse events while on prone position were recorded as secondary outcomes.
**Results:** A total of 117 patients were included in this study. Among those enrolled, 77(65.8%) patients died. Older age and higher SAPS-3 score were significantly related to 28-day survival. Non-survivors underwent longer prone duration, had worse lung mechanics (peak pressure, plateau pressure, driving pressure) post prone, and were placed on prone later after ARDS diagnosis. Survivors were on longer sedation days than non-survivors. Hemodynamic instability was the most common adverse event reported among non-survivors.
**Conclusions:** Elderly patients and those with more severe illnesses increase the risks for mortality among ARDS patients. Early initiation of proning may be beneficial to improve survival. Adverse events during proning such as hemodynamic instability can be an anticipated adverse event among patients placed on prone.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000603

### Fallibility of PaO2/FIO2 and SaO2/FIO2 for assessing pulmonary function: a computer model

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**Introduction:** Reliable measurements to assess pulmonary function have been debated for decades. PaO2/FIO2 and SaO2/FIO2 have been used to discriminate between Acute Lung Injury and ARDS and, recently, between mild, moderate, and severe ARDS. Almost all papers with ARDS diagnosis and/or treatment published in the last 15 years have incorporated analyses of PaO2/FIO2.
**Objectives:** In this study, we wished to determine the accuracy of assessing pulmonary function in patients with variable right to left intrapulmonary shunting of blood (Qsp/Qt) using PaO2/FIO2 and SaO2/FIO2. We also discuss the influence of other variables on PaO2/FIO2 and SaO2/FIO2 values.
**Methods:** A computer model was designed to calculate the PaO2/FIO2 and SaO2/FIO2 ratios for any FIO2 with an assumed value of Qsp/Qt. The model assumed normal values of hemoglobin, PaCO2, cardiac output, oxygen consumption, barometric, and water vapor pressures. We used the mathematical expression of the oxyhemoglobin dissociation curve described by Ruiz to generate SO2 and PO2 values from oxygen contents.
**Results:** PaO2/FIO2 and SaO2/FIO2 vary inconsistently with FIO2 at all levels of Qsp/Qt. Only when Qsp/Qt equals 0, does PaO2/FIO2 ratio remain relatively constant with variable FIO2. For Qsp/Qt values of 5–20%, PaO2/FIO2 decreased as FIO2 increased, until SaO2 was ~ 99%, then it increased in proportion to FIO2. However, for Qsp/Qt > 20%, PaO2/FIO2 decreased with increasing FIO2 and values were similar regardless of the degree of Qsp/Qt. SaO2/FIO2 analyses revealed similar results.
**Conclusions:** Our computational analysis demonstrates that PaO2/FIO2 and SaO2/FIO2 are an inaccurate means of assessing pulmonary function. When used in clinical situations, PaO2/FIO2 and $SaO_2/FIO_2$ are both affected by many variables and can lead to erroneous conclusions that affect therapy. Therefore, since it is doubtful that clinicians will cease using PaO2/FIO2 and SaO2/FIO2 ratios, it is essential that individual patient evaluations be made using a constant FIO2.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000605

## Quantitative impact of traditional open surgery and minimally invasive surgery on first-night sleep status in intensive care unit patients: a pilot study

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**Introduction:** Impaired sleep quality is a commonly experienced stress by critically ill patients undergoing surgery, leading to physical and mental impairments and poor prognosis (1). Sleep disorders in these patients are influenced by the extent of surgical intervention and intensive care unit (ICU) instruments (2). Understanding the characteristics of postoperative sleep disorders is crucial for developing personalized perioperative treatment plans and improving prognosis.
Minimally invasive surgery (MIS) has emerged as an alternative to traditional open surgery (TOS), utilizing smaller incisions and potentially reducing surgical stress responses (3). However, due to the lack of quantitative sleep monitoring tools at the bedside, there is a lack of comparative studies on sleep quality after TOS and MIS.
The gold standard sleep monitor Polysomnography (PSG) is limited in the ICU due to electrode placement difficulties, movement concerns, and electrical artifacts(4). Subjective questionnaires like the Richards Campbell Sleep Questionnaire (RCSQ) are commonly used, sacrificing accuracy and quantification (5).
Modern wearable sleep monitoring wristbands equipped with the cardiopulmonary coupling technique and built-in analysis software have the potential to enhance monitoring capabilities by automatically assessing sleep status and stage, including sleep duration, light and deep sleep, rapid eye movement (REM) sleep, and wakefulness (6–8). However, there is currently limited data on sleep patterns in TOS and MIS surgery patients after recovery from anesthesia.
**Objectives:** The present study investigate the sleep status of patients on the first night in the postoperative ICU using modern wearable wristbands and RCSQ questionnaires to quantitatively assess the impact of TOS and MIS modes on postoperative sleep status.
**Methods:** A single-center observational study was performed (Ethic Approval:KY2022-145-A). Sixty-one post-anesthesia patients who were successfully resuscitated were enrolled. Surgical characteristics were obtained. The sleep status on the night of surgery was assessed by the patient- and nurse-completed RCSQ and Huawei (HW) wearable sleep monitoring wristband.
**Results:** Compared to the TOS group, patients in the MIS group had higher nurse-RCSQ score ($60.9 \pm 16.9$ V.S. $51.2 \pm 17.3$, $p = 0.030$), self-RCSQ sleep score ($58.6 \pm 16.2$ V.S. $49.5 \pm 14.8$, $p = 0.027$), and HW sleep score ($77.9 \pm 4.5$ vs. $68.6 \pm 11.1$, $p < 0.001$) (Figure 1). The Bland–Altman plot showed that the HW sleep score was in good consistency with the patient-RCSQ score (95.1%) and nurse-RCSQ score (96.7%) (Figure 2). HW quantitative sleep analysis showed the minutes of total sleep ($503.0 \pm 91.4$ V.S. $437.9 \pm 144.0$, $p = 0.037$), rapid eye movement (REM) sleep ($81.0 \pm 52.1$ V.S. $55.8 \pm 44.5$, $p = 0.047$) were longer and the deep sleep continuity score (56.4, IQR: 7.0 versus 47.5, IQR: 12.1, $p = 0.001$) was higher in the MIS group compared with the TOS group (Table 1).

**Table 1 (abstract 000605)** Huawei quantitative sleep analysis

| Variables | Minimally invasive surgery ($n = 28$) | Traditional open surgery ($n = 33$) | *p* value |
|---|---|---|---|
| Total Sleep time (min, SD) | 503.0 (91.4) | 437.9 (144.0) | 0.037 |
| Deep sleep time (min, SD) | 145.7 (55.6) | 125.6 (79.7) | 0.254 |
| Light sleep time (min, SD) | 282.0 (92.3) | 255.1 (94.5) | 0.268 |
| REM sleep time (min, SD) | 81.0 (52.1) | 55.8 (44.5) | 0.047 |
| Deep sleep ratio (%, IQR) | 29.7 (7.8) | 27.2 (12.4) | 0.332 |
| Light sleep ratio (%, IQR) | 55.8 (11.2) | 61.1 (17.0) | 0.149 |
| REM sleep ratio (%, IQR) | 14.5 (6.9) | 11.7 (7.3) | 0.128 |
| Deep sleep continuity score (IQR) | 56.4 (7.0) | 47.5 (12.1) | 0.001 |
| Awakening frequency (IQR) | 2.4 (2.0) | 2.5 (2.3) | 0.868 |

SD: standard deviation. IQR: interquartile range

**Conclusions:** MIS, compared with TOS, contributed to higher sleep quality for ICU patients after surgery, manifested as longer sleep time, longer REM sleep time, and better continuity of deep sleep. Wearable sleep monitoring wristbands hold the potential for quantified sleep assessment and tailoring perioperative sleep management strategies in the surgery ICU.

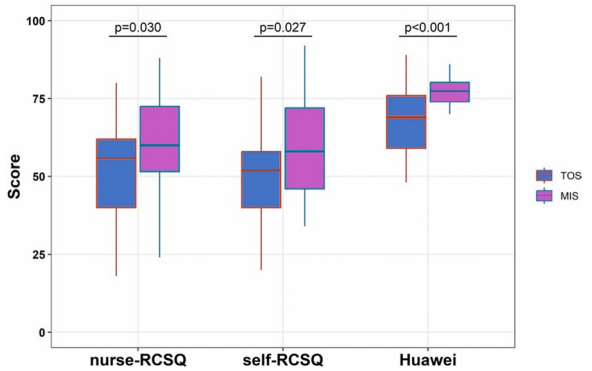


**Fig. 1 (abstract 000605)** The self-RCSQ, nurse-RCSQ and Huawei sleep scores. Boxplots display the median (center line), interquartile range (IQR) (upper and lower hinges) of self-RCSQ (a), nurse-RCSQ (b), and Huawei (c) sleep scores

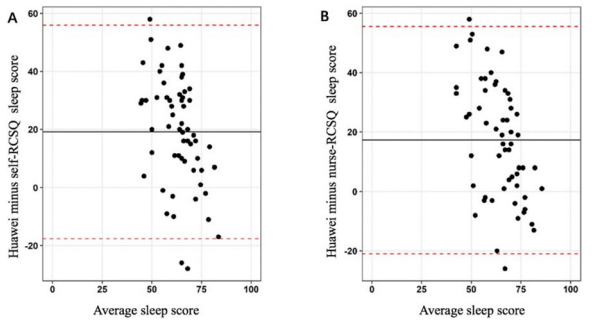


**Fig. 2 (abstract 000605)** The Bland–Altman analysis between Huawei and RCSQ sleep scores. A horizontal line was drawn at the mean difference and at the mean difference plus and minus 1.96 times the standard deviation of the differences, with the x-axis reporting average levels of sleep scores. (a) Huawei sleep monitoring wristband versus self-RCSQ assessment of total sleep score. (b) Huawei sleep monitoring wristband versus self-RCSQ assessment of total sleep score

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**Topic:** Perioperative care

## 000607 The clinical usefulness of GLS, MAPSE and S´ in critically ill patients

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**Introduction:** Left ventricular ejection fraction (LV EF) is the most common echocardiographic parameter for assessing LV systolic function but is limited by dependence on loading conditions. Other parameters related to LV longitudinal function as global longitudinal strain (GLS), mitral valve annular plane excursion (MAPSE), and tissue Doppler annular velocities (S´). These are less dependent on loading conditions, still the PRICES statement [1] report that there are insufficient data on their clinical usefulness.
**Objectives:** The aim of this study was to assess the clinical usefulness of GLS, MAPSE, and S' by assessing their feasibility and possible associations with mortality at 90 days in a mixed population of critically ill patients.
**Methods:** This is a secondary analysis of a study assessing LV dysfunction defined by LV EF and regional wall motion abnormalities in a mixed population of critically ill patients [2]. All included patients had echocardiography performed in accordance with current guidelines within 24 h from admission. Clinical data was recorded on admission and at the time of echo. Three apical LV views (A4C, A2C, PLAX) were used to measure GLS. MAPSE and S´ were measured in the A4C view, using the mean value of the measurements in the septal and lateral side. LV EF was estimated using the Simpsons method. Patients were sub-grouped for specific conditions, i.e., those with (1) a history of or acute ongoing cardiac disease, (2) admission with sepsis, or (3) none of the above.
**Results:** A total of 411 patients were included in the parent study of whom 377 patients had any measurement of GLS, MAPSE or S'. MAPSE was measured in most patients ($n=364$, 88%) followed by S´($n=339$, 82%) and GLS ($n=269$, 65%). Ejection fraction was successfully measured with the Simpson method in 320 (78%). Using Pearson's test, there was a positive correlation between LV EF and GLS (0.718), LV EF and MAPSE (0.520), and LV EF and S´(0.444). Patients with cardiac disease ($n=61$) had lower values in all parameters (LV EF, GLS, MAPSE, S´) compared to patients without these conditions ($n=221$), while patients with sepsis ($n=118$) had lower values in GLS, MAPSE and S´ (Table 1) compared with other. The lowest values in all parameters were in patients with cardiac disease.
At 90 days, 101 patients (27%) had died. Mortality over 90 days was higher in patients with GLS > -15%, MAPSE < 10 mm, and S´< 7.5 (Figure 1). In a logistic regression analysis with adjustments for the SAPS 3 score, age, and the specific conditions of cardiac disease and sepsis, GLS was associated with an increased risk of death (OR 0.89, $p=0.006$), as was MAPSE (OR 0.11, $p<0.001$) and S´ (OR 0.85, $p=0.005$). In contrast, LV EF was not associated with an increased risk of death (OR 0.99, $p=0.369$).

**Table 1 (abstract 000607).**

| | Sepsis, $n=118$ | Cardiac disease, $n=58$ | Other, $n=221$ |
|---|---|---|---|
| Ejection fraction, % | 57 ± 13 | 48 ± 16* | 59 ± 12 |
| GLS, % | −15.0 ± -4.5* | −12.3 ± -5.1* | −17.6 ± −5.0 |
| MAPSE, mm | 11 (9–12)* | 9 (8–12)* | 13 (11–15) |
| S´, cm/s | 8 (7–10.5)* | 7 (4.5–9)* | 9 (7–11) |

*$p < 0.05$ after Bonferroni correction vs group Other

**Conclusions:** In conclusion, the echocardiographic parameters GLS, MAPSE and S´are clinically useful for assessing LV function in critically ill patients. Prognostication seems to be superior to LV EF. MAPSE appears to be the most useful of these three, being easily measured and were strongly associated with mortality after risk-adjustments.

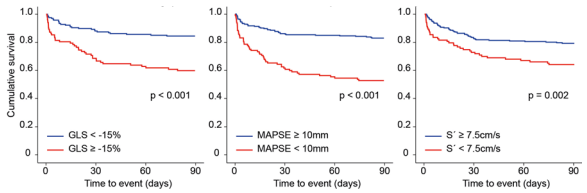


**Fig. 1 (abstract 000607)** Mortality in 90 days in patients with low vs normal GLS, MAPSE and S´

**Reference(s)**


1. 2. Cavefors et al. Regional left ventricular systolic dysfunction associated with critical illness: incidence and effect on outcome, ECS Heart Failure 2021
2. 1. Sanfilippo et al. The PRICES statement: an ESICM expert consensus on methodology for conducting and reporting critical care echocardiography research studies, Intensive Care Medicine 2021
3. Swedish Heart–Lung foundation (number 2017063, 20190292), grants from the Swedish state under the agreement between the Swedish government and the county councils, the ALF agreements (ALFGBG-775041, ALFGBG-942924, ALFGBG-966053), the foundation of Ollie and Elof Ericsson and the Emelle foundation.


**Topic:** Cardiovascular issues in ICU

## 000609

### Fluid accumulation and neurological outcomes in patients receiving extracorporeal cardiopulmonary resuscitation: a sub-analysis of the SAVE-J II study


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000609


**Introduction:** While several studies have found that excessive fluid administration can contribute to the development of cerebral edema and worsen neurological outcomes in brain-injured patients, there are limited reports of an association between fluid accumulation and neurological outcomes in patients with out-of-hospital cardiac arrest (OHCA) receiving extracorporeal cardiopulmonary resuscitation (ECPR).
**Methods:** We conducted a sub-analysis of the multicenter observational cohort SAVE-J II study, including adult OHCA patients who received ECPR between 2013 and 2018 and survived for at least 3 days. Patients who received renal replacement therapy were excluded. The cumulative fluid balance (CFB) was defined as the difference between total infusion volume excluding blood transfusions and urine volume during the first 3 days of hospitalization divided by body weight on admission, and patients were classified into large CFB and small CFB groups based on the median CFB value. The primary endpoint was the neurological status at 30 days (Cerebral Performance Category [CPC], scores range from 1 to 5, with higher scores indicating greater disability). The relationship between CFB and neurological outcomes was investigated using propensity score matching and ordinal logistic regression analysis, adjusting for factors that may be related to neurological outcomes.
**Results:** The study included 488 patients with a mean age of 57 years, of whom 82.6% had a witnessed arrest, 58.2% received bystander CPR, 79.1% had a first documented rhythm of VF/VT, and the median times from emergency call to EMS arrival, EMS arrival to hospital arrival, and hospital arrival to ECMO initiation were 7, 25, and 27 min, respectively. Acute coronary syndrome was identified as the cause of cardiac arrest in 51.6%, and 91% underwent targeted temperature management after ECPR initiation. At 30 days, the neurological outcomes were as follows: CPC 1, 22.7%; CPC 2, 8.4%; CPC 3, 9.0%; CPC 4, 19.3%; and CPC 5, 40.6%. The median CFB was 107 mL/kg, with 244 patients classified into the large CFB group and 244 patients into the small CFB group. After propensity score matching, 179 patients were selected in each group, and a shift in the distribution of scores on CPC toward worse outcomes was observed in favor of the large CFB group over the small CFB group (generalized odds ratio 0.55, 95% CI 0.37–0.82).
**Conclusions:** Fluid accumulation after ECPR initiation may worsen neurological outcomes. Prospective studies should investigate whether a restrictive fluid strategy improves neurological outcomes in ECPR patients.

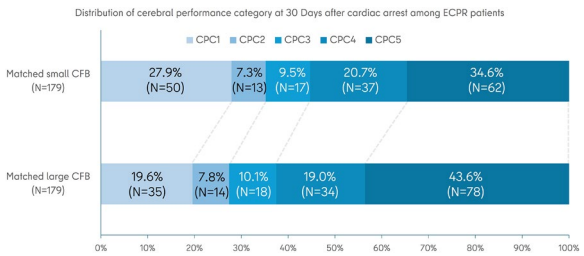


**Fig. 1 (abstract 000609)** Distribution of cerebral performance category at 30 Days after cardiac arrest among ECPR patients

**Reference(s)**


1. van der Jagt M. Fluid management of the neurological patient: a concise review. Crit Care. 2016 May 31; 20(1): 126.


**Topic:** Cardiac arrest

## 000612

### Predictors of the ICU admission in trauma patients referred to trauma level I center in southern of Iran


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000612

**Introduction:** Trauma is one of the underlying causes of hospitalization, disability, and mortality across the world, accounting for one-tenth of causes of mortality around the world, in particular, in Low and Middle-Income Countries (LIMCs) (1). Not only does trauma diminish the disability-adjusted life years (DALY) in different societies, but it also can directly and indirectly impose huge burden of socio-economic challenges on the healthcare system and people, which includes treatment costs, reduced productivity, disabilities, and depriving family of income during hospital length of stay (2).
According to the World Health Organization (WHO) classification, Iran is regarded as a middle-income less-developed country, encountering a high mortality and morbidity rate, which results from trauma. It is estimated that trauma-related mechanism of injuries is the second cause of death following cardiovascular diseases (3). Thereby, patients with traumatic injuries are required to be admitted in the ICU. Previous investigations have reported several factors including anatomical, physiological and clinical variables may be considered as the predictors for the ICU admission in trauma patients (4).
Hence, the purpose of the current study is to recognize and determine the required predictors for the intensive care unit (ICU) admission among trauma patients referred to Rajaee (Emtiaz) hospital, trauma level I center, in southern of Iran.
**Objectives:** Trauma is accounted for the fourth and fifth leading causes of morbidity and mortality around the world. The purpose of the current study is to recognize and determine the required predictors for the intensive care unit (ICU) admission among trauma patients referred to Rajaee (Emtiaz) hospital, a trauma level I center, in southern of Iran.
**Methods:** This is a single-center cross-sectional study that evaluates the predictor factors for ICU admission in patients with trauma. The study population included 6801 trauma patients who had referred to the largest trauma center in southern Iran, (Shiraz, Iran) between January 2023 to February 2024. The injured patients under the age of 15 years were excluded from the study.
Data were extracted from patients' records using a case report form, which includes the age, gender, length of hospitalization, ICU length of stay Injury severity score (ISS) was calculated according to the researchers' previous article (5). The first values of the Glasgow coma scale (GCS), systolic blood pressure (SBP), respiratory rate (RR), percent of saturated $O_2$, and the outcome of traumatic patients were collected by the trained specialist when the patient was admitted to the hospital. Chi-square and quantitative independent *t*-test data were used to analyze the qualitative data. Odds Ratios (ORs) and 95% Confidence Intervals (CIs) were calculated to evaluate the strength of any association. Logistic regression was used to determine the predictor factors for ICU admission among traumatic patients. Analyzes were also performed using SPSS software version 25.
**Results:** The mean age of 6801 traumatic patients included in this study was $41.3 \pm 20.57$. There was a significant difference between patients admitted and non-admitted to the ICU ($44.59 \pm 22.89$ vs. $40.53 \pm 19.92$, $P = 0.0001$). Male patients mostly constituted the study traumatic (78.6%) and ICU-admitted patients (77.3). Moreover, ICU-admitted patients substantially had a lower R.R, SO2, SBP and GCS in comparison with non-admitted patients, respectively ($16.81 \pm 5.03$ vs. $16.64 \pm 3.36$, $P = 0.0001$), ($92.85 \pm 6.1$ vs. $95.4 \pm 21.09$, $P = 0.031$) and ($12.73 \pm 3.71$ vs. $14.91 \pm 0.85$, $P = 0.0001$). While the mean of ISS, hospital length of stay and the mortality rate in ICU admitted patients were drastically higher than non-admitted patients, respectively ($15.27 \pm 10.62$ vs. $6.46 \pm 5.06$, $P = 0.0001$), ($11.27 \pm 11.71$ vs. $3.99 \pm 5.27$, $P = 0.0001$), ($6.84 \pm 8.46$ vs. $0.1 \pm 0.01$, $P = 0.0001$) and (12.3% vs. 0.4%, $P = 0.0001$).
**Conclusions:** Our study suggests that systolic blood pressure, Glasgow coma scale and Injury severirty score can be considered as chief predictors for trauma patients to admit in ICU.

**Topic:** Trauma

## 000613

### Hospital and 1-year mortality rates and risk factors in ICU survivors with solid malignancies: a single-center retrospective cohort study.

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000613

**Introduction:** Patients with solid malignancies represent a significant proportion of intensive care unit (ICU) admissions. Their ICU mortality rates have decreased due to advances in critical care. However, there is a lack of studies on the in-hospital and 1-year mortality among ICU-survived patients with solid malignancies. This study aimed to identify in-hospital and 1-year mortality rates and risk factors at the time of ICU discharge.
**Methods:** In this retrospective cohort study, adult patients with solid malignancies admitted to the medical ICU in a tertiary hospital between 2016 and 2022 were analyzed. Patients who survived and were discharged from the ICU were included. Patients were excluded if they died in the ICU, were transferred from the ICU to another hospital, or stayed in the ICU for only 1 day for monitoring or postoperative care.
**Results:** Of the 708 patients who survived in the ICU, 24.4% ($n = 178$) died in the hospital and 61% ($n = 432$) died within 1 year. At the time of ICU discharge, 20.9% of patients had delirium, 3.8% had coma, and 80.6% had impaired mobility. Oxygen device was used in 88.7%, including bilevel positive airway pressure (BiPAP) in 4.9% and high-flow nasal cannula (HFNC) in 15.5%. Delirium (OR 1.8, $p = 0.018$), coma (OR 6.87, $p < 0.001$), limited mobility (OR 2.36, $p = 0.016$), and use of any oxygen device (OR, from 3.8 to 26.6; all $p < 0.01$) at ICU discharge were significant risk factors for in-hospital mortality. The 1-year survival rate was significantly lower in patients with delirium (35%), coma (26%, $p < 0.001$), or limited mobility (37%, $p = 0.003$). Patients who received oxygen therapy with BiPAP had the lowest survival rate at 23% ($p < 0.0001$).
**Conclusions:** In our study, a considerable portion of ICU-survived patients with solid malignancies died in the hospital and within 1 year after ICU discharge. Mental impairment, mobility impairment, and remaining pulmonary dysfunction at ICU discharge were strong risk factors for in-hospital and long-term mortality. These conditions may act as barriers to further oncologic treatment after ICU discharge.

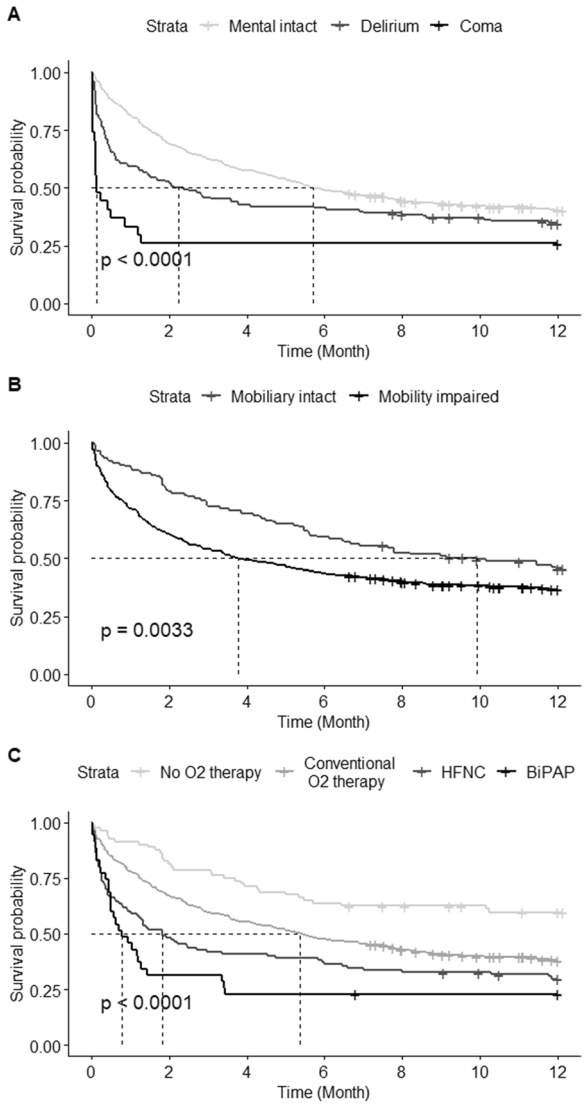


**Fig. 1 (abstract 000613)** One-year survival curve (A) according to delirium and coma status (B) according to mobility status (C) according to oxygen device at the time of ICU discharge

**Topic:** Haematologic-oncologic issues in the ICU

### 000614

**Trends in inflammatory markers according to antibiotics susceptibility in gram-negative *sepsis***

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000614

**Introduction:** The application of susceptible antibiotics in patients with sepsis is pivotal. While susceptible antibiotics may rapidly reduce the inflammatory response by eradicating the bacteria, understanding of longitudinal changes of inflammatory markers according to antibiotics susceptibility is limited.

**Objectives:** The aim of the study is to compare early trends in inflammatory markers, including white blood cell (WBC), platelets, albumin, and C-reactive protein (CRP), in patients with gram-negative sepsis treated with susceptible and non-susceptible antibiotics.
**Methods:** A retrospective cohort study of sepsis patients in a single emergency department was conducted. Microbiologic culture data (blood, genitourinary, respiratory, others) and antibiotics treatment in sepsis patients were acquired. WBC, platelet, albumin, and CRP variables from study enrollment to 72 h were acquired. Subgroup analysis with focus on source control and type of antibiotics was performed.
**Results:** Of the 683 patients, 440 patients (64.4%) were treated with susceptible antibiotics. In trend analysis, a decrease in WBC at 24 h preceded both an increase in platelets at 48 h and a decrease in CRP at 72 h in both groups. Trends in WBC, platelets, albumin, and CRP were not significantly different between the two groups. Subgroup analysis revealed a difference in albumin trends between susceptible and non-susceptible in the source control group, while no differences were identified in the group without source control.
**Conclusions:** The observed trends in WBC, platelet, albumin, and CRP within the first 72 h may not serve as reliable markers for distinguishing between gram-negative sepsis patients treated with susceptible and non-susceptible antibiotics. Additionally, the subgroup analysis suggests a potential association between albumin trends and source control, warranting further exploration of its clinical significance.

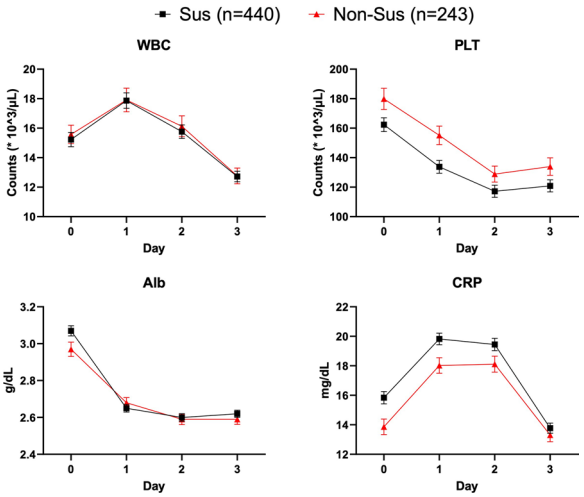


**Fig. 1 (abstract 000614)** Comparison of trends in inflammatory markers between sepsis patients according to antibiotics susceptibility

**Topic:** Sepsis

### 000617

**Exploring the impact of Liver Frailty Index (LFI) on surgical risk, recovery, and complications in liver transplantation: spotlight on the ICU environment**

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000617

**Introduction:** Patients with severe chronic liver disease (CLD) are susceptible to recurrent complications (1,2). The Liver Frailty Index score (LFI), comprising three performance-based tests (hand grip, sit-to-stand, and balance), categorizes patients with liver disease into frail, pre-frail, and robust classes (3). Those meeting the frailty criteria defined by the LFI exhibit higher rates of adverse outcomes (4). In this study, we examine the correlation of the LFI with early outcomes after liver transplantation (LTx). We introduced the LFI in a home telemonitoring system for liver cirrhosis to predict rehospitalization and worsening of the disease.
**Objectives:** To assess whether higher LFI scores correlate with increased risk of mortality, complications, and length of stay (ICU and overall) following LTx in a transplant center located in southern Italy.
**Methods:** We reviewed retrospective data (April 2021–March 2024), comparing pre-transplant LFI assessments with hospital records, documenting age, death, n. of OR sessions, ICU readmission, days on ventilation, neuro consult, and tracheostomy during the LTx hospitalization. A descriptive analysis of postoperative (PO) outcomes was done, with a focus on ICU settings.
**Results:** 210 LTx patients were evaluated, with a mean age of 55 (ST ± 10.6). Metabolic and alcoholic etiologies were more prevalent in frail patients compared to hepatocellular carcinoma (HCC) etiology in the robust class (Table 1). Frail patients showed reduced access to LTx among those evaluated at the time of work-up (33.3%). Pre-frail individuals constituted approximately 48% of the total cohort (Table 2). Following LTx, frail patients had higher mortality (16.7%), readmission to the ICU (29.2%), and reoperation (16.7%) rates compared to other classes (Figure 1). They also exhibited longer PO mechanical ventilation time (4 days), higher rates of re-intubation (33.3%) and tracheostomy (25%). Additionally, there was a significantly higher frequency of neurological consultations (29.2%). Their overall length of stay (LOS) was longer (42.2 days), with prolonged ICU stay (17.6 days) (Figure 2). A higher proportion of frail LTx recipients required post-discharge assistance (16.7%) compared to robust patients (1.2%) (Figure 3).
**Conclusions:** Screening for frailty is an effective tool in the hands of a multidisciplinary team for identifying patients at higher risk of transplant complications. Our findings underscore a positive association between LFI scores and PO outcomes, emphasizing the importance of addressing frailty through pre-habilitation interventions. Healthcare systems should consider the potential impact on costs, including increased LOS and ongoing care needs post-discharge, while also exploring strategies to improve functional status and transition frail patients to a better LFI class.

**Table 1 (abstract 000617)** Etiology of Liver Transplanted Population

| | Frail (%) | Pre-frail (%) | Robust (%) |
|---|---|---|---|
| *MASLD* | 45.8 | 27.5 | 17.9 |
| *HCV* | 4.2 | 0.0 | 1.2 |
| *HBV* | 0.0 | 0.0 | 1.2 |
| *Alcoholic* | 25.0 | 17.6 | 11.9 |
| *Polycystic* | 8.3 | 3.9 | 6.0 |
| *Auto-Immune* | 0.0 | 4.9 | 2.4 |
| *CBP* | 8.3 | 3.9 | 1.2 |
| *HCC* | 12.5 | 42.2 | 65.5 |
| *Others* | 0.0 | 1.0 | 0.0 |

**Table 2 (abstract 000617)** Variables under Study of the Liver Transplanted Population

| | Frail | Pre-frail | Robust | *TOTAL* |
|---|---|---|---|---|
| *Pt evaluated with LFI by classification (n)* | 75 | 208 | 151 | *434* |
| *Pt in class/tot evaluated (%)* | 17.3% | 47.9% | 34.8% | |
| *LTx by classification (n)* | 24 | 102 | 84 | *210* |
| *LTx by classification / total LTx (%)* | 11.4% | 48.6% | 40.0% | |
| *LTx in class/evaluated by classification (%)* | 32.0% | 49.0% | 55.6% | *48.4%* |
| *Age by classification (med)* | 55.0 | 55.5 | 54.4 | *55.0* |
| *BMI by classification (med)* | 24.9 | 26.2 | 26.3 | *26.1* |
| *LFI value in LTx pt. by classification (med)* | 5.39 | 3.74 | 2.79 | *3.55* |
| *LTx deceased by classification (n)* | 4 | 2 | 5 | *11* |
| *Deceased by classification (%)* | 16.7% | 2.0% | 6.0% | *5.2%* |
| *LTx LOS by classification (d)* | 42.2 | 26.9 | 17.2 | *24.8* |
| *LTx ICU-LOS by classification (d)* | 17.6 | 8.3 | 5.2 | *8.2* |
| *Pre-LTx ICU admission by classification (n)* | 0 | 4 | 3 | *7* |
| *Re-admission to ICU post LTx by classification (n)* | 7 | 13 | 4 | *24* |
| *Re-admission to ICU by classification (%)* | 29.2% | 12.7% | 4.8% | *11.4%* |
| *OR session post LTx by classification (n)* | 4 | 10 | 5 | *19* |
| *OR session post LTx by classification (%)* | 16.7% | 9.8% | 6.0% | *9.0%* |
| *Days on vent post LTx by classification (med)* | 4.0 | 1.6 | 1.2 | *1.70* |
| *Re-intubation post LTx by classification (n)* | 8 | 9 | 3 | *20* |
| *Re-intubation post LTx by classification (%)* | 33.3% | 8.8% | 3.6% | *9.5%* |
| *Tracheostomy post LTx by classification (%)* | 25.0% | 4.9% | 4.8% | *7.1%* |
| *Neuro consult post LTx by classification (%)* | 29.2% | 16.7% | 7.1% | *14.3%* |

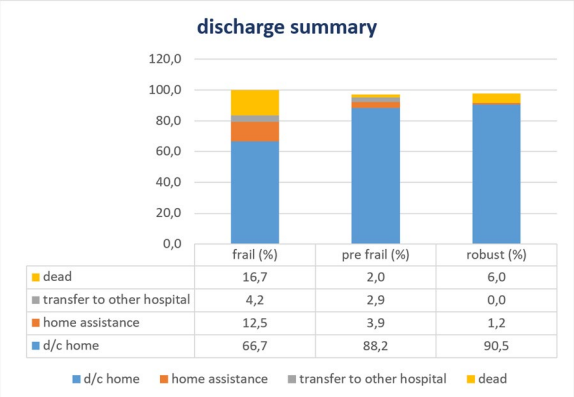



**Fig. 3 (abstract 000617)** Discharge Summary of the Liver Transplanted Population

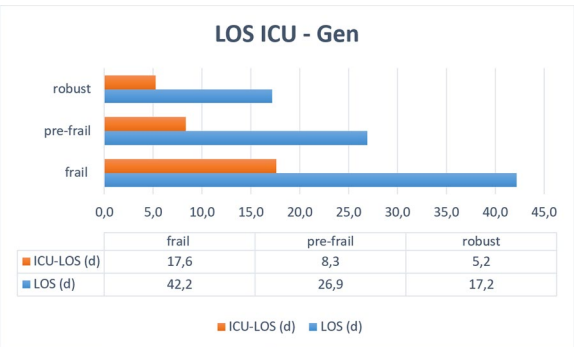
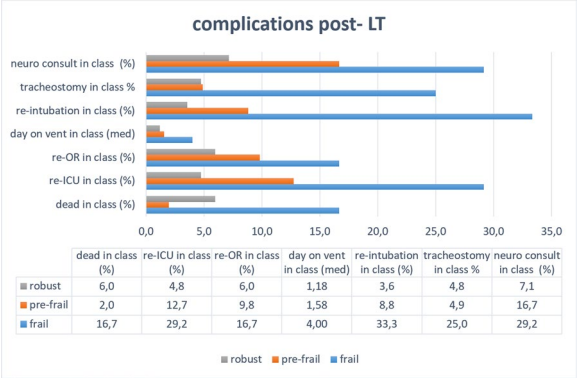



**Fig. 2 (abstract 000617)** Length of Stay Post-Liver Transplantation




| | dead in class (%) | re-ICU in class (%) | re-OR in class (%) | day on vent in class (med) | re-intubation in class (%) | tracheostomy in class % | neuro consult in class (%) |
|---|---|---|---|---|---|---|---|
| robust | 6,0 | 4,8 | 6,0 | 1,18 | 3,6 | 4,8 | 7,1 |
| pre-frail | 2,0 | 12,7 | 9,8 | 1,58 | 8,8 | 4,9 | 16,7 |
| frail | 16,7 | 29,2 | 16,7 | 4,00 | 33,3 | 25,0 | 29,2 |

**Fig. 1 (abstract 000617)** Table and Graph of Complications Secondary to Liver Transplantation by LFI Classification

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4. Kardashian A, Ge J, McCulloch CE, Kappus MR, Dunn MA, Duarte-Rojo A, et al. Identifying an Optimal Liver Frailty Index Cutoff to Predict Waitlist Mortality in Liver Transplant Candidates. Hepatology. 2021 Mar; 73(3): 1132–9.
5. This research was supported by EU funding within the NextGenerationEU – MUR – National Recovery and Resilience Plan, Mission 4, Component 2 Investment 1.5 – Innovation Ecosystem: Sicilian Micronanotech Research and Innovation Center SAMOTHRACE (project no. ECS00000022, CUP B73D21014940004).

**Topic:** Nursing care and physiotherapy

## 000618

### Comparison of time for endotracheal intubation with flexible tip bougie versus standard bougie during videolaryngoscopy in simulated cervical spine immobilization in adult patients: a prospective, randomized control study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):** 000618

**Introduction:** The incidence of cervical spine injury ranges from 1.8 to 9% which leads to difficult intubation due to poor glottic visualization due to neck immobilization. Endotracheal tube introducer helps to facilitate oral intubation in fixed cervical spine situations. Flexible tip bougie may help during in insertion of endotracheal tube in these situations.

**Objectives:** Primary objective was a comparison of endotracheal intubation time with flexible tip bougie and standard bougie in a simulated difficult airway. The secondary objectives were a comparison of a number of attempts, the need for maneuvers, and complications between the groups.
**Methods:** A day before surgery, pre-anaesthetic check-up was done and informed consent was obtained. Airway assessment including mouth opening and modified Mallampati grade was done without or with AMBU Perfit Ace adult adjustable cervical collar.
Seventy-six adult patients were allocated and randomized into two groups for oral endotracheal intubation in simulated cervical spine stabilization with a cervical collar. In the operation theatre, standard monitored and train of four monitors were applied. After administration of general anaesthesia (2mcg/kg fentanyl and 2mg/kg propofol) and non-depolarising muscle relaxant; the trachea was intubated with the help of flexible tip bougie (group F) or standard bougie (group B) using CMAC video laryngoscope size 3 or 4 Macintosh blade. We evaluated the time for intubation, best glottic view, railroading ETT, removal of the bougie, number of attempts, ease of bougie insertion, the need for maneuvers (BURP, cricoid pressure), and complications during intubation. The second attempt was tried if SpO2 decreased to 93% or total time exceeded more than 120 s. If 2nd attempt failed then the anterior part of the cervical collar was removed and intubation was done after proper positioning the patient.
**Results:** Demographic data, BMI, and neck circumference were comparable in both groups. The mean time required for endotracheal intubation was comparable but the mean time for bougie insertion was significantly shorter in Group F as compared to Group B. (Table 1).

**Table 1 (abstract 000618)** Comparison of time parameters between Group F and Group B

| Time parameters Mean ± SD, Seconds | Group F ($n=37$) | Group B ($n=37$) | *p* value |
|---|---|---|---|
| Time for best glottic view | 10.95 ± 7.12 | 10.26 ± 5.86 | 0.65 |
| Time for insertion of bougie | 5.76 ± 2.7 | 9 ± 9.29 | **0.048** |
| Time for railroading endotracheal tube | 15.55 ± 17.45 | 16.4 ± 14.39 | 0.82 |
| Time for removal of bougie | 3.17 ± 1.58 | 3.18 ± 1.01 | 0.96 |
| Total time for intubation | 34.88 ± 20.41 | 39.27 ± 22.05 | 0.37 |
| Time for procedure | 45.07 ± 20.69 | 51.85 ± 20.64 | 0.16 |

**Conclusions:** In conclusion, flexible tip bougie insertion time is shorter as compared to standard bougie insertion in simulated cervical spine stabilization. Flexible tip bougie resulted in decreased number of intubation attempts in comparison to standard bougie. However total time for intubation, railroading ETT, bougie removal, ease of bougie insertion, need for manoeuvres and complications during intubation were comparable in both the groups.

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8. No grant was taken for this study.

**Topic:** Perioperative care

## 000619

### Relationship between the timing of tracheostomy and long-term prognosis in patients with COVID-19

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000619

**Introduction:** The timing of tracheostomy in coronavirus disease 2019 (COVID-19) patients does not affect survival. In addition, few studies have shown an association between the timing of tracheostomy and long-term prognosis, particularly with PICS.
**Objectives:** We aimed to determine the relationship between tracheostomy timing and long-term outcomes in tracheostomy-requiring patients with COVID-19.
**Methods:** This prospective observational study was a secondary analysis of the "Post-intensive care outcomes in patients with Coronavirus Disease 2019 study" and was conducted in 32 intensive care units (ICUs) in Japan. Adults with COVID-19 who received ventilatory management and were discharged from the ICU between March 2020 and March 2021 were included. Follow-up questionnaires were mailed 1 and 2 years after ICU discharge. Those who received tracheostomy within and later than 14 days were classified into early and late groups, respectively. Mortality and post-intensive care syndrome (PICS) incidence, defined by the Barthel Index and Hospital Anxiety Depression Scale and Short Memory Questionnaire scores, were compared 1 and 2 years after ICU discharge.
**Results:** Overall, 508 ventilated patients with COVID-19 were included, of whom 101 underwent tracheostomy (45 and 56 patients in the early and late groups, respectively). Ventilation duration was significantly shorter in the early group than in the late group (19 [interquartile range: 14–28] vs. 39 [28–59] days, $P<0.01$). The corresponding in-hospital mortality rates were 31.1% (14) and 28.6% (16, $P=0.83$). The 1-year mortality rates in the early and late groups were 35.9% (14/39) and 36.2% (17/47), respectively ($P=1.0$). The corresponding PICS incidence rates were 52.4% (11/21) and 65.4% (17/26, $P=0.39$). The 2-year mortality rates in the early and late groups were 36.8% (14/38) and 37.0% (17/22), respectively ($P=1.0$). The corresponding PICS incidence rates were 64.7% (11/17) and 77.2% (17/22, $P=0.48$). After adjusting for age and sequential organ failure assessment score at ICU admission, intergroup differences in the 1- and 2-year mortality rates were found to be insignificant ($P=0.82$ and 0.83, respectively).
**Conclusions:** Ventilation duration was significantly shorter in the early group; however, intergroup differences in the in-hospital death, 1-year death and PICS incidence rates, and 2-year death and PICS incidence rates were insignificant. Post-tracheostomy PICS symptoms persisted for much longer than 2 years in > 50% of the patients.

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3. PICS-COVID study was funded by the Nestlé Health Science Company of Nestlé Japan. The funder of this study had no role in the study design, data collection, data analysis, data interpretation, or writing of the report. The funds were used to conduct the electronic data capture for the study, operate the central office, pay for questionnaire postage, and provide honoraria to patients.

**Topic:** Perioperative care

## 000621

### Stroke code in a county hospital: management by an intensivist

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**Introduction:** Stroke is one of the leading causes of disability and mortality worldwide, making early reperfusion treatment essential. In recent years, the creation of remote teams responsible for assessing this condition and its treatment has been promoted with the aim of improving care in areas without 24-h neurologist coverage.
**Objectives:** To analyze the management of stroke code by an intensivist, including factors related to the prognosis of these patients. Evaluate the usefulness of telestroke in our environment.
**Methods:** Prospective cohort analysis in which acute strokes with activation of "stroke code" were included between January 2017 and November 2023. Demographic outcomes, comorbidities, contact with telestroke, reperfusion therapy, assistance time, complications, ICU and hospital length of stay (LOS), mortality, and neurological sequelae. Statistical analysis: categorical variables (frequencies and percentages) and quantitative variables (mean and standard deviation or median and interquartile range). Comparisons: X2 test (percentages), Student's t test (means), and Mann–Whitney U test (medians). Multivariate logistic regression. Statistical significance at $p<0.05$.
**Results:** 273 patients were included. Age 67.9 ($\pm$13.6). Sex: man 59.7%. Time (min): door-to-CT 25 [17; 42], emergency department-ICU call 22 [5; 49.3], CT-to-needle 44 [26; 65], door-to-needle 70 [53.5; 94.7]. Telestroke 28.5%. Fibrinolytic therapy 41.4%. Thrombectomy 19.4%. Mortality 18.3%.
Telestroke ($n=78$) vs. Non-telestroke ($n=195$) were compared. Thrombectomy 37.2% vs. 12.3%, $p<0.001$. Hemorrhagic Transformation 23.1% vs. 9.2%, $p=0.006$. Time CT-to-needle 70 [49; 91] vs. 37 [23.7; 52.7], $p<0.001$. Time door-to-needle 90 [68; 129] vs. 62 [51; 87], $p=0.001$. Rankin at discharge $\leq 2$: (37.3% vs. 53.6%, $p=0.024$). Rankin at discharge (3 [1; 5] vs. 2 [0; 4], $p=0.013$).
Previous years ($n=157$) vs. 2023 ($n=111$) were compared. Fibrinolytic therapy 50.9% vs. 29.7%, $p<0.001$. ICU activation 77.1% VS. 91.9%, $p=0.002$. Time CT-to-needle 51 [29; 70.5] vs. 34.5 [25; 45], $p=0.037$. Complic: MV 21% vs. 9.9%, $p=0.024$. ICU-LOS 1 [0; 3] vs. 1 [0; 2], $p=0.034$. Hospital-LOS 9.5 [5; 15] vs. 6 [4; 10], $p<0.001$. Rankin at discharge 3 [1; 5] vs. 1 [0; 4], $p=0.004$. Rankin at discharge record (p0.012): $\leq 2$ (42.3% vs. 58.5%), > 2 (57.7% vs. 41.4%).
Dead ($n=50$) vs. Survivors ($n=218$) were compared. Sex: man 76.0% vs. 55.6%, $p=0.015$. Age 72.2 ($\pm$10.7) vs. 67.1 ($\pm$14.1), $p=0.006$. Comorbidity: CKD (16.0% vs. 5.5%, $p=0.018$), neoplasia (24% vs. 7.3%, $p=0.002$). Fibrinolytic therapy (26% vs. 45.8%, $p=0.02$). Complications ($p<0.001$): MV 62% vs. 5.9%, hemorrhagic transformation 34% vs. 8.7%. ICU-LOS (2.5 [1; 7] vs. 1 [0; 2], $p<0.001$). The number needed to treat (fibrinolysis): 8.
Multivariate logistic regression: Neoplasia (OR 6.6, IC 95% [2.22–19.86], $p<0.001$), Fibrinolysis (OR 0.33, IC 95% [0.13–0.79], $p=0.016$), previous

CKD (OR 6.0, IC 95% [1.79–19.6], $p = 0.003$), complication: MV (OR 37.6, IC 95% [15.6–99.7], $p < 0.001$).
**Conclusions:** The leadership of the "stroke code" assumed by the intensivist has made it possible to reduce the time until fibrinolysis, complications, ICU and hospital LOS, and neurological sequelae.
Telestroke consultation were associated with delays in reperfusion therapy, greater complications, and neurologic sequelae.
The need for MV, previous CKD, and neoplasia were observed as independent risk factors for mortality, while fibrinolysis was a protective factor.

**Topic:** Neurointensive care

## 000624

### Hoping for the best or the worst: factors associated with expected future wellbeing in persons with a long-term illness

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**Introduction:** Persons with long-term critical illness often suffer from decreased physical, mental, and cognitive capacity, which can lead to impaired well-being. Although current well-being is often assessed in research studies, the expected future well-being and factors that could contribute to the expected well-being are scarcely described.
**Objectives:** To determine factors associated with expectations of future well-being in persons with long-term illness.
**Methods:** Baseline data of a randomised controlled study, (The teleyoga study, clinicaltrials.gov: NCT03703609) are used in which participants were recruited from four hospitals in Sweden between 2018 and 2022. Inclusion criteria: > 18 years, cared for at intensive care or cardiology unit during the last 36 months and clinically stable at the time of inclusion. Exclusion criteria: inability to perform data collection or intervention due to severe physical or mental limitation, expected survival of less than 6 months.
Expected well-being was measured with Cantril's ladder of life, where patients could rate their expected (in one year) well-being on a ladder from bottom (0: worst possible life) to top (10: best possible life). Based on the literature, factors considered associated with expected well-being were age, sex, Body Mass Index, living condition, economic situation, comorbidities (Charlson comorbidity index (CCI)), cognition (Montreal Cognitive Assessment, MoCA), depressive symptoms (Hospital Anxiety and Depression scale, HADs), sleep (Minimal Insomnia Symptom Scale, MISS) and exercise capacity (6-min walk test).
Linear regression was performed with variables associated with expected well-being in univariate analysis ($p < 0.05$, see table).
**Results:** In total 303 persons with long-term illness were included. The mean score on the expected well-being was 7.5 (SD 1.75). The mean age was 65 years (SD 12) and 70% was male, 78% were married or in a relationship, and 90% rated their financial situation as good. In total 18% of patients were considered depressed (> 7 on HADs), 32% experienced sleeping difficulties (> 6 on MISS), and 54% had mild to moderate cognitive impairment (< 26 on MoCA). Patients walked a mean of 456 m on the 6-min walk test (SD 124). The mean score on CCI was 4 (SD 3).
The multivariate analysis showed that persons with long-term illness that were younger ($p$-value 0.005), male ($p$-value 0.006), married or being in a relationship (p-value 0.043), had fewer comorbidities ($p$-value 0.018) and had fewer depressive symptoms ($p$-value < 0.001) expected a higher future wellbeing the coming year (see table).
**Conclusions:** Expectations for future well-being were associated with age, sex, marital status, comorbidities, and mental health but unexpectedly not with functional measures such as sleep, cognition, or exercise capacity.

**Table (abstract 000624)** Univariate and multivariate statistics to assess factors associated with expected well-being

Table Univariate and multivariate statistics to assess factors associated with expected well-being

| | Univariate analysis | | | |
|---|---|---|---|---|
| Variables | P-value | Standardized beta | 95% Confidence interval | P-value |
| Age | 0.001 | -0.179 | -0.045: -0.008 | 0.005 |
| Sex (1 male, 2 female) | 0.014 | -0.159 | -1.043: -0.180 | 0.006 |
| Body Mass Index | 0.109 | | | |
| Marital status (0 single, 1 married/in a relationship) | 0.002 | 0.113 | 0.15: 0.947 | 0.043 |
| Economic situation (0 problematic economic situation, 1 good economic situation) | 0.037 | 0.020 | -0.588: 0.841 | 0.729 |
| Comorbidities* | 0.002 | -0.137 | -0.180: -0.017 | 0.018 |
| Cognition* | 0.092 | | | |
| Depressive symptoms* | <0.001 | -0.365 | -0.259: -0.132 | <0.001 |
| Sleeping difficulties* | 0.011 | 0.046 | -0.056: 0.105 | 0.447 |
| Suboptimal exercise capacity* | <0.001 | 0.011 | -0.002: 0.002 | 0.865 |

*Comorbidities (Charlson comorbidity index), cognition (Montreal Cognitive Assessment, MoCA), depressive symptoms (Hospital Anxiety and Depression scale, HADs), sleeping difficulties (Minimal Insomnia Symptom Scale, MISS) and suboptimal exercise capacity (6-minute walk test)

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2. This work is supported through the Swedish Research Council (VR) 2018 02719 and 2022–01089, The Swedish Heart–Lung Foundation 20170766 and 20210473, Swedish Research Council for health, working life and welfare (FORTE) 2018–00650 and Medical Research Council of Southeast Sweden (FORSS) and Region Östergötland.

**Topic:** Health Services Research and Outcome

## 000625

### Expert perspectives on ECCO2R – what could be its future role respiratory failure?

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000625

**Introduction:** Expert perspectives on ECCO2R – what could be its future role respiratory failure?
Introduction. Facilitating ultraprotective ventilation by ECCO2R has been considered for patients with acute respiratory failure. Thus far, study results are contradictory and terms like "ultraprotective ventilation" may require clarification. In addition, different technologies potentially impact outcome of clinical studies.
**Objectives:** Objectives: Outline a framework for ECCO2R based on clinical experience and provide guidance for a new trial.
**Methods:** We convened a meeting of 15 European intensivists and nephrologists and used a modified Delphi process to provide updated insights into the role of ECCO2R in acute lung failure, including ARDS and to identify recommendations for a future randomized controlled trial. Over four rounds of iterative questioning, including a pre-meeting survey, a live survey during the meeting, and two post-meeting surveys (voting and survey all anonymous) was performed. Round 3 survey included newly published literature, the secondary analysis of the REST trial, the ESICM guidelines, and the VT4COVID, a second post-meeting survey (Round 4) was shared with the authors to understand their definition of ultra-protective ventilation and the role of ECCO2R.
**Results:** Participants ranked VT, ΔP, PPlat, and RR as the four most important respiratory parameters to monitor and agreed that a protective ventilation strategy for patients with mild-to-moderate ARDS should have a target VT of < 6 mL/kg PBW, maximum ΔP of 15 cmH2O, and maximum PPlat of 29–30 cmH2O Figure 1A–C). Based on the ECCO2R data published after the meeting, most participants indicated that ultra-protective lung ventilation should have a maximum VT ≤ 6 mL/kg PBW, (Figure 2A). Fourteen (93%) participants agreed that ECCO2R would be needed in most patients to implement ultra-protective lung ventilation (*consensus*) (Figure 2B). All participants indicated that ultra-protective lung ventilation facilitated by ECCO2R would require a maximum ΔP (100%, *consensus*), with the *majority* selecting 14–15 cmH2O as their preference (Figure 2C). A range of 251–350 mL/min or 351–450 mL/min as the minimum blood flow rate was required for effective use of ECCO2R (Figure 3). A *majority* of participants (73%) indicated a minimum $CO_2$ removal rate of 80 mL/min delivered by continuous renal support machines was required for ECCO2R to be effective (Figure 4). During the post-meeting survey, 14/15 (93%, *consensus*) participants stated that a new randomized trial of ECCO2R is needed in patients with ARDS. A ΔP of ≥ 14–15 cmH2O was suggested by 12/14 participants (86%) as the primary inclusion criterion.
**Conclusions:** ECCO2R might have potential as a treatment for patients with respiratory failure in whom ventilation of less intensity like UPLV is indicated. A future randomized trial is necessary, and values like driving pressure and ventilatory ratio could help to identify the adequate patient subgroups that have a potential benefit from ECCO2R combined with less intensive ventilation. Also to be considered are that differences in technology, e.g. use of centrifugal pumps (initially optimized to generate high blood flow > 2 l/min) for low blood flow in ECCO2R, may contribute to unfavorable clinical outcomes; there could be a potential for devices in a flow range up to 400 ml/min based on the peristaltic drive like in CRRT if they provide a sufficient removal capacity for $CO_2$.

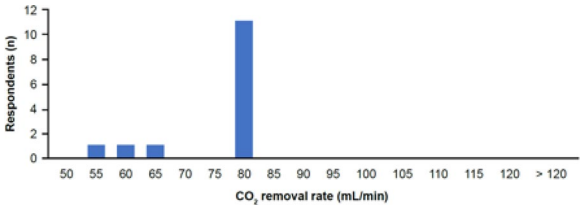


**Fig. 4 (abstract 000625)** Minimal extraction capacity for $CO_2$/min (absolute vaolue) for ECCO2R therapy

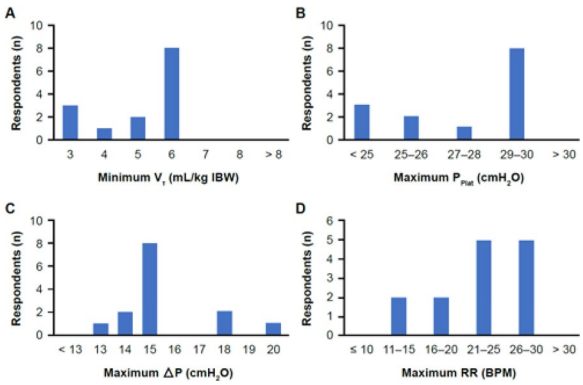


**Fig. 1 (abstract 000625)** Minimum Tidal Volume [ml/kg PBW] defined as 6 ml or below; Plateau Pressure & delta P (cm/$H_2O$) as indicators for UPLV initiation

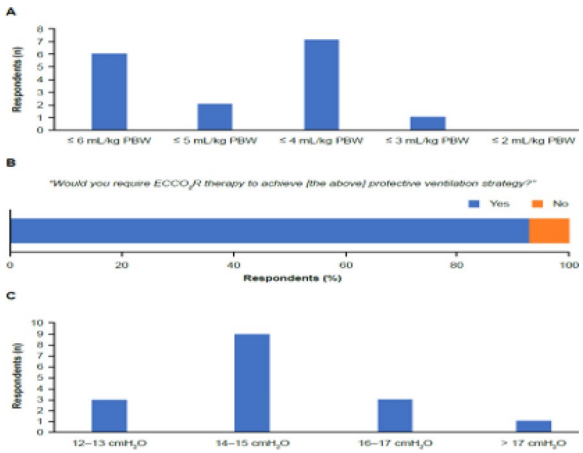


**Fig. 2 (abstract 000625)** Range of tifdal volume for UPLV less than 6 ml / kg PBW; driving pressure for use of UPLV not below 12 cm$H_2O$

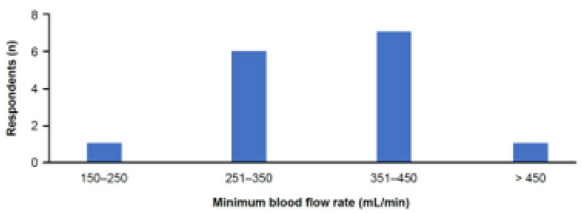


**Fig. 3 (abstract 000625)** RMinimum blood flow rate [ml/min] required to generate sufficient extraction capacity for $CO_2$

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000626

## Association between left- and right ventricular dysfunction in critically ill COVID-19 patients

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**Introduction:** Myocardial injury and cardiac dysfunction have been reported among critically ill COVID-19 patients. Although the focus has generally been on the right ventricle (RV), left ventricular (LV) dysfunction also occurs and is associated with myocardial injury (1). A recent study showed that RV injury was associated with LV dysfunction in 18% of cases (2), suggesting both ventricles should be assessed in relation to each other.

**Objectives:** The aim of this study was to evaluate the incidence of LV systolic dysfunction and its association with outcomes such as acute myocardial injury (AMInj), length of stay in the intensive care unit (ICU), days free of organ support and mortality, adjusted for RV dysfunction, preexisting cardiac disease, Simplified Acute Physiology Score III (SAPS-III) and Sequential Organ Failure Assessment (SOFA).

**Methods:** Retrospective, observational study of 189 adult patients with laboratory-confirmed COVID-19, treated in the ICU at Linköping University Hospital during 2020–2022. All had at least one echocardiogram performed in the first 10 days of care.

Left ventricular dysfunction was defined as left ventricular ejection fraction < 50% (Simpsons biplane method).

Right ventricular dysfunction was defined as at least two of the following; Tricuspid Annular Plane Systolic Excursion < 17 mm, RV s' < 9.5 cm/s, Fractional Area Change < 35%, Free Wall Strain > −20%.

Acute myocardial injury was defined as high-sensitivity troponin T (hs-TnT) > 14 ng/l with an absolute change of > 20%.

**Results:** LV systolic dysfunction was present in 16.5%, RV dysfunction in 22.0% and biventricular dysfunction in 9.2%. AMInj occurred in 70.5%. There was a significant association between LV and RV dysfunctions. Patients with LV systolic dysfunction had higher hsTnT and a greater proportion suffered AMInj at admission. LV systolic dysfunction was independently associated with AMInj even after adjustment for important confounders. There was no association between LV systolic dysfunction and ICU length of stay, days free of organ support, ICU- or 30-day mortality (Table 1).

**Table 1 (abstract 000626)** Outcomes

| | Normal LV systolic function | LV systolic dysfunction | *p* |
|---|---|---|---|
| RV dysfunction | 19 (17,1%) | 12 (60,0%) | < 0,001*** |
| AMInj at admission | 25 (20,3%) | 13 (52,0%) | < 0,001*** |
| AMInj during ICU stay | 84 (65,1%) | 21 (84,0%) | 0,064 |
| Peak hsTnT | 65,2 (14,5–63,0) | 305,5 (36,0–226,0) | < 0,001*** |
| Peak NTproBNP | 2763,0 (440,0–2275,0) | 14300,4 (1950,0–35000,0) | < 0,001*** |
| Days free of organ support, first 30 days | 15,7 (3,5–25,0) | 15,2 (4,0–22,0) | 0,683 |
| ICU length of stay | 14,8 (5,5–21,5) | 15,5 (5,0–32,0) | 0,565 |
| 30d mortality | 21 (15,9%) | 2 (7,7%) | 0,372 |
| ICU mortality | 23 (17,4%) | 2 (7,7%) | 0,376 |

**Conclusions:** LV dysfunction occurred commonly in critically ill COVID-19 patients. These patients also often had RV dysfunction and increased cardiac biomarkers. More than half of patients who developed LV dysfunction had acute myocardial injury at admission and there was an independent relationship between LV dysfunction and AMInj. LV dysfunction was not associated with organ failure, ICU LOS or mortality.

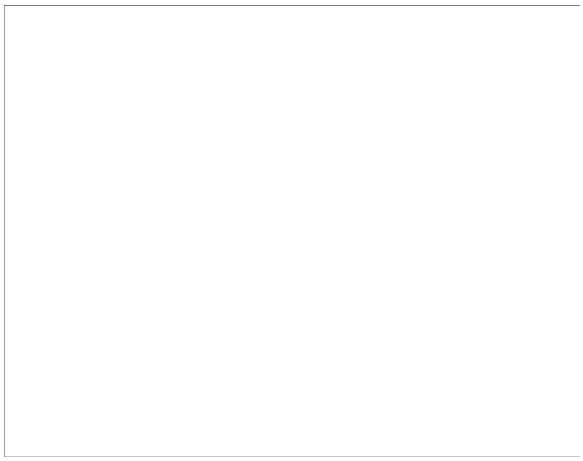

**Fig. 1 (abstract 000626)** RMinimum blood flow rate [ml/min] required to generate sufficient extraction capacity for $CO_2$

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**Topic:** Cardiovascular issues in ICU

## 000627

### Prolonged and difficult ventilatory weaning and reintubations—how to anticipate?

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**Introduction:** It is estimated that 40% of the duration of mechanical ventilation is spent with the process of weaning. Approximately 20% of ventilated patients have difficult or prolonged weaning, which is associated with worse outcomes. Weaning success is dependent on a structured approach, which includes a correct assessment and identification of risk factors, and timely and specific interventions.
**Objectives:** To study the risk factors to anticipate difficult and prolonged weaning in our patients.
**Methods:** Retrospective observational study of adult patients with difficult and prolonged weaning according to WIND classification, admitted in a mixed intensive care unit (ICU) at a university hospital in a period of three years—2021 to 2023. We analyzed patients' electronic records to collect data concerning demographics, comorbidities, cause for ICU admission, SAPS II, reintubations, tracheostomies, mortality, ICU, and hospital length of stay. Statistical analysis was performed with IBM SPSS Statistics. Comparative analysis was conducted and a p value less than 0.05 was deemed statistically significant.
**Results:** During the study period, 1307 patients were admitted; 844 were submitted to mechanical ventilation and 427 patients (50,1%) were excluded: 254 (30.1%) for missing data, 162 (19,2%) for ventilatory support < 2 days, and 11(1,3%) transferred before weaning.
We analyzed the weaning, extubation and reintubation events of 417 patients and compared the groups: simple ($n=264$, 63,3%), prolonged ($n=92$, 22,1%), and difficult ($n=61$, 14,6%) weaning.
Patients with prolonged and difficult weaning had more frequent body mass index > 30kg/m2 ($n=38$, 41,3% and $n=11$, 18,0% versus $n=39$, 14,8%, $p<0,001$) and reduced ejection fraction heart failure (HFrEF) ($n=5$, 5,4% and $n=11$, 18,0%, versus $n=17$ 6,4%, $p=0.003$).
Patients were similar with respect to the other analyzed variables at admission. As expected, they had longer ICU and hospital length of stay ($27\pm16$ and $17\pm8$ versus $9\pm6$ days, $p<0,001$ and $58\pm44$ and $50\pm36$ versus $31\pm30$ days, $p<0,001$, respectively), longer ventilation duration ($20\pm12$ and $12\pm7$ versus $6\pm5$ days, $p<0,001$), and higher ICU mortality ($n=14$, 15,2% and $n=5$,8,2% versus $n=8$, 3,0%, $p<0,001$).
Among patients with difficult and prolonged weaning, 47 (49,5%) were reintubated and had a larger proportion of tracheostomies ($n=41$, 44,6% and $n=12$, 19,7% versus $n=3$, 1,1%, $p<0,001$). Early reintubation (first 48 h) was more frequent than later reintubation ($n=39$, 83,0% versus $n=8$, 17,0%). Reintubated patients had longer ICU length of stay ($23\pm12$ and $30\pm19$ days) than non-reintubated patients ($19\pm12$ days, $p=0.033$).
**Conclusions:** Based on our data, we propose to add to our standard practice: in obese patients the transpulmonary pressure monitoring (compliance and asynchronies), the systematic evaluation of airway occlusion pressure 100 ms and early diaphragmatic rehabilitation (diaphragmatic dysfunction); and in HFrEF patients the routine use of non-invasive ventilation in weaning, guided by bedside echocardiography.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000628

### Nosocomial infections during extracorporeal membrane oxygenation, preliminary reports of the INF-ECMO Study, a multicenter prospective observational study

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**Introduction:** Extracorporeal Membrane Oxygenation (ECMO) is a life support technique for patients with reversible refractory respiratory and/or circulatory failure. ECMO patients are at higher risk of infections, but the characterization of infections during ECMO and risk factors are not clearly defined.
**Objectives:** To describe the incidence, type, microbial etiology, risk factors, and impact on outcomes of nosocomial infections during ECMO.
**Methods:** In an ongoing multicenter worldwide-open prospective observational study, we enrolled patients treated with ECMO, excluding patients < 18 years old, with expected survival < 24 h, pregnant women, and ECMOs as Cardio-pulmonary resuscitation or as a bridge to lung transplant. Only microbiologically confirmed infections diagnosed from the day of cannulation until 48 h after decannulation or death were considered.
**Results:** From January 2023 to March 2024, 105 patients were enrolled in 9 centers, and 43 from 7 European medical-surgical ICUs ended follow-up and were included in this analysis (75% males, 58 [45–65] years old, Sequential Organ Failure Assessment Score 7 [4–10]) who underwent peripheral ECMO primarily for respiratory support (68% veno-venous, 32% veno-arterial). Twelve patients (28%) suffered from 16 infections (46.9 infections/1,000 ECMO-days) after 5 [3–11] days of life support. We identified 6 ventilator-associated pneumonia (VAP), 4 bloodstream infections, 2 catheter-related bloodstream infections (CRBSI), one pulmonary aspergillosis, one colitis, one Herpes Simplex Virus reactivation, and one ECMO cannula infection. 2 VAP and one CRBSI infection were polymicrobial. Multidrug-resistant (MDR) organisms cause 25% of bacterial infections. Patients who needed at least one ECMO circuit change were more infected (33% vs. 10%; OR 4.67 (0.86 – 25.31), $p = 0.059$). Ten patients (23%) died (31.1 deaths/1,000 ECMO-days). Infected patients had longer intensive care unit stay (30.5 [17.5–39] vs. 16 [9–23] days; $p = 0.013$), mechanical ventilation (21.5 [14–35.5] vs. 9 [7–23] days; $p = 0.007$), and ECMO support (9 [7–14] vs. 5 [4–7] days; $p = 0.006$). Infected patients had a similar death rate to non-infected (28.4 vs. 33.3 deaths/1,000 ECMO-days; $p = 0.674$), while infections caused by MDR bacteria were associated with a higher percentage of death (75% vs 15%, $p = 0.044$).

**Table (abstract 000628)** Pathogens of the bacterial nosocomial infections during Extracorporeal Membrane Oxygenation

| Gram stain and pathogen | Overall n. (n. mdr) | VAP n. (n. mdr) | BSI n. (n. mdr) | CRBSI n. (n. mdr) |
|---|---|---|---|---|
| Gram + | 9 (1) | 2 (0) | 4 (1) | 3 (0) |
| E. faecium | 4 (0) | - | 1 (0) | 3 (0) |
| Staphylococcus aureus | 2 (1) | 1 (0) | 1 (1) | - |
| Enterococcus spp | 1 (0) | - | 1 (0) | - |
| Others Gram + | 2 (0) | 1 (0) | 1 (0) | - |
| Gram - | 3 (2) | 3 (2) | - | - |
| P. aeruginosa | 3 (2) | 3 (2) | | |
| Klebsiella spp | 2 (1) | 2 (1) | - | - |
| Enterobacterales (other) | 1 (0) | 1 (0) | - | - |

*VAP*: Ventilator Associated Pneumonia; *BSI*: Blood Stream Infection; *CRBSI*: Catheter Related Blood Stream Infection; *mdr*: multidrug resistant.

**Conclusions:** Infections during ECMO support are common; up to 25% involve multidrug-resistant organisms. In addition, infection is associated with prolonged need for mechanical ventilation, extracorporeal support, and intensive care unit stay.

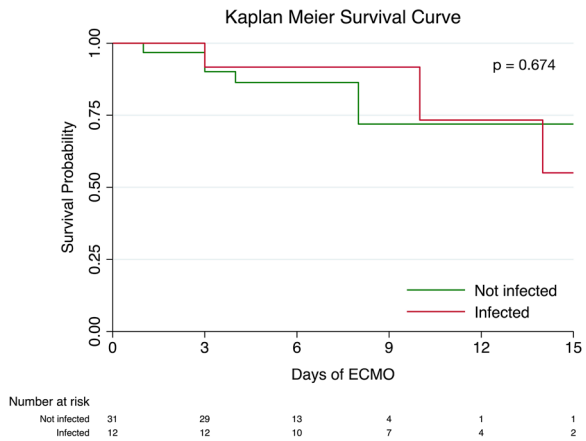


**Fig. (abstract 000628)** Kaplan–Meier survival curve comparing infected vs. not infected patients

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**Topic:** Infections and prevention

## 000629

### Intrinsic apoptotic pathway activation underlies diaphragm atrophy in mechanically ventilated ICU patients

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**Introduction:** Intensive care unit (ICU) acquired diaphragm weakness is a common consequence of mechanical ventilation (MV) (1). Diaphragm weakness contributes to difficult weaning, which is associated with increased morbidity, mortality, and healthcare costs (1). Furthermore, it can lead to physical disability and impairment of intensive care survivors (2). Diaphragm weakness is caused by a combination of atrophy and contractile weakness of muscle cells, also called myofibers. In the previous years, several mechanisms underlying ICU-acquired diaphragm weakness have been identified. Increased autophagy and apoptosis were identified to underlie diaphragm atrophy in rodents and brain-dead organ donors receiving controlled MV (5). Brain-dead organ donors and controlled-ventilated rodents have distinct clinical characteristics compared to mechanically ventilated ICU patients and thus, do not adequately reflect diaphragm pathophysiology in critically ill patients. Whether apoptotic mechanisms contribute to diaphragm atrophy and weakness in mechanically ventilated patients is currently unknown.
**Objectives:** We aimed to investigate whether apoptotic mechanisms underlie diaphragm atrophy and weakness in mechanically ventilated ICU patients.
**Methods:** Diaphragm biopsies of mechanically ventilated ICU patients undergoing abdominal or thoracic surgery for clinical reasons with and without established myofiber atrophy (myofiber cross-sectional area (CSA) < 2000 um2, CSA > 2500 um2, respectively) were compared to biopsies of patients undergoing thoracic surgery for a, pulmonary nodule (controls). RNA sequencing was performed ($n = 26$) on whole tissue samples. Cross-sections were stained using a TUNEL ($n = 27$) assay and activated caspase-3 ($n = 21$) staining to identify apoptotic cells. Furthermore, myonuclei were stained with a specific antibody (PCM-1) to distinguish myonuclei from other cell types present in the cross-sections.
**Results:** In the transcriptomic analysis, both ICU groups were analyzed as one group due to poor clustering results with principal component analysis. We identified 2977 differentially expressed genes (1741 upregulated in the ICU group and 1236 downregulated). Panther pathway enrichment analysis of significant (FDR < 0.05) differentially expressed genes revealed marked upregulation of the P53 and apoptosis pathways (20/81), P53-pathway associated genes differentially expressed and (16/108) apoptosis-pathway associated genes differentially expressed. TUNEL staining revealed an increased apoptotic index (TUNEL + myonuclei/total myonuclei) in the ICU group with atrophy and cleaved caspase-3 staining revealed an increased apoptotic index (cleaved caspase-3 + myonuclei/total myonuclei) in both ICU groups.
**Conclusions:** P53 and intrinsic apoptotic pathway activation are associated with diaphragm atrophy in mechanically ventilated ICU patients. Myonuclear apoptosis may compromise transcriptional capacity and therefore recovery of the diaphragm after atrophy, possibly contributing to weaning failure and physical disability of intensive care survivors.

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**Topic:** Translational biology

## 000631

### Impact of the introduction of digestive decontamination in the ICU of a county hospital in 2023

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**Introduction:** Ventilator associated pneumonia is a high prevalence and mortality infection in the ICU, specially during the COVID-19 pandemic. In 2011, the "Pneumonia Zero project" was drafted in Spain to reduce the incidence of VAP with a series of basic recommendations, among which selective digestive decontamination was included.
**Objectives:** To analyze the impact of selective digestive decontamination (SDD) on the incidence of ventilator-associated pneumonia (VAP) in the ICU of a county hospital with poor compliance with zero pneumonia measures, as also analyze the factors related to the development of pneumonia.
**Methods:** Retrospective descriptive analysis was performed using a prospective cohort obtained from a 15-bed ICU collected between June of 2019 to October of 2023. Demographic variables, comorbidities, prognosis scores (APACHE II and SAPS II), risk factors, ICU-acquired infections microorganism isolation, ICU and hospital length of stay (LOS), antimicrobial therapy used, and mortality were collected. Statistical analysis: continuous variables (mean and standard deviation or median and interquartile range),categorical variables (percentages and frequencies). Comparison: Chi-square test (percentages) and T-student test (mean) or Wilcoxon test (median). Multiple logistic regression. Statistical significance was set at $p < 0.05$.
**Results:** 745 patients were included. SDD patients ($n = 30$) vs. non-SDD patients ($n = 715$). APACHE II on admission (16 [11; 21] vs. 11 [8; 18.5], $p = 0.025$). Origin ($p < 0.001$): community 66.7% vs. 42.9%, other ICU 20% vs. 3.2%, ward 13.3% vs. 53.7%. Type of admission ($p = 0.014$): scheduled surgery 3.3% vs. 7.5%, urgent surgery 10% vs. 17.1%, coronary 3.3% vs. 7.5%, non-coronary medical 73.3% vs. 66.9%, trauma 10% vs. 0.8%. Prior antimicrobial therapy (48 h) 16.7% vs. 42.1%, $p = 0.009$. First ICU-acquired infection ($p < 0.155$): secondary bacteriemia (6.7% vs 6.6%), VAP (3.3% vs. 5.6%). Second ICU-acquired infection ($p = 0.127$): secondary bacteriemia (0% vs. 1.1%), VAP (6.7% vs. 5.7%). Days of mechanical ventilation (VM) (6.5 [3; 13.5] vs. 3 [1; 8], $p < 0.001$). Days of the central venous catheter (CVC) (10 [6; 18.5] vs. 5 [2; 12], $p = 0.001$). Days of the urinary catheter (UC) (10 [6; 20.5] vs. 6[2; 12], $p = 0.001$). Days of the arterial catheter (5 [3; 10.7] vs. 2 [0; 7], $p < 0.001$). ICU LOS (days) (10 [6; 18.5] vs. 6 [2; 13], $p = 0.002$). VAP incidence (14.2 cases/1000 days VM vs. 21.05 cases/1000 days VM). Multivariate logistic regression (VAP): Sex (man) (OR 2.08, IC 95% [1.14–4.17], $p = 0.023$), origin other ICU (OR 4.17, IC 95% [1.51–10.73], $p = 0.004$), days of MV (OR 1.16, IC 95% [1.13–1.19], $p < 0.001$).
**Conclusions:** The beginning of the SDD protocol meant a decrease in the incidence of VAP to 14.2 cases/1000 days of VM. Sex, origin from another ICU, and the days of MV were observed as independent risk factors of VAP.

**Topic:** Sepsis

**000632**

## Hydrocortisone in ICU burn patients with septic shock: a retrospective cohort study

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**Introduction:** Burn patients with septic shock present circulatory failure which increases morbidity and mortality. Initial treatment to manage hypotension includes fluid therapy and vasoactive medications. In case these treatments are not effective hydrocortisone is administered as a rescue treatment.
**Objectives:** To investigate differences between ICU burn patients with septic shock who received hydrocortisone therapy and those who did not.
**Methods:** This retrospective cohort study included burn ICU patients with septic shock. Data between patients who received hydrocortisone as rescue therapy for refractory septic shock and those who did not receive hydrocortisone were compared. The following data were included in statistical analysis: demographic characteristics, total body surface area (TBSA%) burnt, APACHE II score, SOFA score, ICU length of stay, hydrocortisone administration, noradrenaline dosage, C-Reactive Protein (CRP), procalcitonin (PCT), and acute kidney injury (AKI) incidence.
**Results:** We included 31 patients, 19 (61%) of whom were male. Mortality was 19.4%. Six(19.4%) patients received hydrocortisone. The mean duration of hydrocortisone treatment was 5.33 ± 2.34 days. Descriptive characteristics are shown in Table 1. Patients who received hydrocortisone were at higher dosages of noradrenaline at the beginning of sepsis ($p = 0.016$) and 48 h after the onset of septic episode ($p = 0.049$). CRP was lower by −5.64 mg/dl after 48 h in patients who received hydrocortisone ($p = 0.03$). Maximum PCT values were also lower in patients who received hydrocortisone ($p = 0.033$).No association was found between administration of hydrocortisone and sex ($p = 0.65$, OR = 1.78, 95% CI 0.30, 10.72), acute kidney injury ($p = 0.49$, OR = 6, 95% CI 0.22, 162.53) and mortality ($p = 1$,OR = 0.89, 95% CI 0.14, 5.85).

**Table 1 (abstract 000632)** Characteristics of septic shock patients

| | Hydrocortisone | | No hydrocortisone | | *p* |
|---|---|---|---|---|---|
| | **Mean ± SD / Median(Q25-Q75)[+]** | ***n*** | **Mean ± SD / Median(Q25-Q75)[+]** | ***n*** | |
| Age (years) | 57.17 ± 14.35 | 6 | 55.48 ± 15.75 | 25 | 0.81 |
| TBSA (%) | 37.08 ± 11.63 | 6 | 40.9 ± 13.85 | 25 | 0.54 |
| APACHE II at admission | 10.17 ± 2.86 | 6 | 9.36 ± 4.45 | 25 | 0.68 |
| SOFA score at septic shock | 2.5 ± 1.76 | 6 | 4.28 ± 2.26 | 25 | 0.08 |
| ICU length of stay (days) | 85 ± 64.6 | 6 | 70 (24–139.5)[+] | 25 | 0.9 |
| Noradrenaline at the beginning of sepsis (mcg/kg/min) | 1.25 ± 0.82 | 6 | 0.28 (0.16–0.65) | 25 | 0.016* |
| Noradrenaline at 48 h after sepsis onset (mcg/kg/min) | 1.29 ± 1.2 | 6 | 0.33 (0.18–0.57) | 25 | 0.049* |
| Duration of noradrenaline administration (hours) | 84 ± 29.39 | 6 | 120 (72–120) | 25 | 0.23 |

[+]non-parametrical data, *statistically significant

**Conclusions:** Patients who received hydrocortisone for septic shock needed higher dosages of noradrenaline from the beginning of sepsis.Lower CRP and PCT values were observed in patients who received hydrocortisone. Administration of hydrocortisone did not affect mortality.

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**Topic:** Sepsis

**000633**

## Revolutionizing ICU mortality prediction: XGBoost-based model outperforms other scoring systems

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000633

**Introduction:** Accurate prediction of mortality in intensive care units (ICUs) is essential for enhancing patient outcomes and optimizing healthcare resource allocation 1.
**Objectives:** This study aims to establish an effective predictive model for mortality and to explicate factors strongly associated with mortality.
**Methods:** This study was conducted using electronic records of ICU admissions for adult patients, excluding those under 18, to a single-tertiary healthcare center from July 2012 to July 2022. A novel ICU mortality prediction machine learning model was developed with a focus on the 30-day mortality rate as the primary predictor. Clinical data including demographics, comorbidities, laboratory results, and medication groups were used for model development to achieve superior prediction accuracy. Descriptive analysis was conducted, class imbalance was addressed using Synthetic Minority Over-sampling Technique (SMOTE), and missing data was treated using imputation methods. Model performance was evaluated against alternative machine learning algorithms, including logistic regression, conventionally employed in traditional scoring systems.
**Results:** The dataset comprised 26,248 ICU admissions for 13,567 patients. The final dataset of 13,304 adult patients yielded 72 features reduced to 65 after feature selection of extracted data using LASSO. Comparative analysis revealed that the XGBoost model performed better than other scoring systems, manifesting heightened accuracy (87.91%), sensitivity (92.88%), and Area Under the Receiver-Operating

Characteristic Curve (AUC-ROC) Score/Curve (94.29%). Notably, the patient's length of hospital stays, albumin levels, and urea levels emerged as the most substantial predictors for ICU mortality each exhibiting respective SHAP values of 0.5, 0.41, and 0.37.
**Conclusions:** An ICU mortality prediction model was developed, underscoring the pivotal role of predictors such as hospital stay duration, albumin, and urea levels in predicting patient outcomes. The heightened accuracy and sensitivity of the XGBoost model signifies its potential as an invaluable tool in the critical task of mortality prediction within the ICU context.

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2. This study was supported by Deanship of Research at Jordan University of Science and Technology (grant number 2023/430).

**Topic:** Information systems and Data Science

## 000634

### The role of zinc in oxidative stress response in critically ill patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000634

**Introduction:** Sepsis-related complex immune and oxidative response continues to pose a perilous challenge for clinicians. Imbalance between oxidative stress and anti-oxidative protective mechanisms, favoring the oxidant levels, significantly contributes to the sepsis process and may lead to organ damage and failure. Amongst various anti-oxidative micronutrients, zinc has recently been acknowledged for its potent anti-oxidative and immunomodulatory functions.
**Objectives:** The aim of this prospective study is to investigate the homeostasis of certain biomarkers of oxidative stress and of zinc, as a central antioxidative micronutrient, in critically ill patients.
**Methods:** The study was performed in a sample of critically ill patients with sepsis (S) ($n=120$), compared to patients with non-infectious inflammation (T) ($n=120$) and to healthy controls (H) ($n=77$). Patient serum samples were collected during the first day of Intensive Care Unit (ICU) admission. Photometric analyses of total products of lipid peroxidation, and of the enzymatic reaction with a predefined oxidative substance were used for total oxidative stress (TOS) and total antioxidant capacity (TAC) quantification, respectively. Atomic absorption spectrometry was used for zinc quantification in serum.
**Results:** The ratio of total oxidative stress over total antioxidant capacity (TOS/TAC) was significantly elevated in septic patients (S), compared to non-infectious critically ill patients (T) and to healthy controls (H) ($p=0.005$). Zinc serum levels were significantly reduced in both groups of critical illness (mean value Zn; S group 50.9 µg/dl vs. T group 46.6 ± 12 µg/dl vs. H group 81.9 ± 12 µg/dl, $p<0.001$) (Fig. 1a). TAC was significantly depressed ($p<0.001$) and TOS and TOS/TAC ratio significantly elevated ($p<0.001$) in sepsis (S) compared to control groups (T and H) (Fig. 1b). Zinc was negatively correlated with TOS (Spearman's rho = −0.37, $p=0.001$) and TOS/TAC (rs = −0.39, $p=0.001$) and positively with TAC (rs = 0.22, $p=0.033$). Concerning mortality, TOS/TAC ratio was significantly elevated in non-survivors (median = 7.1; IQR 2.7–21) compared to survivors (1.5; IQR 0.67–2.8) ($p=0.001$), but the difference in serum zinc levels between the outcome groups did not reach statistical significance (survivors 60 ± 22 µg/dl vs. non-survivors 54.7 ± 16 µg/dl).
**Conclusions:** The upregulation of oxidative stress and repressed anti-oxidant capacity, accompanied by the downregulation of zinc, seem to characterize the developing processes of sepsis. Furthermore, low zinc levels are related to the oxidative patients' status, which is associated with mortality.

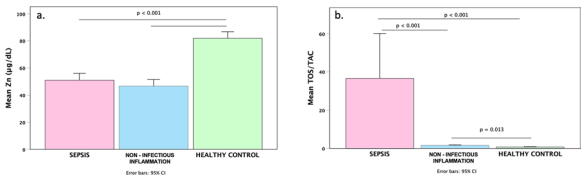


**Fig. 1 (abstract 000634)** Zinc (a) and TOS/TAC (b) mean serum levels differed significantly in septic critically ill patients compared to healthy controls and/or non-infectious critically ill patients. *TOS/TAC: total oxidative stress over total antioxidant capacity.*

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000635

### Modular Educational Programme for Organ Donation (MEPOD): the implementation of a novel national simulation course for multidisciplinary healthcare professionals

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000635

**Introduction:** The Organ Donation Taskforce recommends "all clinical staff likely to be involved in the treatment of potential organ donors should receive mandatory training in the principle of donation."1 Additionally, organ donation facilitation is within intensive care and anaesthetic training doctors' curricula.2 The National Deceased Organ Donation Course (NDODC) run by NHS Blood and Transplantation (NHSBT) is aimed at only senior intensivists and is consistently oversubscribed.3 Providing excellent end-of-life care is challenging and opportunities to gain clinical training in organ donation can be infrequent, making simulation training desirable and necessary.
**Objectives:** Deliver an accessible modular educational programme based on NDODC for healthcare professionals in a psychologically safe environment.
Enable intensive care and anaesthetic doctors to meet their training requirements.
**Methods:** In collaboration with NHSBT, we produced 3 simulation modules to deliver in-situ at London ICUs. Modules included

Diagnosing Death using Neurological Criteria (DNC), Donor Management and Optimisation (DMO), and Donation after Circulatory Death (DCD).
Delegates completed a pre-and post-course survey which included module-specific questions rated on a Likert scale of confidence. We also tested technical knowledge and invited course delivery feedback. To assess for statistically significant differences between pre-and post-course confidence scores, median confidence scores followed by a one-sided paired Wilcoxon signed rank test was performed. P-values were adjusted for multiple comparisons using the False Discovery Rate adjustment of Benjamini and Hochbery (1995) with a significant result taken as adjusted $p < 0.05$.
**Results:** A total of 30 delegates attended 5 MEPOD modules across 3 London hospitals. 100% of delegates would recommend MEPOD to their colleagues. The median post-course confidence scores were higher than pre-course scores for every question, for all courses. After FDR adjustment, there were significant differences for all questions bar one in the one-sided Wilcoxon test, illustrating greater post-course confidence. Figures 1 and 2 illustrate confidence gained in working with a SNOD 77% vs 100%, and diagnosing and recording circulatory death 62% vs 100% respectively.
**Conclusions:** We effectively implemented a modular educational programme in organ donation for multidisciplinary delegates at London hospitals. An improvement in confidence ratings across all modules and unanimous recommendation was demonstrated. This novel project has increased collaboration and accessibility to simulation training for the multidisciplinary ICU team. Limitations include small delegate numbers meaning we were unable to account for seniority of delegate, location of module, and differences between participants completing all 3 modules in one day as opposed to single module attendance. Our future plans include delivering MEPOD nationally with the support of NHSBT educational leads in organ donation.

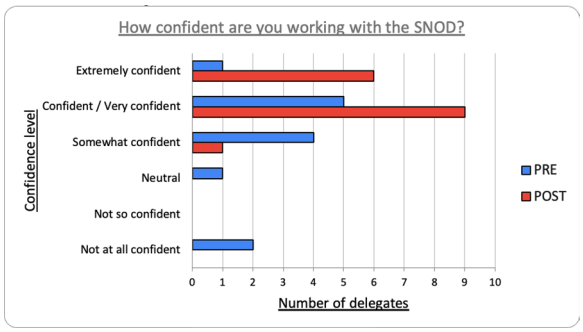


**Fig. 1 (abstract 000635)** Graph demonstrating delegates' confidence in working with a SNOD. Pre-MEPOD survey (blue) and post-MEPOD survey results (red)

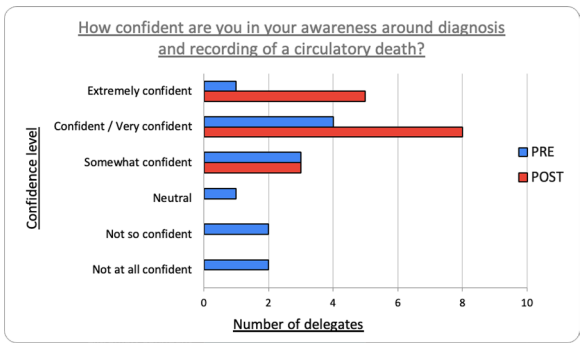


**Fig. 2 (abstract 000635)** Graph demonstrating delegates' confidence in their diagnosis and recording of circulatory death. Results show pre-MEPOD survey (blue) and post-MEPOD survey (red)

**Reference(s)**
1. 3. The National Deceased Donation Course for Intensive Care Medicine Trainees. https://www.odt.nhs.uk/deceased-donation/education-and-training/the-national-deceased-donation-course-for-icm-trainees/
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**Topic:** Brain death, organ donation and transplantation

## 000636

## Congenital hypoproconvertinemia in pregnant women: four clinical cases of effective correction of changes in the hemocoagulation system

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000636

**Introduction:** Hemorrhage is a cause of preventable maternal death. Congenital coagulopathies increase this risk. The low frequency of their occurrence (0.5–1%) makes it difficult to develop a unified algorithm for the management of patients. Targeted hemostatic replacement therapy under the control of thromboelastometry can reduce the risk of hemorrhagic and thrombotic complications in pregnant women with hereditary coagulopathies.
**Objectives:** present clinical observations of hemostasiological therapy in the management of four patients (three of whom are pregnant) with congenital hypoproconvertinemia (factor VII deficiency).
**Methods:** From 2018 to 2023, four patients aged 21–45 years with FVII deficiency were treated. Three patients had no or minimal history of hemorrhagic syndrome. In one case there was abnormal uterine bleeding.To monitor hemostasis, in addition to routine coagulation tests, thromboelastometry was used.
**Results:** Two women underwent cesarean section for obstetric indications. For the purpose of preoperative preparation and in the postoperative period, an antifibrinolytic (tranexamic acid) 1 g and interval programmed administration of prothrombin complex concentrate were used: 2000 IU every 12 h for 5 days. In the third case, replacement therapy was carried out with a prothrombin complex concentrate in a maximum single dose of 3000 IU for the purpose of preoperative preparation for hysteroresectoscopy and 500 IU 8 h after the intervention under the control of the international normalized ratio, prothrombin time for 5 days of the postoperative period. In the fourth case (factor VII activity < 1%, CT in Extem = 281), childbirth was carried out through the vaginal birth canal. The decision to target therapy with prothorambin complex concentrate was made based on the results of ROTEM, rather than by calculation based on the international normalized ratio (initial value 6.72); with the introduction of 1000 units of prothrombin complex concentrate, INR = 1.7 and ROTEM norm were achieved (ST in Extem = 80). It was decided to refuse further administration of the prothrombin complex concentrate. Blood loss during natural childbirth was 250 ml and 500 ml during surgical delivery, not exceeding the physiological one. No hemorrhagic complications were noted in all patients in the postpartum period.
**Conclusions:** The tactics of a single use of prothrombin complex concentrate under thromboelastometry control made it possible to reduce the effective dose of prothrombin complex concentrate in the absence of hemorrhagic manifestations and reduce the risk of thrombotic complications. Multicenter studies are required to create an evidence base for the use of this technique.

**Topic:** Transfusion and haemostasis disorders

## 000639

### Predicting hypoglycemia using machine learning among ICU patients: a study from a developing country

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000639

**Introduction:** In the realm of patient care, maintaining optimal glycemic control is a cornerstone of treatment1. Therefore, leveraging the latest healthcare advancements, the power of comprehensive health records and cutting-edge machine learning algorithms to pioneer a novel approach to predicting hypoglycemia within hospital settings is crucial2.
**Objectives:** To develop and validate a robust machine-learning model utilizing electronic health records (EHR) to forecast the risk of hypoglycemia among Intensive Care Unit (ICU) patients in Jordan.
**Methods:** The present study drew upon a substantial cohort of ICU admissions over ten years from July 2012 to July 2022 with patients younger than 18 years old or those without at least one glucose reading during their ICU stay were excluded. A random forest algorithm was used for candidate predictor variables selection including patients' demographics, length of stay (LOS), comorbidities, received medications, and laboratory results. The primary outcome of interest was the occurrence of any hypoglycemic episode during the patient's ICU stay. Developing and testing predictor models were conducted using Python machine learning libraries.
**Results:** A total of 26,248 ICU admissions for 13,567 were extracted. Out of 1,896 included patients, 206 experienced at least one hypoglycemic episode. A total of 43 candidate predictor variables were taken into consideration. Eight ML models were trained to predict hypoglycemia. Models showed predicting power with a range of (74.53–99.69) for AUROC. Except for Naive Bayes, the six remaining models performed distinctly better than the basic logistic regression usually used for prediction in epidemiological studies. CatBoost model was consistently the best performer with the highest AUROC (0.99), accuracy and precision, sensitivity and specificity, and recall. An increased predicted risk of ICU hypoglycemia was observed for glucose, white blood cell count, magnesium, urea, and LOS.
**Conclusions:** Machine learning models were developed to anticipate the likelihood of hypoglycemia in ICU patients. This is crucial for early detection, personalized glycemic management, and identification of patients at higher risk of hypoglycemia. Ultimately, it will enable timely interventions, optimized treatment strategies contributing to more efficient and proactive critical care management.

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3. This study was supported by Deanship of Research at Jordan University of Science and Technology (grant number 2023/627).

**Topic:** Information systems and Data Science

## 000641

### Heparin-induced thrombocytopenia in the cardiac intensive care unit. A unique, 8-year, single-centre experience

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000641

**Introduction:** Heparin-induced thrombocytopenia (HIT) is a rare immune-mediated disorder related to the use of unfractionated heparin or low-molecular-weight heparin associated with significant thrombotic risk and death. Despite the widespread use of heparin in the cardiac intensive care unit (CICU) there is no data concerning epidemiology, risk factors and treatment efficacy of HIT in acute cardiac settings. Of note, there are also many other than HIT causes of thrombocytopenia occurring in acute patients, but no comparison of these two distinct clinical scenarios has been made so far. Non-heparin anticoagulants are recommended for the treatment of HIT. However, no specific therapeutic recommendations for the acute cardiac population exist. We want to share our unique 8-year experience concerning heparin-induced thrombocytopenia in the intensive cardiac care unit setting.
**Methods:** We retrospectively collected data of all patients with HIT and of all patients with thrombocytopenia from other causes in whom HIT had been firmly excluded and who were hospitalized in our cardiac intensive care unit in 2016–2024. We performed statistical analysis to determine epidemiological, prognostic, therapeutic characteristics and clinical outcomes in our patients with HIT.
**Results:** Among 30 960 patients hospitalized in our cardiology department 12 were diagnosed with HIT (incidence of 1:2 580). All patients with HIT were hospitalized in the ICCU. Clinical characteristics of patients with HIT are summarized in Table 1. Dabigatran was the most commonly used non-heparin anticoagulant for HIT in our CICU. 4 patients with HIT died during index hospitalization and 8 survived. Higher C-reactive protein level at admission was associated with increased mortality in acute cardiac patients with HIT. Non-survivors had higher CRP levels at admission as compared to survivors, 190 [125–247] mg/l vs. 22 [9–71] mg/l respectively ($p = 0{,}03$). However, there was no difference in in-hospital mortality between the patients with HIT and the patients with thrombocytopenia from other causes ($p = 0{,}7426$).
**Conclusions:** Heparin-induced thrombocytopenia constitutes a relevant clinical issue in the CICU and is associated with similar mortality as compared to other causes of thrombocytopenia. The use of direct oral anticoagulants and especially dabigatran seems safe and efficace in acute cardiac patients with HIT. C-reactive protein level may be an important prognostic factor for HIT.

**Table (abstract 000641)** Characteristics of patients with HIT

| | Patient 1 | Patient 2 | Patient 3 | Patient 4 | Patient 5 | Patient 6 | Patient 7 | Patient 8 | Patient 9 | Patient 10 | Patient 11 | Patient 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age, y | 71 | 80 | 76 | 32 | 73 | 80 | 67 | 73 | 55 | 61 | 79 | 72 |
| Sex | M | M | M | M | M | K | K | M | M | M | K | M |
| Indication for heparin use | OPCAB | OPCAB | CABG | OHCA, ICA | ACS | ACS, COVID-19, | AF | AF, COVID-19 | PE, COVID-19 | PE | COVID-19 | ACS |
| PLT count before exposition to heparin (/µl) | 208 000 | 182 000 | 173 000 | 434 000 | 169 000 | 161 000 | 272 000 | 177 000 | 213 000 | 83 000 | 277 000 | 349 000 |
| Day of PLT decrease >50 % after heparin exposition | 10 | 8 | 5 | 12 | 10 | 8 | 30 | 7 | 12 | 7 | 5 | 22 |
| PLT count nadir (/µl) | 23 000 | 26 000 | 87 000 | 117 000 | 88 000 | 83 000 | 92 000 | 81 000 | 70 000 | 60 000 | 149 000 | 137 000 |
| Drop in platelet count | 90 % | 86 % | 50 % | 73 % | 48 % | 50 % | 67 % | 54 % | 67 % | 28 % | 46 % | 61 % |
| Antibody level (reference < 1,0 U/ml) | 15,7 U/ml | >16 U/ml | 3,6 U/ml | 1,4 U/ml | 6,0 U/ml | 2,7 U/ml | 1,1 U/ml | 2,3 U/ml | 1,0 U/ml | 1,8 U/ml | 1,3 U/ml | 1,0 U/ml |
| Non-heparin anticoagulant | Dabigatran | Dabigatran | Dabigatran | Dabigatran | Dabigatran | Fondaparinux | VKA | Fondaparinux | Fondaparinux | Dabigatran | Fondaparinux | Fondaparinux |
| Thrombotic Complication | None | None | None | PE | None | None | None | None | None | None | None | None |
| Outcome | Survivor | Survivor | Survivor | Survivor | Survivor | Non-Survivor | Survivor | Non-Survivor | Non-Survivor | Survivor | Survivor | Non-Survivor |

**Table (abstract 000641)** Predictors of mortality

| | HIT Non-survivor (n=4) | HIT Survivor (n=8) | p-value |
|---|---|---|---|
| **Sex,** *male* | 3 (75%) | 6 (75 %) | 1 |
| **Age,** *years* | 72,5 [63,5-76,5] | 74 [64-77,5] | 0,93 |
| **Platelet at admission,** $10^3$*/ul* | 195 [169-281] | 200 [178-303,5] | 0,93 |
| **Platelet nadir,** $10^3$*/ul* | 61 [36-80] | 87,5 [43-104,5] | 0,46 |
| **Heparin treatment time,** *days* | 15,5 [8,5-20,5] | 10,5 [8-12,5] | 0,57 |
| **D-dimer,** *ng/ml* | 2368 [209-7000] | 8300 [4029-16947] | 0,21 |
| **Troponin T (hs),** *ng/ml* | 0,1785 [0,008-1,59] | 0,8785 [0,056-1,765] | 0,68 |
| **NT-proBNP,** *pg/ml* | 259,6 [259-11634] | 838 [331,8-4504] | 0,46 |
| **CRP,** *mg/l* | 190 [125-247] | 21,94 [8,6-70,5] | 0,03 |
| **WBC,** $10^3$*/ul* | 16,5 [8,05-74,1] | 9,6 [7,6-10,4] | 0,28 |
| **Ejection fraction (EF),** *%* | 41,5 [37-52,5] | 50 [44,5-55] | 0,57 |
| **AccT,** *ms* | 121 [91-166] | 87 [79,5-87] | 0,11 |

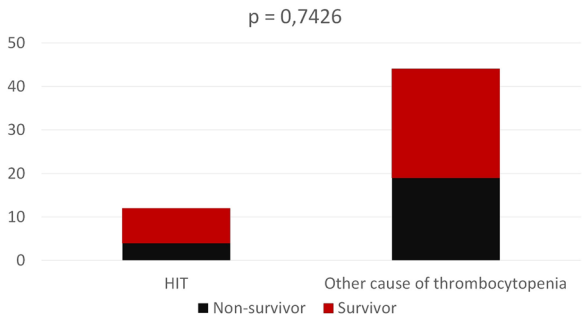


**Fig. (abstract 000641) Mortality of patients with thrombocytopenia**

**Topic:** Cardiovascular issues in ICU

## 000642

## Resource shortages in the ICU—a metric of strain associated with patient outcomes (UNITE-COVID study)

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000642

**Introduction:** Patient care is affected by patient factors and health system factors (1,2). Understanding how strain on the latter affects the quality of patient care and outcomes is important, but conducting experiments in this area is complex and ethically difficult. As such, naturally occurring strain events such as the COVID-19 crisis provide a unique insight into a period of exceptional health service pressures on intensive care units (ICU) across countries and settings (3).
**Objectives:** TTo report ICU shortages as a strain surrogate during both COVID-19 surges and evaluate their correlation with patient outcomes.
**Methods:** Secondary analysis of the ESICM UNITE-COVID study (4,5) which collected patient and site-specific data during the 2020 and 2021 surges of COVID-19. The patient-level outcomes were collated for each site to include mortality, length of stay, and a complications score encompassing the number of complications during the patients' stay. On a site level, data on shortages and their impact on clinical practice (shortage without change or shortage with change) were collected for sedation medications, analgesic medications, invasive lines, microbiological treatments, ventilators, renal replacement therapy, tracheostomy care and others. A cumulative shortage score with equal weighting for each category was calculated for both types of shortage (labelled as "simple shortage score" and "practice change score").
**Results:** There was a significantly higher level of simple shortages (mean score 2.9 in 2020 and 2.3 in 2021) than shortages that changed practice (mean score 1.2 in 2020 and 0.8 in 2021) with $p = 0.03$.
Overall the main shortages that resulted in a change in practice were related to sedatives and analgesics and access to ventilators and renal replacement therapy. This was particularly striking during the 2020 surge where nearly a third of sites reported shortages in sedation and ventilator access resulting in a change in practice. In 2021 there were still shortages resulting in a change in practice, however, to a lesser extent. Microbiological treatments and invasive lines were the only shortages that were essentially the same between the two surges.
Linear regression of the complications score with shortage score (corrected for patient comorbidities and severity of infection) showed significantly higher level ($p = 0.0004$) of complications with higher levels of shortages resulting in a change of practice.

**Table 1 (abstract 000642)**

| **Surge period of:** | **2020 surge** | | **2021 surge** | |
|---|---|---|---|---|
| Type of shortage | Change in practice | Without change | Change in practice | Without change |
| Sedation | 33% | 61% | 17% | 44% |
| Analgesia | 25% | 48% | 16% | 34% |
| Invasive lines | 5% | 22% | 3% | 20% |
| Microbiological treatment | 7% | 25% | 10% | 24% |
| Ventilator | 27% | 50% | 16% | 34% |
| Renal replacement therapy | 16% | 38% | 9% | 40% |
| Tracheostomy | 9% | 23% | 6% | 18% |
| Other | 0% | 27% | 0% | 14% |
| Mean shortage score | 1.2 | 2.9 | 0.78 | 2.3 |

**Conclusions:** There were significant shortages throughout both surges of COVID-19 resulting in changes in practice and therefore representing significant strain with potential impact on quality of patient care and safety. The correlation of shortages that changed practice

with complications indicates that patient care was of lower quality in ICUs that experienced higher levels of system pressures (reflected in necessity to change practice). The causes and potential mitigations for this will require further investigation.

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**Topic:** Health Services Research and Outcome

## 000644

## Hemodynamic influence of the timing to administer polymyxin B hemoperfusion in patients with septic shock requiring high-dose norepinephrine: an exploratory analysis of a prospective cohort study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000644

**Introduction:** A recent randomized controlled trial showed that polymyxin B hemoperfusion (PMX-HP) improved hemodynamic status in patients with septic shock [1]. Early administration of PMX-HP may decrease the duration of vasopressor therapy [2], but its short-term hemodynamic effect remains unknown.

**Objectives:** Whether early administration of PMX-HP for septic shock would improve the short-term hemodynamic status as well as the clinical course, including mortality?

**Methods:** BEAT-SHOCK (BEst Available Treatment for septic SHOCK) registry was a prospective observational study consisting of 309 adult patients with septic shock requiring high-dose norepinephrine ($\geq$0.2 microg/kg/min). As the exploratory analysis, we enrolled 82 patients treated with PMX-HP and divided them into two groups by the median time (265 min) from ICU admission to administer PMX-HP (early administration group [$n=40$] and late administration group [$n=42$]). The primary outcome is short-term hemodynamic status, including mean arterial pressure and vasopressor-inotrope score (VIS; calculated from doses of dopamine, dobutamine, norepinephrine, epinephrine, vasopressin, milrinone, and levosimendan) within 48 h after ICU admission.

**Results:** In the 82 patients, the median time from ICU admission to administer PMX-HP was 265 min (interquartile range [IQR] 113–480), and the median duration of PMX-HP was 1016 min (IQR 533–1359). The median age was 69.5 (IQR 58.5–80.8) and 72 (IQR 63.8–80) years old ($P=0.77$), and 21 (53%) and 25 (60%) patients were male ($P=0.52$) in the early and late administration groups. The dose of norepinephrine at ICU admission was 0.33 (IQR 0.24–0.47) and 0.30 (0.22–0.34) microg/kg/min in the early and late administration groups ($P=0.17$). Within 48 h after ICU admission, mean arterial pressure was significantly higher at some time points, and VIS was significantly lower at most time points in the early administration group (Figures 1 and 2). In the 28- days, vasopressor-free days were 23 (21–25) and 21 (0–24) days ($P=0.027$), and ICU-free days were 18 (1–23) and 14 (0–19) days ($P=0.025$) in the early and late administration groups, respectively. The cumulative mortality rates at 90 days were 15.3% and 31.3% in the early and late administration groups (adjusted hazard ratio 0.38; 95% confidence interval 0.13–1.09).

**Conclusions:** In patients with septic shock, early administration of PMX-HP was associated with higher mean arterial pressure and lower VIS within 48 h after ICU admission. Additionally, it might be associated with an improved clinical course.

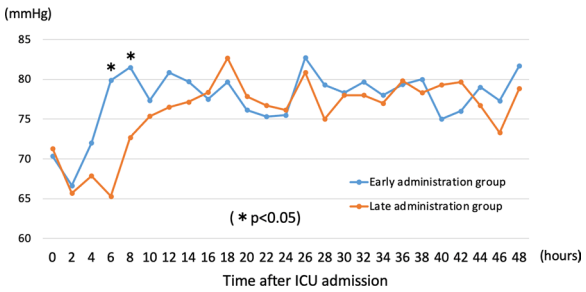


**Fig. 1 (abstract 000644)** Mean arterial pressure within 48 hours after ICU admission
We expressed each data by median value. We used Wilcoxon rank sum test for each comparison.

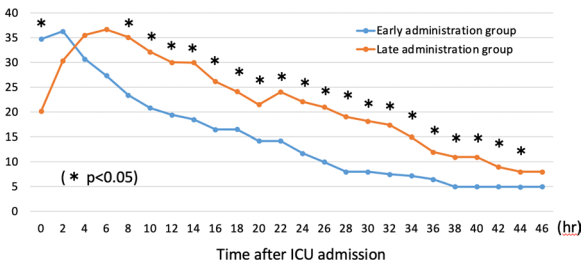


**Fig. 2 (abstract 000644)** Vasopressor-inotrope score within 48 hours after ICU admission
We expressed each data by median value. We used Wilcoxon rank sum test for each comparison.

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3. The BEAT-SHOCK registry was supported by the Institute for Clinical Effectiveness, Kyoto, Japan which received the contracted grant from Toray Industries, Inc., Tokyo, Japan.

**Topic:** Sepsis

## 000645

### BOx ratio and outcome in patients with non-traumatic subarachnoid haemorrhage (SAH)

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000645

**Introduction:** The ratio between brain oxygen pressure (PbtO2) and partial pressure of arterial oxygen (PaO2), i.e. the BOx ratio, has been recently described as a clinically useful tool to understand abnormal oxygen delivery mechanisms in head trauma patients. However, its prognostic role in subarachnoid hemorrhage (SAH) has not been well explored.
**Objectives:** To investigate the prognostic role of the BOx ratio in SAH patients.
**Methods:** We reviewed our cohort of patients admitted to the Intensive Care Unit (ICU) with non-traumatic SAH treated from March 2015 to October 2023, in whom PbtO2 monitoring was considered according to a local protocol. For each patient, the mean PbtO2 and the mean BOx ratio were computed over all ICU stays. Hospital mortality was considered as the primary outcome. We performed a multivariate analysis to study the association between the mean BOx ratio and hospital mortality.
**Results:** Of the 263 SAH patients admitted over the study period, 64 were monitored with PbtO2 and included in the analysis. Of those, 30 patients (47%) died during their hospital stay. No differences in age, gender, and clinical score on admission were found between survivors and non-survivors. The occurrence of delayed cerebral ischemia (DCI) and intracranial hypertension (ICHT) was respectively 54% vs. 41% and 63% vs. 87% ($p=0.401$, $p<0.001$) in both groups, respectively. The mean values of PbtO2 were $25\pm6$ mmHg in survivors and $23\pm9$ mmHg in non-survivors ($p=0.40$), while the mean BOx ratio was $0.23\pm0.07$ in survivors and $0.20\pm0.08$ in non-survivors ($p=0.183$). In the multivariate analysis, adjusted for the occurrence of DCI and ICHT, neither mean PbtO2 (OR 0.967; CI 95% 0.897, 1.041; $p=0.37$) nor mean BOx ratio (OR 0.58; CI 95% 0.0, 1.8; $p=0.07$) was independently associated with hospital mortality.
**Conclusions:** In this cohort of non-traumatic SAH patients, a lower BOX ratio was not associated with an increased risk of hospital mortality.

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**Topic:** Neurointensive care

## 000647

### Post Intensive Care Syndrome and length of hospital stay in ICU survivors: a prospective multicenter cohort study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000647

**Introduction:** Patients who survive their intensive care unit (ICU) stay, often encounter new or worsening physical, cognitive, and metal health problems known as the Post-Intensive Care Syndrome (PICS). While the primary goal of an ICU admission is to secure patients' survival, it is equally imperative to reduce long-term health problems after ICU treatment. ICU length of stay (LOS) and pre and post ICU LOS are objective variables which can easily be observed by all healthcare professionals and may contribute to identifying patients who are at risk for developing PICS.
**Objectives:** To determine the association between ICU-LOS, pre and post ICU-LOS and PICS one year after ICU admission.
**Methods:** A longitudinal prospective multicenter cohort study was conducted in seven hospitals from the MONITOR-IC study. Patient characteristics, including ICU LOS, pre and post-ICU LOS, were collected from the patients' medical records and the Dutch National Intensive Care Evaluation registry (NICE). In addition, at ICU admission and 12 months post ICU, patients completed validated questionnaires regarding physical, cognitive, and mental problems of which composite scores for each domain (physical, cognitive, mental) were calculated. When patients experienced only physical problems they were categorized as patients with PICS in one domain. When patients experienced physical and cognitive problems, they were categorized as patients with PICS in two domains etc. To determine the associations between patients' ICU LOS, pre and post-ICU LOS and PICS domains one year after an ICU admission, adjusted multinominal logistic analyses were used. These analyses included patients characteristics such as age, gender, disease severity, and baseline physical, cognitive and mental problems.
**Results:** In this study, 3118 patients admitted between 2016 and 2020 were analyzed. Of these 31% were admitted for a medical, 12% for an acute surgical, and 57% for a planned surgical reason. They had an average ICU LOS of 3 days, a pre ICU LOS of 2 days and a post ICU LOS of 8 days. One year after an ICU admission 63% experienced physical, 11% cognitive, and 31% mental PICS. In addition, 34% experienced no PICS, 34% experienced PICS in one domain, 23% in two domains, and 9% in three domains.
Compared to patients who do not experience PICS, the Odds ratios of ICU LOS and post-ICU LOS significantly increase for patients who experience PICS in one, two or three domains one year after an ICU admission. See Table 1.

**Table 1 (abstract 000647)** Multinominal regression analyses of ICU LOS, pre ICU LOS, post ICU LOS, and PICS in 1, 2 or three domains

| Frequency of PICS domains | Independent variable | B | Exp(B) | 95% confidence interval | | Sig |
|---|---|---|---|---|---|---|
| | | | | Lower | upper | |
| 1 | ICU LOS | 0.056 | 1.057 | 1.023 | 1.092 | < 0.001 |
| | pre ICU LOS | −0.010 | 0.990 | 0.966 | 1.016 | 0.451 |
| | Post ICU LOS | 0.024 | 1.024 | 1.007 | 1.042 | 0.006 |
| 2 | ICU LOS | 0.053 | 1.055 | 1.019 | 1.092 | 0.003 |
| | pre ICU LOS | −0.013 | 0.987 | 0.957 | 1.018 | 0.411 |
| | Post ICU LOS | 0.032 | 1.033 | 1.014 | 1.052 | < 0.001 |
| 3 | ICU LOS | 0.061 | 1.063 | 1.022 | 1.106 | 0.002 |
| | pre ICU LOS | −0.027 | 0.973 | 0.924 | 1.025 | 0.305 |

| Frequency of PICS domains | Independent variable | B | Exp(B) | 95% confidence interval | | Sig |
|---|---|---|---|---|---|---|
| | | | | Lower | upper | |
| | Post ICU LOS | 0.048 | 1.049 | 1.026 | 1.074 | < 0.001 |

PICS = Post intensive care syndrome; ICU = intensive care unit, LOS = length of stay

**Conclusions:** Even though ICU LOS and post ICU-LOS are significantly associated with the development of PICS in one or more domains one year after an ICU admission, the Odds ratios are small and might not be appropriate to identify patients who are at risk for developing PICS.

**Reference(s)**

1. The authors have no conflicts of interest. For this study no funding was received

**Topic:** Health Services Research and Outcome

## 000651

### Differences in the impact of hypothermia on mortality between pediatric and adult trauma patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000651

**Introduction:** Pediatric patients, characterized by a larger body surface area-to-mass ratio compared with adults, are inherently predisposed to rapid heat loss and subsequent hypothermia. Previous studies reported a consistent association between hypothermia and worse outcomes in trauma patients across age groups, but there have been few comparative studies focusing on the differential mortality attributable to hypothermia between pediatric and adult trauma cohorts.
**Objectives:** The aim of this study was to evaluate the difference in mortality associated with hypothermia on hospital admission between pediatric and adult patients.
**Methods:** We retrospectively analyzed patient data from the Japan Trauma Data Bank date collected from January 2019 to December 2022. We compared the differences in mortality based on the body temperature on hospital admission between pediatric (< 18 years) and adult (≥ 18 years) trauma patients. Mortality differences were quantitatively evaluated through adjusted spline curve analyses, incorporating various covariates (e.g. injury sites, measuring techniques of body temperature, Focused Assessment with Sonography in Trauma (FAST) findings, transfusion at the emergency department, mechanical ventilation requirements, and Injury Severity Score (ISS)). An interaction effect between age categories and body temperature was introduced to evaluate its effect on mortality. The primary outcome was defined as mortality at hospital discharge.
**Results:** A total of 60,617 patients were analyzed, with 3002 classified as pediatric and 57,615 as adult. The median age in adults was 66.8 years with a median ISS of 14; pediatrics had a median age of 9.7 years with a median ISS of 11. The mortality was higher in hypothermic patients (< 36 ℃) compared with that in normothermic patients in both pediatric (14.9% [72/483] vs 1.2% [31/2,518], $p < 0.001$) and adult (15.1% [2,271/15,050] vs 4.6% [1,975/42,565], $p < 0.001$) groups. The effect of decreased body temperature on mortality was profoundly modified by the age category (pinteraction < 0.001) (Figure).
**Conclusions:** The impact of hypothermia on hospital admission on mortality was more pronounced in pediatric trauma patients compared with adults. Preventing hypothermia may be more important in pediatric trauma patients.

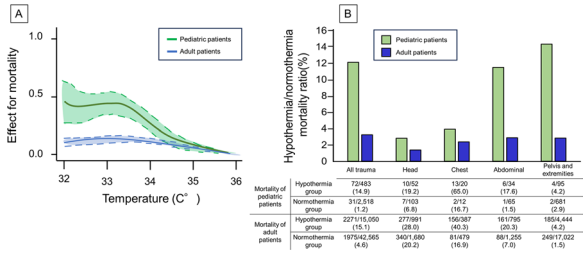


**Fig. A (abstract 000651)** Adjusted spline curve for the effect of mortality according to temperature. B. Difference of hypothermia/normothermia ratio between pediatric and adult

**Topic:** Trauma

## 000652

### A cost-minimization analysis of dexmedetomidine compared with standard clinical practice during noninvasive ventilation in intensive care unit patients with acute respiratory failure

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000652

**Introduction:** In the randomized open trial DexiNIVE (NCT02958150) it was shown that the intensive care unit (ICU) patients undergoing noninvasive mechanical ventilation (NIV) with acute respiratory failure (ARF) sedated with dexmedetomidine (DEX) were more comfortable. In addition, DEX did not increase the risk of orotracheal intubation (OTI), did not lead to further adverse effects, and did not have an impact on mortality. Considering resource utilization data from this trial, it was performed a secondary, cost-minimization analysis assessing the economics of DEX versus standard clinical practice (SCP).
**Objectives:** To assess the costs of the use of DEX vs SCP during the NIV in patients with ARF.
**Methods:** A cost-minimization analysis was performed in this study.
The cost estimates were based on the calculation of the resources used in the treatment and their costs.
The perspective of the study was the hospital perspective.
To describe ICU stay costs, hospital stay costs, total hospitalization costs, pharmacological costs, OTI costs, and total costs, the median and interquartile range (IQR) of each of them in each group were used since they did not follow a normal distribution.
The Mann–Whitney U test was used to compare each type of cost between the two groups.
This analysis was performed using IBM SPSS Statistics version 25.0.
Moreover, the bootstrapping method was applied to calculate the probability of savings using DEX, in ICU stay costs, total hospitalization costs, pharmacological costs, OTI costs, and total costs.
1000 simulations were performed using Microsoft Excel, where new patient samples were created by patient selection (with replacement).

**Results:** The median (IQR) of ICU stay costs was 11.690 (6.680–22.545) euros in the DEX group vs 11.690 (5.010–23.380) euros in the SCP group, $p = 0{,}602$.
The median of total hospitalization costs was 24.178 (11.690–33.914) euros in the DEX group vs 23.566 (13.573–34.358,50) euros, $p = 0{,}899$.
The median of pharmacological costs was 65,18 (64,75–129,50) euros in the DEX group vs 0,25 (0–1,12) euros, $p = 0{,}000$.
The median of OTI costs was 0 (0–0) euros in the DEX group vs 0 (0–0) euros, $p = 0{,}469$.
The median of total costs was 24.242 (11.974,81–33.978,97) euros in the DEX group vs 23.566 (13.708–34.358,61) euros, $p = 0{,}943$.
The probability of a cost saving using DEX in patients of ICU stay was 44.8%; of total hospitalization was 67%; of pharmacological costs was 0%; of cost saving of OTI costs was 23,7%; and of cost saving of total costs was 70,5%.
**Conclusions:** The use of DEX during NIV in ICU patients with ARF does not lead to a significant increase in costs.
Moreover, when a simulation is performed by increasing the sample size, the probability of total cost savings using DEX is high.

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**Topic:** Sedation, analgesia and delirium

**000653**

## The PaO2/FiO2 ratio within 24 h after discontinuing prone position ventilation was associated higher mortality


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000653



**Introduction:** Acute respiratory distress syndrome (ARDS) is a life-threatening condition characterized by hypoxemia and diffuse chest infiltrates. With moderate to severe ARDS, prone positioning during mechanical ventilation has been proven to reduce mortality. However, despite discontinuing prone position ventilation due to fulfilling the criteria, some patients still experience worsening. The aim of our study is to find an appropriate discontinuing point for prone position ventilation. Acute respiratory distress syndrome (ARDS) is a life-threatening condition characterized by hypoxemia and diffuse chest infiltrates. With moderate to severe ARDS, prone positioning during mechanical ventilation has been proven to reduce mortality. However, despite discontinuing prone position ventilation due to fulfilling the criteria, some patients still experience worsening. The aim of our study is to find an appropriate discontinuing point for prone position ventilation.
**Methods:** We retrospectively reviewed 70 patients who received prone position ventilation for ARDS at Chonnam National University Hospital from Jan. 2021 to Dec. 2022. The criteria for successful discontinuing prone position ventilation were defined as a ratio of arterial oxygen partial pressure to fractional inspired oxygen (P/F ratio) of $\geq 150$ mm Hg, with a positive end-expiratory pressure (PEEP) of $\leq 10$ cmH2O and an FiO2 of $\leq 0.6$ in the supine position at least 4 h after the end of the last prone session. The failure of prone position ventilation is defined as P/F ratio $< 150$ mmHg within 24 h after the end of prone position ventilation.
**Results:** Among 70 patients who underwent prone position ventilation, 32 were excluded from the study. Of these, 24 patients expired during prone position ventilation, 6 required extracorporeal membrane oxygenation (ECMO), and 2 developed hypoxia following prone position ventilation. Thirty-eight patients successfully discontinued prone position ventilation. The mean age of these patients was 70.9 years, and 20 (52.6%) were male. The most common cause of ARDS in this group was Corona Virus Disease 2019 (COVID-19). The median P/F ratio was 185.3 mmHg, measured 4 h after switching to the supine position following the last prone session. Among 38 patients, 21 patients (55.3%) had a P/F ratio $< 150$ mmHg within 24 h after the last prone session, which was significantly associated with higher mortality rates (81.0% versus 35.3%; $p = 0.05$). Patients with a P/F ratio $< 180$ mmHg in the supine position at 4 h after the last prone session were significantly more likely to experience failure of prone position ventilation (Odds Ratio 63.75; 95% Confidence Interval 6.40–635.01; $p < 0.001$). Kaplan–Meier analysis showed that the median survival time was shorter for patients with prone position ventilation failure (24 days versus not reached; Hazard Ratio 3.4; 95% CI 1.332–8.721; $p = 0.011$).
**Conclusions:** In ARDS, P/F ratio of $< 150$ mmHg within 24 h after discontinuing prone position was associated with a high mortality. And P/F ratio of $< 180$ mmHg measured 4 h after switching to the supine position following the last prone session was significantly associated with P/F ratio of $< 150$ mmHg within 24 h.


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**Topic:** Acute respiratory failure and mechanical ventilation

**000654**

## Randomized Embedded Multifactorial Adaptive Platform in ExtraCorporeal Membrane Oxygenation (REMAP ECMO)—rationale and design of the left ventricular unloading trial


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 000654

**Introduction:** The use of Extracorporeal Membrane Oxygenation (ECMO) remains associated with high rates of complications, weaning failure, and mortality in part due to a knowledge gap on how to properly manage patients on ECMO support. To address relevant patient management issues, we designed a "Randomized Embedded Multifactorial Adaptive Platform (REMAP)" in the setting of ECMO (REMAP ECMO) and a first embedded trial domain investigating the effects of routine early left ventricular (LV) unloading through intra-aortic balloon pumping (IABP) (Figure 1).
**Methods:** REMAP ECMO describes a registry-based platform allowing for the embedding of multiple response adaptive randomized controlled trials (RCTs) (trial domains) which can perpetually address the effect of relevant patient management issues on ECMO weaning success. A first trial domain studies the effects of LV unloading by means of an IABP as an adjunct to veno-arterial (V-A) ECMO versus V-A ECMO alone on ECMO weaning success at 30 days in adult cardiogenic shock patients admitted to the Intensive Care Unit (ICU) (Figure 2).
**Results:** The primary outcome of this trial is "successful weaning from ECMO" being defined as a composite of survival without the need for mechanical circulatory support, heart transplantation, or left ventricular assist device (LVAD) at 30 days after initiation of ECMO. Secondary outcomes include the need for interventional escalation of LV unloading strategy, mechanistic endpoints, and quality of life. Trial data will be analyzed using a Bayesian statistical framework. The adaptive design allows for a high degree of flexibility, such as response adaptive randomization and early stopping of the trial for efficacy or futility (Figure 3).
**Conclusions:** The REMAP ECMO trial platform enables the efficient roll-out of multiple RCTs on relevant patient management issues. A first embedded trial domain will compare routine LV unloading by means of an IABP as an adjunct to V-A ECMO versus V-A ECMO alone.

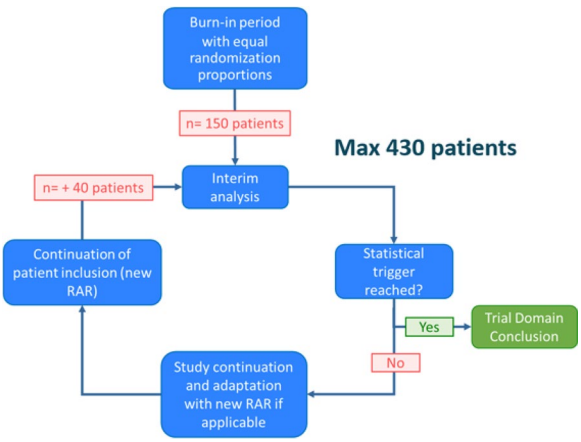


**Fig. 5 (abstract 000654)** Response adaptive randomization (RAR) and statistical triggers. The trial will start with a burn-in period during which all patients will be included with equal randomization proportions for the duration of 150 patients. After this burn-in period, a first interim analysis will test whether statistical triggers are reached, leading either to a trial domain conclusion or study continuation and adaptation with new RAR if applicable. These interim analyses will be performed after every following 40th patient is randomized and has reached their 30-day follow-up, until a maximum of 430 patients are included

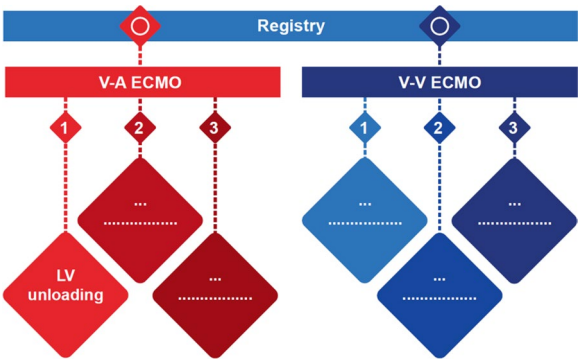


**Fig. 1 (abstract 000654)** Architecture of the REMAP ECMO platform. (*VA = venoarterial ECMO, VV = Venovenous ECMO, LV unloading = left ventricular unloading)*

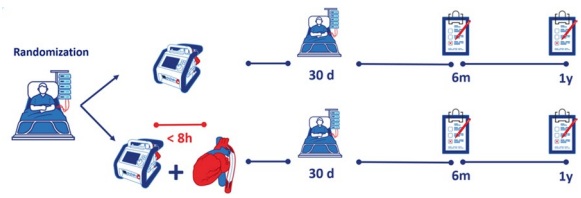


**Fig. 3 (abstract 000654)** ALeft Ventricular Unloading trial design. Patients are randomized to a strategy with V-A ECMO in combination with IABP versus V-A ECMO alone. IABP placement must occur within 8 h (< 8h) after ECMO initiation. The primary endpoint will be measured at 30 days (30d) after ECMO initiation Other follow-up moments will follow at 6 months (6m) and 1 year (1y) using questionnaires

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**Topic:** Cardiovascular issues in ICU

## 000656

### Analysis of nitrogen balance test in patients with traumatic brain injury

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000656

**Introduction:** During the acute stage of traumatic brain injury, individuals require increased nutritional assistance due to elevated metabolic and catabolic activity. Protein emerges as a critical component in such circumstances, with nitrogen balance serving as a reliable indicator of protein levels within the body. This study investigate nitrogen balance within patients admitted to the Neurocritical Care Unit (NCU),

exploring its correlation with disease severity and discerning variances between traumatic and non-traumatic cases.
**Objectives:** The purpose of this study was to analyze the catabolic phases of TBI patients through the Nitrogen Balance Test (NB Test).
**Methods:** Patients admitted to NCU from June 2019 to March 2022, both traumatic and non-traumatic (e.g., Tumor, stroke, etc), were retrospectively studied. Each patient stayed in NCU for at least 7 days, and had a nitrogen balance test with 1-week interval. We evaluated trends in nitrogen balance values and compared disease severity indicators (initial GCS, SOFA, APACHE, ICU stay days, presence of operation, etc.).
**Results:** A total of 280 patients were admitted to the NCU and underwent the initial nitrogen balance assessment. Among them, 160 underwent a second test, and 90 underwent a third test. The initial nitrogen balance averaged at $-6.77 \pm 4.9$, while it measured $7.24 \pm 5.1$ in the first week and $-4.3 \pm 5.3$ in the second week. However, parameters related to disease severity did not exhibit a statistically significant relationship with nitrogen balance values. Trauma patients, in comparison to non-trauma patients, displayed notably lower nitrogen balance values in the first week ($-11.2$ for traumatic patients versus $-7.2$ for non-traumatic patients; $p = 0.005$). No significant differences were observed between initial and second-week nitrogen balance values.
**Conclusions:** In actual clinical situations, physicians should be aware of the catabolic phases of acute TBI events indicating notable protein loss in the patients. Therefore, we should consider the additional supply of protein during the management of TBI patients.

**Topic:** Neurointensive care

## 000657

### Polyclonal Intravenous immunoglobulins improve outcome in severe invasive group A streptococcus infections. A randomised controlled study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000657

**Introduction:** Surviving sepsis campaign do not recommend the use of intravenous immunoglobulins (IVIG) in sepsis or septic shock because of the lack of scientific evidence. Nevertheless some authors[1,2,3], reported particularly in patients presenting streptococcus pyogenes severe infections with shock, an improvement of outcome with IVIG.
**Objectives:** To evaluate the administration of IVIG versus placebo in patients with septic shock due to severe group A streptococcus infections.
**Methods:** We performed a randomised controlled study and enrolled 40 patients admitted to university hospital ICU between 2002 and 2005. The patients were 35 + -10 years old without previous comorbidity and all were mechanically ventilated for severe septic shock and received the same antibiotics in the first hour of admission for suspicion of invasive streptococcus infection.
The patients were randomised into 2 groups:
**An IVIG group** of 20 patients received IVIG 36 h after admission in ICU.
**A control group** of 20 patients receiving saline as a placebo 36 h after ICU admission
IVIG was administered for 3 days at a dose of 1g/kg the first day and 0.5g/kg over 2 days.
We recorded in the 2 groups: SOFA score day 1 and day 4, P/F ratio /12h, blood lactate every hour, blood cultures, blood gases, creatinine, C. reactive protein every day(CRP), transaminases, blood cell count, coagulation parameters, blood concentration of immunoglobulins(IgG), limb ischemic lesions, ICU stay, hospital length of stay, ICU mortality and 28-day mortality.
Statical analysis used the Mann–Whitney test and results were expressed as Mean ±standard deviation

**Results:**

**Table (abstract 000657).**

| | IVIG GROUP | CONTROL GROUP | P |
|---|---|---|---|
| SOFA score day 4 | 4.2 + -0.2 | 7.2 + -0.4 | 0.001 |
| P/F ratio day3 | 250 + -7 | 190 + -10 | 0.03 |
| Lactate mmo/l day 3 | 2.6 + -0.2 | 4 + -0.5 | 0.001 |
| CRP mg/l day3 | 152 + -6 | 359 + -3 | 0.001 |
| limb ischemic lesions % | 5% | 25% | 0.001 |
| ICU stay/days | 12 + -2 | 18 + -1 | 0.003 |
| 28 day mortality | 12% | 30% | 0.001 |

*Variables in relation with outcome in IVIG and control group

**Conclusions:** We observed that early intravenous administration of polyvalent immunoglobulins associated with adequate antibiotics improve outcome of patients with group A streptoccocal septic shock.

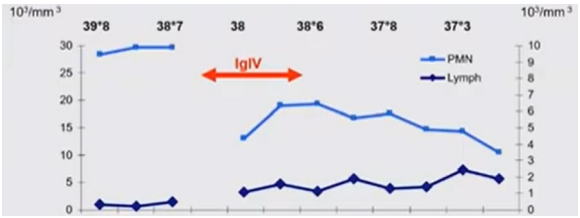


**Fig. (abstract 000657)** Time course of polynuclears and lymphocytes before and after IVIG

**Reference(s)**

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**Topic:** Sepsis

## 000658

### Traumatic brain injury-induced cardiac autonomic dysfunction (from bench to clinical experiments

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000658

**Introduction:** Traumatic brain injury (TBI) frequently causes cardiac autonomic dysfunction (CAD), which is associated with increased morbidity and mortality. However, the exact mechanism of CAD has not been elucidated yet. Hereby we tried to elucidate the cellular mechanism of CAD and try to assess the CAD in real patients.
**Methods:** TBI model was induced by a controlled cortical impact in rats. We assessed the heart rate variability and baroreflex sensitivity, which was indicated that CAD, based on the severity. And then we measured the excitability the intracardiac ganglion (ICG) neuron and stellate ganglion (SG) neurons in TBI rats. And we also check the baroreflex sensitivity (BRS) in TBI patients, according to the severity.
**Results:** In the TBI rat model, the BRS according to the degree of severe trauma was $0.98 \pm 0.08$ ms/mmHg in the control group,

whereas it was 0.45 ± 0.09 and 0.47 ± 0.08 ms/mmHg in the Mild TBI(mTBI) and Severe TBI (sTBI) groups. ($p < 0.01$) Then we measured excitability and K currents in SG and ICG. The SG neurons of the control group and sTBI group discharged at 4.2 ± 0.4, 6.5 ± 0.4, 8.6 ± 0.5 spikes/s, and 7.4 ± 0.3, 10.5 ± 0.4, 13.0 ± 0.4 spikes/s, in response to 1X, 2X, and 3X threshold current stimulations. respectively. The ICG neurons of the control group and sTBI group discharged at 5.7 ± 0.4, 8.0 ± 0.5, 11.0 ± 0.6 spikes/s and 2.0 ± 0.3, 4.0 ± 0.7, and 5.8 ± 0.6 spikes/s in response to 1X, 2X, and 3X threshold current stimulations, respectively.

The transient A-type K + (KA) currents, but not the delayed rectifying K + currents were significantly decreased in SG neurons in TBI rats, compared with sham-operated rats. Consistent with these electrophysiological data, the transcripts encoding the Kv4 α subunits were significantly downregulated in SG neurons in TBI rats, compared with sham-operated rats. TBI causes downregulation and upregulation of M-type K + (KM) currents and the KCNQ2 mRNA transcripts, which may contribute to the hyperexcitability of the SG neurons and the hypoexcitability of the ICG neurons, respectively. Finally, we evaluated the baroreflex in TBI patients. BRS was 5.7 ± 3.2ms/mmHg in mTBI groups and 3.57 ± 3.1ms/mmHg in severe sTBI groups.

**Conclusions:** From bench to clinical situation, we research the CAD in TBI rat models and TBI patients. In our results suggest the CAD in TBI situation was based on the sympathetic and parasympathetic incoordination. And additionally, perspectives and interpretations of the Cushing triad must change.

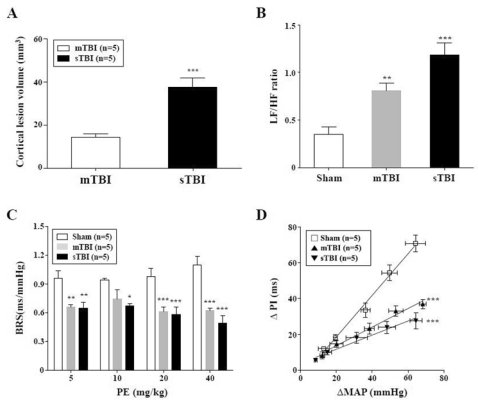


**Fig. 1 (abstract 000658)** Assessment of the HRV and arterial baroreflex in the sham-operated (control), mTBI, and sTBI rats. A: histologic assessment of the cortical lesion volumes measured after TBI in rats, B: summary of the LF/HF ratio acquired from the frequency domain analysis of HRV. C: summary of the BRS for different doses of PE (5,10, 20, and 40 mg/kg), D: comparison of the slope (baroreflex gain) of the relationship between the ?PI and ?MAP. Data are presented as the means ± SE. ***$P < 0.001$ compared between the mTBI and sTBI groups; *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$ compared with the sham-operated group

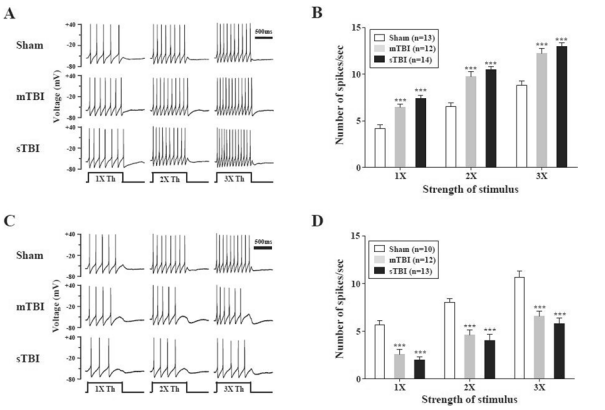


**Fig. (abstract 000658)** Changes in the excitability of SG and ICG neurons in TBI rats. A and C: AP discharges in response to depolarizing current steps to 1, 2, and 3 times threshold(1X, 2X, and 3 X Th) for 1 s in the SG and ICG neurons, respectively from the sham-operated, mTBI, and sTBI groups. Each neuron was depolarized from a resting membrane potential between ?? 57 and ?? 60 mV. B and D: summary of the average number of spikes per second measured in A and C. Data are presented as the means ± SE. ***P < 0.001 compared with the sham-operated group

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**Topic:** Neurointensive care

## 000660

### Exploring the potential of Human-AI partnerships: a comparison of ICU nurse triage processes and generative AI model outputs in critical care scenarios

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000660

**Introduction:** As generative Artificial Intelligence (GenAI) tools continue advancing, rigorous evaluations are needed to understand their capabilities relative to experienced clinicians and nurses.

**Objectives:** This study aims to objectively and qualitatively compare the diagnostic accuracy and response formats of ICU nurses versus various GenAI models.
**Methods:** 74 ICU nurses participated in a simulation-based assessment involving 4 written clinical scenarios representative of real practice. Simultaneously, we asked ChatGPT-4 and Claude-2.0 to provide initial assessments and treatment recommendations for the same scenarios. The responses from ChatGPT-4 and Claude-2.0 were then scored by certified ICU nurses for accuracy, completeness, and response time.
**Results:** Nurses consistently achieved higher diagnostic accuracy than AI across open-ended scenarios, though certain models matched or exceeded human performance on standardized cases. Reaction times also diverged substantially. Qualitative response format differences emerged such as concision versus verbosity. Variations in GenAI model system performance across cases highlighted generalizability challenges.
**Conclusions:** While GenAI demonstrated valuable skills, experienced nurses outperformed in open-ended domains requiring holistic judgment. Continued development to strengthen generalized decision-making abilities is warranted before autonomous clinical integration. Response format interfaces should consider leveraging distinct strengths. Rigorous mixed-methods research involving diverse stakeholders can help iteratively inform safe, beneficial human-GenAI partnerships centered on experience-guided care augmentation.

**Clinical decision-making performance scores (mean and standard deviation) for nurses and large language models across four intensive care units case scenarios**

| CASE | Nurse | Claude | Short Claude | ChatGPT | Short ChatGPT | F score | P value |
|---|---|---|---|---|---|---|---|
| **Case 1: CPR cardiopulmonary resuscitation** | 57.48 (16.3) | 50 | 45 | 75 | 53.25 | 0.50 | 0.73 |
| **Case 2: Head injury** | 73.83 (14.4) | 71.42 | 53.57 | 28.57 | 42.85 | 3.93 | **0.00** |
| **Case 3: Diabetic ketoacidosis** | 77.64 (21.9) | 68.8 | 55 | 13.83 | 16 | 4.15 | **0.00** |
| **Case 4: Hemorrhagic shock** | 81.65 (8.93) | 56.6 | 50.6 | 40 | 64.5 | 10.59 | **0.00** |
| **F score/ P value** | 28.4/**0.00** | 7.34/**0.00** | 2.15/**0.00** | 1.08/**0.00** | 1.24/**0.00** | | |

**Fig. (abstract 000660)** Clinical decision-making performance scores (mean and standard deviation) for nurses and large language models across four intensive care unit case scenarios

**Topic:** Nursing care and physiotherapy

## 000662

### Effect of Automated versus Conventional Ventilation on Mechanical Power of Ventilation – a randomized crossover clinical trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000662

**Introduction:** Mechanical power of ventilation (MP), a summary parameter reflecting the energy transferred from the ventilator to the respiratory system, has associations with outcomes. INTELLiVENT–Adaptive Support Ventilation (ASV) is an automated ventilation mode that changes ventilator settings according to algorithms that target a low work – and force of breathing.
**Objectives:** To compare MP between automated ventilation by means of INTELLiVENT–ASV and conventional ventilation in critically ill patients. We hypothesize that automated ventilation results in less MP when compared to conventional ventilation.
**Methods:** International, multicenter, randomized crossover clinical trial in patients that were expected to need invasive ventilation > 24 h. Patients were randomly assigned to start with a 3-h period of automated ventilation or conventional ventilation after which the alternate ventilation mode was selected. The primary outcome was MP in passive and active patients; secondary outcomes included key ventilator settings and ventilatory parameters that affect MP.
**Results:** A total of 96 patients were randomized. Median MP was not different between automated and conventional ventilation (15.8 [11.5–21.0] vs 16.1 [10.9–22.6] J/min; mean difference −0.46 (95%–CI −1.61 to 0.69) J/min; $P = 0.43$). Subgroup analyses showed that MP was lower with automated ventilation in passive patients (17.2 [12.8–23.2] vs 19.2 [14.4–24.6] J/min; mean difference −1.13 (95%–CI −1.89 to −0.37) J/min; $P < 0.01$), and not in active patients (14.6 [11.0–20.3] vs 14.1 [10.1–21.3] J/min; mean difference 0.82 (95%–CI −2.13 to 0.49) J/min; $P = 0.22$).
**Conclusions:** In this cohort of unselected critically ill invasively ventilated patients, automated ventilation by means of INTELLiVENT–ASV did not reduce MP. A reduction in MP was only seen in passive patients.

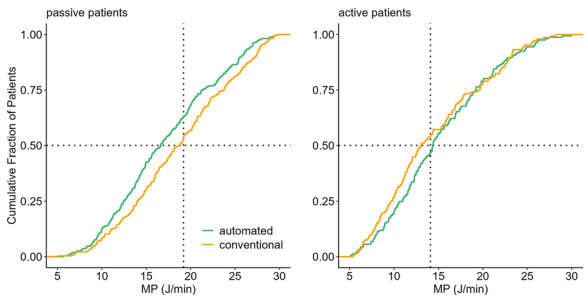


**Fig. (abstract 000662)** Distribution plots of MP with automated ventilation and conventional ventilation in passive and active patients, showing all measurements of every patient. Vertical dotted lines represent the median value with conventional ventilation. Horizontal dotted lines show the respective proportion of patients reaching each cutoff. Abbreviation: MP, mechanical power

**Topic:** Acute respiratory failure and mechanical ventilation

## 000663

### Adrenaline is a futile treatment for elderly patients with out-of-hospital cardiac arrest due to asphyxia

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000663

**Introduction:** In Japan, a hyper-aged society that is prominent in the world, adrenaline is routinely administered to elderly patients with out-of-hospital cardiac arrest (OHCA) due to asphyxia as advanced life support. However, given the pathophysiology of asphyxia, adrenaline is not effective and may increase the number of patients with poor neurological status.
**Methods:** We retrospectively studied patients aged 65 years or older with asphyxial OHCA registered in the All-Japan Utstein Registry of Fire and Disaster Management Agency between 2013 and 2021. Patients who were not in cardiac arrest at the time of EMS arrival were excluded. Patients were divided into adrenaline-treated and non-treated groups, and propensity-score matching was used to balance possible confounders that might affect prognosis. The primary endpoint was neurological status at 1 month (Cerebral Performance Category [CPC] 1–2 defined as good, CPC 3–4 as poor, CPC 5 as death).

**Results:** Of the 53,994 eligible patients, 31.2% received prehospital adrenaline, 18.6% resumed the return of spontaneous circulation (ROSC), 7.5% were alive, 1.4% had good neurological status, and 6.1% had poor neurological status at 1 month. The propensity-score matching process selected 14,991 patients from the adrenaline-treated and non-treated groups. Compared with non-treated groups, adrenaline-treated groups incurred a higher rate of ROSC (35.3% vs. 12.2%, $p < 0.001$), survival (8.9% vs. 7.5%, $p < 0.001$), poor neurological status (8.1% vs. 6.0%, $p < 0.001$), and a lower rate of good neurological status at 1 month (0.8% vs. 1.5%, $p < 0.001$). In multivariable logistic regression after matching, adrenaline administration was associated with increased odds of poor neurological status (odds ratio [OR] 1.44, 95%CI 1.32–1.58), and decreased odds of good functional status (OR 0.55, 95%CI 0.44–0.69).
**Conclusions:** The results of this study suggest that adrenaline administration to elderly asphyxial OHCA patients is associated with poor neurological prognosis. From the standpoint of healthcare economics, adrenaline administration to such patients may be discouraged.

**Topic:** Cardiac arrest

## 000667

### Reasons for not attending follow-up appointments after intensive care stay – a descriptive study

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**Introduction:** To optimise rehabilitation after intensive care, surviving patients are invited to follow-up appointments, but many do not attend these appointments. Therefore, the aim of the study was to prospectively collect information on reasons for not attending follow-up appointments and to investigate whether the quality of life and posttraumatic symptoms differed between those who attended ICU follow-up and those who did not.
**Methods:** Adult patients treated at the intensive care unit for > 72 h between August 2017 and December 2018 and invited to follow-up appointments three months after discharge from the intensive care unit were included in the study. Patients who declined a follow-up appointment were asked for reason(s). Further, the patients responded to questionnaires assessing health-related quality of life and symptoms of posttraumatic stress. Quantitative content analysis was used to identify reasons for not attending follow-up appointments. Mann Whitney U test and Chi2 test were used to compare differences in health-related quality of life and posttraumatic stress symptoms between the groups.
**Results:** Of the 150 invited patients, 126 (84%) did not attend their ICU follow-up appointment. Some had recovered on their own, but the majority did not attend due to reduced physical health or logistical reasons that prevented them from attending. Others stated that they felt psychological reluctance towards visiting the ICU. Health-related quality of life scores and symptoms of posttraumatic stress were similar between the groups.
**Conclusions:** The study provides information about patients who did not attend ICU follow-up appointments and contributes to the evidence supporting the use of digital healthcare interventions and a more thorough selection for ICU follow-up.

**Table 2 (abstract 000667)** Health-related quality of life (RAND-36) and symptoms of posttraumatic stress (PTSS-14) between ICU survivors who attended and did not attend ICU follow-up appointments

| | Attended follow-up | Did not attend follow-up | p-value |
|---|---|---|---|
| Total number | 24 | 51 | |
| **RAND-36** Median score (IQR) | | | |
| Physical function | 40.0 (17.5-52.5) | 35.0 (15.0-65.0) | 0.96 |
| Physical role function | 0 (0-50.0) | 0 (0-41.5) | 0.91 |
| Bodily pain | 45.0 (32.0-72.0) | 45.0 (32.0-83.0) | 0.75 |
| General health | 45.0 (32.5-65.5) | 45.0 (35.0-67.5) | 0.68 |
| Vitality | 45.0 (37.5-50.0) | 45.0 (35.0-50.0) | 0.33 |
| Social function | 50.0 (25.0-87.0) | 62.0 (37.0-81.0) | 0.58 |
| Emotional role function | 33.0 (0-100.0) | 33.0 (0-100.0) | 0.94 |
| Mental health | 68.0 (48.0-78.0) | 68.0 (52.0-78.0) | 0.60 |
| **PTSS-14** | | | |
| Median score (IQR) | 26 (17.5-38.5) | 29 (21-37) | 0.36 |
| Cut-off >45 (n, %) | 5 (23) | 8 (16) | 0.40 |

IQR = interquartile range 25-75; PTSS = posttraumatic stress symptom scale

**Reference(s)**
1. The authors thank all research participants who supported and facilitated this research.

**Topic:** Nursing care and physiotherapy

## 000670

### Monocyte distribution width: new biomarker of delayed cerebral ischemia after aneurysmal subarachnoid hemorrhage

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**Introduction:** Delayed cerebral ischemia (DCI) is a major determinant for poor neurological outcomes after aneurysmal subarachnoid hemorrhage (aSAH). Blood inflammation biomarkers have been studied to predict DCI. Monocyte distribution width (MDW), a sepsis biomarker that reflects the enlargement of monocytes after infection, may represent a novel inflammation biomarker associated with DCI.
**Objectives:** The objectives were: to analyse the relationship between traditional inflammation biomarkers and the development of DCI; to analyse the relationship of MDW and the development of DCI.
**Methods:** Retrospective observational cohort study of patients with aSAH from a single center since 2018. Statistical analysis. Descriptive: qualitative variables expressed in proportions; quantitative variables expressed in mean (SD) or median (IQR). Normality distribution was

analyzed using the Shapiro–Wilk test. Bivariate analysis: two categorical variables were analyzed using the Fisher's exact test or Chi-Square test; abnormal quantitative variables were analyzed using the Mann–Whitney test; normal quantitative variables were analyzed using the Student's t-test.

**Results:** $N = 168$. Females: 60.1%. Age: 57.1 (SD 12.9) years. GCS: 14 (IQR 4). Fisher Grading Scale IV: 75.6%. Hunt-Hess II: 33.9%. Hunt-Hess III: 23.2%. DCI: 69.4%.

GCS of patients without DCI *vs.* GCS of patients with DCI: 15 (IQR 3) *vs.* 13 (IQR 6); ($p = 0.02$). No differences in DCI were observed according with age ($p = 0.7$) and sex ($p = 0.4$). DCI was related with Hunt-Hess ($p = 0.003$), whereas Fisher Grading Scale was not associated with DCI ($p = 0.23$). The correlation between Hunt-Hess and Fisher Grading Scale reached statistical significance ($p = 0.047$).

The day of the onset of aSAH, leukocytes were higher in patients with DCI *vs.* without DCI: $14.8 \times 109$/L (IQR 4.5) *vs.* $12.3 \times 109$/L (IQR 5.8); ($p = 0.002$). Leukocytes 3 days after aSAH were also higher in patients with DCI *vs.* without DCI: $13.2 \times 109$/L (IQR 5.6) *vs.* $10.8 \times 109$/L (IQR 4.8); ($p = 0.03$). No differences in the leukocyte count were observed after the fourth day of the onset of aSAH (pns). Fibrinogen values were constantly higher in patients with DCI *vs.* without DCI during all the Intensive Care Unit (ICU) stay, with statistical significance observed in all comparisons ($p < 0.05$). IL-6 was higher during the first week of the neurological disease in patients with DCI *vs.* without DCI, reaching its peak on day 3 after the onset of illness: 24.5 pg/mL (IQR 42.6) *vs.* 11 pg/mL (IQR 33.4); ($p = 0.04$). CRP had a similar kinetics than IL-6, being higher in patients with DCI *vs.* without DCI, expressing its maximum values on day 3 after the beginning of the aSAH: 49.1 mg/L (IQR 86.6) vs. 19.1 mg/L (IQR 72); ($p < 0.00$). PCT values were also persistently higher in patients with DCI *vs.* without DCI during the evolution of the disease in the ICU, reaching statistical significance in all comparisons ($p < 0.05$). MDW was also higher 3 days after the onset of aSAH in patients with DCI *vs.* without DCI: 21.3 (IQR 4) *vs.* 19.1 (IQR 4.3); ($p = 0.005$).

**Conclusions:** Patients with aSAH that developed DCI expressed higher values of inflammation biomarkers than those without DCI, especially during the first 3 days of the onset of bleeding. MDW could be considered a new early biomarker of DCI after aSAH.

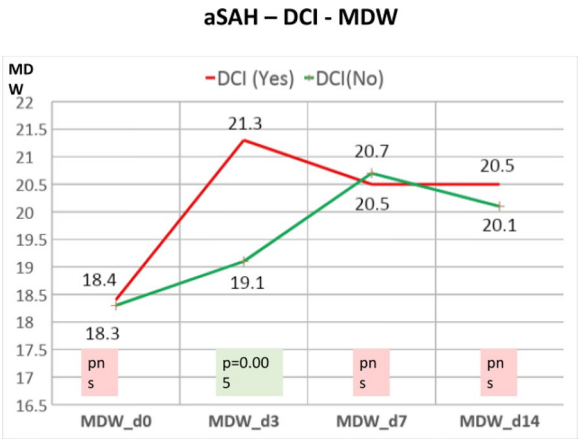


**Fig. (abstract 000670)** MDW tendency in patients with DCI and without DCI

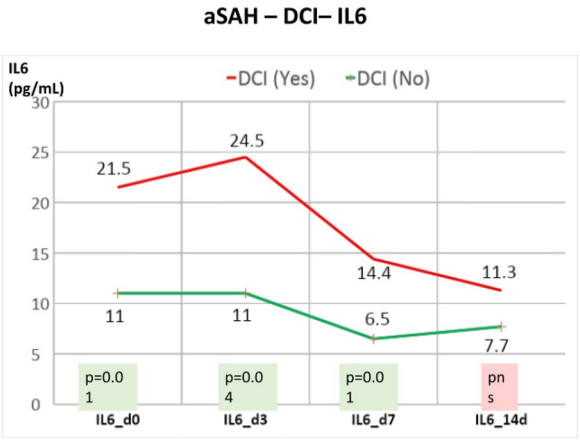


**Fig. (abstract 000670)** IL-6 kinetics in patients with DCI and without DCI

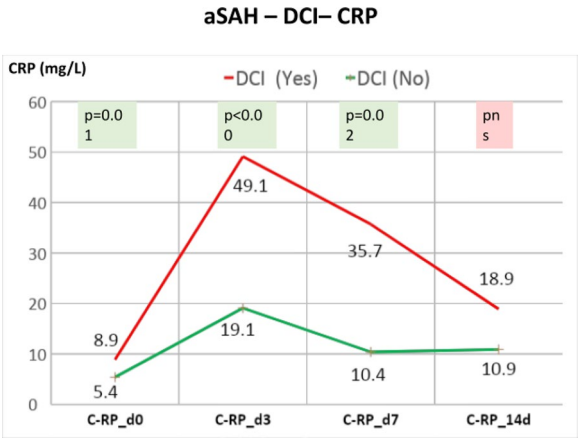


**Fig. (abstract 000670)** CRP tendency in patients with DCI and without DCI

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4. Neurocritical Care Team

**Topic:** Neurointensive care

**000671**

**Factors influencing community ICU participation in research: a qualitative descriptive study**

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**Introduction:** Community hospitals account for the majority of hospitals and hospital beds in Canada [1]. However, most health research is conducted in academic hospitals. Consequently, a large proportion of the patient population is excluded from clinical trials, denying individuals who seek care in these centers equitable access to novel treatments. Excluding community hospitals from the research also limits its generalizability of study results and slows trial recruitment, which can increase expenditures and delay mobilization of study findings into practice [2,3]. The COVID-19 pandemic highlighted opportunities to improve Canada's clinical research infrastructure, which must include increasing the research capacity of community ICUs [4]. Therefore, it is critical to refine our understanding of the factors that influence research participation in these settings, to help those interested in building research programs and increasing community hospital participation.
**Objectives:** This study aimed to identify and describe the factors that influence (a) community hospital research participation and (b) the development, implementation, and sustainability of a community ICU research program.
**Methods:** Principles of qualitative descriptive methodology informed the sampling strategies, data collection, and analysis [5]. In-depth semi-structured interviews were conducted virtually with a purposeful sample of individuals who were interested in or actively participating in Canadian community ICU research. Interview data were triangulated with field notes and survey data, which included multiple-choice and open-ended questions about demographics and existing research program characteristics. Qualitative data were analyzed using both conventional content analysis and rapid qualitative analysis [6,7]. Quantitative survey data were analyzed using descriptive statistics.
**Results:** The final sample included 38 (23 healthcare professionals, 10 research staff, and 5 hospital administrators) participants from 20 different community hospitals across 6 provinces in Canada. Participants described factors across individual, unit, institutional and external levels that influence community ICU research participation in Canada. Participants reported on: (1) the infrastructure necessary to initiate and sustain a research program, (2) personnel characteristics important for program growth, (3) key relationships and connections, and (4) the influence of the COVID-19 pandemic.
**Conclusions:** Despite significant barriers that impact community hospital research participation, community ICU professionals are motivated to engage in research. To increase community ICU research participation, these findings suggest that all levels of the Canadian healthcare system need to invest in research infrastructure, establish policies that embed research within health service delivery and facilitate relationships through mentorship, collaboration, and professional networks.

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8. Dr. Jennifer Tsang received a grant from the Physicians' Services Incorporated (PSI) Foundation to support this work.

**Topic:** Health Services Research and Outcome

## 000672

### Microbiological profile and clinical outcomes of severely injured trauma patients undergoing damage control surgery with bogota bag: a retrospective cohort study

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**Introduction:** Damage control surgery (DCS) with temporary abdominal closure (TAC) using the Bogota bag method is a widely used technique in the management of severely injured trauma patients. During DCS, pads are often packed into the abdominal cavity and adjacent to the wounds to control bleeding and contamination. While this approach has been shown to improve survival in critically injured patients, it has also been associated with a high incidence of ventral hernia development, which can lead to significant morbidity and require additional surgical interventions.
**Objectives:** This study aims to investigate the outcomes of DCS with Bogota bag, focusing on mortality, wound infection rates, and hernia development, and their association with microbiological findings from the packing pads.
**Methods:** A retrospective study was conducted on 126 severely injured trauma patients who underwent DCS with Bogota bag TAC. During the surgery, pads were packed into the abdominal cavity and adjacent to the wounds. These pads were then cultured for microbiological analysis (culture_wound for pads adjacent to wounds and culture_abd for intra-abdominal pads). The association between positive pad cultures and mortality, wound infection, or hernia development was evaluated.
**Results:** Among the 126 patients, 20 (15.9%) died during hospitalization. The mortality rate was not significantly associated with positive pad cultures (50% in non-survivors vs. 35.8% in survivors, $p = 0.3119$). The most frequently identified pathogens in non-survivors were *Acinetobacter baumannii* (40%, 8/20), Pseudomonas aeruginosa (25%, 5/20), and *Enterococcus faecium* (20%, 4/20).
Wound infection was observed in 46 patients (36.5%) and was significantly associated with positive pad cultures (78.3% in patients with wound infection vs. 15% in those without, $p < 0.001$), suggesting that contamination of the pads during DCS may be a major contributor to the development of wound infections. The most common causative agents of wound infection were Staphylococcus aureus (43.5%, 20/46), *Enterococcus faecalis* (37%, 17/46), Escherichia coli (28.3%, 13/46), and Klebsiella pneumoniae (19.6%, 9/46).
The predominant pathogens identified from different sample types were as follows: blood cultures—Acinetobacter baumannii (35%, 7/20), *Enterococcus faecium* (25%, 5/20), and Candida albicans (15%, 3/20); respiratory samples—Acinetobacter baumannii (30%, 6/20), Pseudomonas aeruginosa (25%, 5/20), and Klebsiella pneumoniae (20%, 4/20); wound cultures—Staphylococcus aureus (43.5%, 20/46), *Enterococcus faecalis* (37%, 17/46), Escherichia coli (28.3%, 13/46), and Pseudomonas aeruginosa (21.7%, 10/46); intra-abdominal cultures—*Enterococcus faecalis* (32.6%, 15/46), Escherichia coli (28.3%, 13/46), and Candida albicans (17.4%, 8/46).

Hernia development was noted in 9 patients (7.1%), but it was not significantly associated with positive pad cultures (66.7% in patients with hernia vs. 35.9% in those without, $p = 0.1429$).
**Conclusions:** This study highlights the complex challenges faced by severely injured trauma patients undergoing DCS with Bogota bag TAC. The high incidence of wound infection and its strong association with contaminated packing pads underscore the importance of implementing strategies to minimize contamination during DCS. The predominance of nosocomial pathogens such as Acinetobacter baumannii, Pseudomonas aeruginosa, and *Enterococcus faecium* in non-survivors suggests that infections caused by these organisms may have a significant impact on patient outcomes. Similarly, the high prevalence of Staphylococcus aureus and *Enterococcus faecalis* in wound infections indicates their potential role in the development of this complication. Further research is needed to confirm these hypotheses and to develop targeted prevention and treatment strategies for infections caused by these pathogens in patients undergoing DCS.

**Topic:** Trauma

## 000674

### The prevalence of post-traumatic stress disorder and symptoms of major depression in Intensive Care Unit patients with and without COVID-19

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**Introduction:** The limitations on personal interactions due to the pandemic have restricted the provision of palliative care to patients in Intensive Care Units (ICUs) and have made it more challenging to provide support to their families. Even today, the impact of ICU hospitalization on the development of mental health disorders like Major Depressive Disorder (MDD) and Post-Traumatic Stress Disorder (PTSD) remains unclear.
**Objectives:** This study aims to explore the prevalence of MDD and PTSD symptoms among patients admitted to an academic ICU during the pandemic. It also seeks to analyse the correlation between these mental health disorders and various demographic and clinical factors, comparing their incidence among patients hospitalized with COVID-19 and those with other illnesses.
**Methods:** A cross-sectional study design was employed, involving patients admitted to the ICU from January 1, 2020, to January 1, 2022. Demographic and clinical data were gathered from the Electronic Health Record (EHR) system. A questionnaire, adapted from the "Mini International Neuropsychiatric Interview" (MINI)1 and aligned with DSM-IV criteria, comprising 10 closed and open-ended questions, was utilized as a screening tool for PTSD and MDD.
**Results:** The study encompassed 100 ICU patients, with COVID-19 accounting for 28% and non-COVID-19 cases comprising 72%. The prevalence rates of MDD (27.8%) and PTSD (33%) did not significantly differ between COVID-19 and non-COVID-19 patients (Fig.). However, patients with COVID-19 experienced longer durations of mechanical ventilation ($p < 0.001$) and ICU stay ($p = 0.003$). Notably, feelings of fear, trepidation, or despair were significantly more common among COVID-19 ICU patients compared to non-COVID-19 patients (5.7% vs. 3.3%, $p = 0.043$). Symptoms like melancholy, its duration, and daily lack of interest exhibited strong predictive abilities for MDD (AUC 0.885, $p < 0.001$; AUC 0.904, $p < 0.001$; AUC 0.736, $p = 0.001$, respectively), irrespective of the cause of admission. Similarly, issues affecting work and social life and causing distress significantly predicted PTSD across all patients (AUC 0.885, $p < 0.001$).
**Conclusions:** Approximately one-fourth of ICU patients, whether with or without COVID-19, exhibit MDD symptoms, while around one-third display PTSD symptoms within approximately two years post-ICU discharge. Among various emotions, patients hospitalized with COVID-19 are characterized by feelings of fear or despair. Furthermore, melancholy and lack of interest are associated with MDD, whereas disruptions in work and social life predict PTSD in ICU patients, regardless of COVID-19 status.

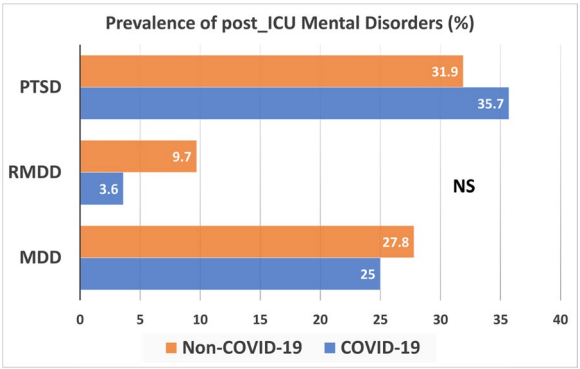


**Fig. 1 (abstract 000674)** Occurrence of Major Depressive Disorder (MDD), recurrent MDD (RMDD), and Post-Traumatic Stress Disorder (PTSD) between patients with and without COVID-19

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**Topic:** Health Services Research and Outcome

## 000676

### Impact of comorbidity on long-term mortality in older ICU patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000676

**Introduction:** An understanding of how a critical condition interacts with preexisting comorbidities to determine the long-term survival probability is important.
**Objectives:** To describe the impact of comorbidity on long-term mortality in older ICU patients.
**Methods:** The mortality after a first ICU admission in patients ≥ 55 years old from 2006 to 2012 registered in the Swedish Intensive Care Registry was compared to age- and sex-matched controls from the general population. Kaplan–Meier curves describe survival with a landmark at 1 year. Cox regression adjusted the comparison for age, sex, and comorbidity. Quantitative measures of comorbidity were based on linkage to hospital discharge diagnoses from in-patient care five years preceding the index date for the ICU admission [1]. Associations between specific comorbidities and survival were adjusted for age, sex, and quantitative measures of other comorbidities.
**Results:** During the 7-year study period there were 140 008 patients ≥ 55 years old with a first admission to an ICU and 23% were 80 years or older. The prevalence of comorbidities and the median SAPS3 increased with increasing age, along with the mortality rate during the first year (Fig. 1).
ICU patients surviving the first year remained at increased risk compared to the general population, but this difference was completely attenuated after adjustment for baseline comorbidity (HR, 1.03; 95% CI 1.02 to 1.04) (Fig. 1). When stratified for age, a slightly elevated risk remained after 1 year in the age group 55–64 years (HR, 1.17; 95% CI,

1.05 to 1.32). This increased risk was attenuated with increasing age and was not seen in the age group 75 and older (HR, 0.98; 95% CI, 0.96 to 0.99).

The associations between specific comorbidities and mortality rate were variable depending on the type of comorbidity, recency of hospitalization for that specific condition, and follow-up period (before/after the landmark). E.g. a prior hospital admission for infection was associated with an increased mortality rate after an ICU admission, with a gradient indicating that more recent hospitalizations conferred a higher risk (Fig. 2). The strongest association was seen in patients surviving the first year after ICU admission (adjusted HR, 1.50; 95% CI 1.42 to 1.59).

**Conclusions:** Older patients admitted to the ICU have a higher baseline burden of comorbidity, higher severity of illness, and consequently a higher mortality during the first year. Those that survive the first year after an ICU admission return to the mortality rate of the general population having similar baseline comorbidity. The results do not support any major concern for the selection of patients for ICU admission in relation to age and comorbidity. For some types of comorbidities, the recency of a prior hospital admission may predict both short- and long-term mortality rates.

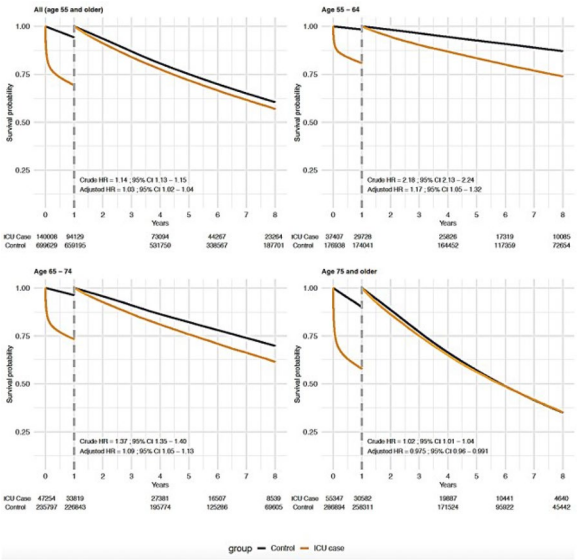


**Fig. 1 (abstract 000676)** Landmark analysis of survival probability after admission to intensive care. Survival described by Kaplan–Meier curves is compared to age- and sex-matched control groups from the general population, and separately for different age groups. Hazard ratios (HR) with 95% confidence intervals (CI) have been estimated in Cox proportional hazard models adjusted for age, sex, and comorbidity

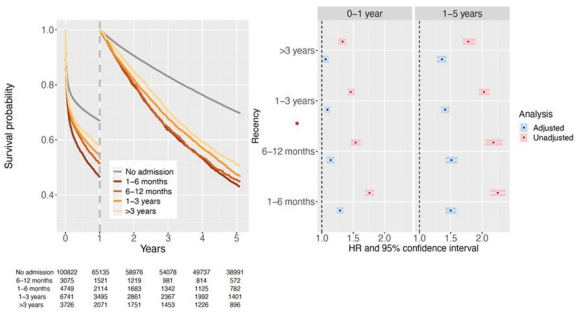


**Fig. 2 (abstract 000676)** Landmark survival analysis described by Kaplan–Meier curves (left panel), stratified for recency of previous hospital admission with infection as the main discharge diagnosis. Hazard ratios (HR) with 95% confidence intervals (CI) (right two panels) have been estimated from Cox proportional hazards models separately for each time period, comparing an unadjusted analysis with an analysis adjusted for sex, age, and other comorbidities

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**Topic:** Information Systems and Data Science

## 000677

### Community versus academic hospital community-acquired pneumonia patients: a nested cohort study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000677

**Introduction:** Most Canadians receive their care in community hospitals, yet most clinical research is conducted in academic hospitals. Compared to academic hospitals, community hospitals are more likely

to be located in rural and suburban communities and are more likely to serve populations with higher proportions of recent immigrants [1], lower socioeconomic status [2], and reduced access to subspecialized care [3]. Thus, research conducted exclusively in academic hospitals may not accurately reflect the patient population in community hospitals.
**Objectives:** Community-acquired pneumonia (CAP) is a significant cause of morbidity, disproportionately affecting older individuals and those with comorbidities [4]. Given previous literature identifying sociodemographic differences between academic and community hospital populations, this study aimed to compare CAP patients treated in academic and community hospitals with respect to their baseline and clinical characteristics, treatments, and outcomes.
**Methods:** This nested observational cohort sub-study of the Community-Acquired Pneumonia: Toward InnoVAtive Treatment (CAPTIVATE) trial, included hospitalized adults with CAP recruited between March 1st, 2018, and September 31st, 2023 from 15 Canadian hospitals; 10 academic and 5 community. Inclusion criteria were hospitalized patients > 18 years of age with an admitting diagnosis of acute CAP defined by having one of fever, chills, leukocytosis, leukopenia; one of cough, sputum, dyspnea; and new infiltrates on chest x-ray consistent with CAP [5–8]. Exclusion criteria were Emergency Department visits without hospital admission, readmissions, and admissions for other reasons. The primary outcome was 28-day mortality. Secondary outcomes were hospital mortality, ICU admission rates, organ dysfunction, and ICU and hospital length of stay. Unadjusted and adjusted analyses for age, sex, and co-morbidities using logistic, Cox, and censored quantile regressions were conducted.
**Results:** Patients in community hospitals were older (mean [SD] 75.0 [15.7] years vs 68.3 [16.2] years; $p < 0.001$), more likely to be female (49.7% vs 41.0%, $p = 0.002$), and had more comorbidities (75.9% vs 64.8%, $p < 0.001$). More patients in community hospitals received corticosteroids (49.2% vs 37.4%, $p < 0.001$). Community hospital patients had a higher likelihood of developing acute respiratory distress syndrome (OR 3.13, 95% CI: 1.87, 5.24, $p \leq 0.001$), and acute cardiac injury (OR 2.53, 95% CI: 1.33, 4.83, $p = 0.005$). In unadjusted and adjusted analyses, the 28-day mortality difference did not meet statistical significance (OR 1.43, 95% CI: 0.98, 20.7, $p = 0.062$ and OR 1.23, 95% CI: 0.81, 1.87, $p = 0.332$, respective).
**Conclusions:** Patients with CAP in Canadian community and academic hospitals differed with respect to their age, clinical characteristics, treatments and outcomes, emphasizing the importance of including community hospitals in clinical research studies to ensure the generalizability of results.

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9. Support for CAPTIVATE was obtained from grants to Dr. James A. Russell from the Canadian Institutes of Health Research (grant number: 439993) and St. Paul's Hospital Foundation.


**Topic:** Health Services Research and Outcome

## 000678

### Development of a clinical protocol for managing pulmonary aspergillosis in the ICU


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000678


**Introduction:** Pulmonary aspergillosis in the Intensive Care Unit (ICU) has increased over recent years due to Influenza and COVID-19 pandemics. Its treatment is continuously under review due to the emergence of new antifungals and the high mortality associated with this condition.
**Objectives:** Development of a care protocol after reviewing the cases diagnosed with pulmonary aspergillosis in our ICU.
**Methods:** Observational and retrospective study conducted in a second-level hospital ICU from January 2022 to October 2023. All patients diagnosed with Pulmonary Aspergillosis during this period were included. Demographic and clinical variables, treatment administered and changes, complications, and mortality were collected. Values with $p \leq 0.05$ were considered statistically significant. Statistical analysis was performed using SPSS 15.
**Results:** Eleven patients were included (64% male). The median age was 62 years (range: 45–77), APACHE-II score median was 17 (range: 12–25), and body mass index median was 29.17 (range: 22.7–45). 81.8% had COVID-19 Associated Pulmonary Aspergillosis (CAPA).
72.7% had hypertension, 27.3% dyslipidemia and diabetes mellitus. 36.4% of patients had some form of immunosuppression. Only one patient had chronic liver disease, two patients had chronic kidney disease on admission and one was on peritoneal dialysis.
*Aspergillus fumigatus* was the most frequently identified microorganism (54.54%), followed by *Aspergillus terreus* (27.27%). Multiple Aspergillus species were present in 5 patients at diagnosis.
The most frequent initial treatment was voriconazole (54.5%) followed by liposomal amphotericin B (36.4%) and isavuconazole (9.1%).
Treatment was changed in 54.5% of patients, with 50% of cases due to toxicity (hepatic or renal), and in 33.3% because the empirical treatment used was not appropriate for the microbiological isolation. No relationship was found between patient history and the development of toxicity. In the two patients with hepatic toxicity, voriconazole was attributed as the cause, leading to a treatment change. The cause of renal failure was attributed to amphotericin, leading to a change in treatment.
Among patients receiving voriconazole, serum levels were only requested in half of cases, with 75% of these cases being subtherapeutic. The median waiting time for voriconazole level results was 8 (range: 7–10) days. Overall mortality was 37%.
**Conclusions:** In our centre, due to difficulties in obtaining voriconazole levels, this drug was not considered the first-choice treatment of Pulmonary Aspergillosis (difficulties in extracting levels and long waiting times for results). Isavuconazole and Liposomal Amphotericin are the first-choice antifungals after the implementation of the new protocol.

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**Topic:** Infections and prevention

## 000679

### The significance of creep fluids and the modified Renal Angina Index (mRAI) during the initial week in the ICU: correlations with fluid overload, the composition of administered fluids, and outcomes

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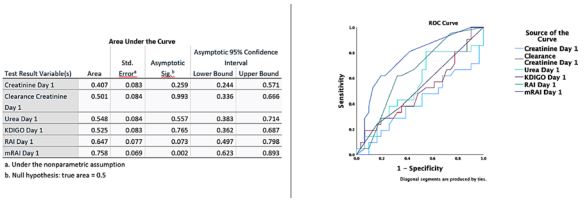
***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000679

**Introduction:** Fluid overload (FO) can lead to severe complications, extended mechanical ventilation support, and even mortality. The Renal Angina Index (RAI) has emerged as a validated tool for predicting Acute Kidney Injury (AKI), a condition associated with significant morbidity and mortality.
**Objectives:** This study aims to investigate the sources, composition, and volume of administered fluids in ICU patients and their correlations with RAI and clinical outcomes.
**Methods:** This retrospective monocentric observational study analyzed adult patients admitted to an academic ICU between 2017 and 2023. One hundred patients meeting inclusion criteria were assessed for various parameters including fluid input sources, daily and cumulative fluid balance, FO (%), AKI according to KDIGO criteria, and RAI and modified RAI (mRAI) within the first 24 h.
**Results:** Among 100 patients (with 84% having comorbidities, 52% presenting AKI at admission, and 32% mortality), no significant difference in overall outcome was observed between balanced crystalloids and N/S 0.9%. Balanced crystalloid solutions such as Ringer's Lactate and Plasma-Lyte, along with combinations with D/W solutions, were predominantly used for resuscitation and maintenance fluids. Notably, hyperchloremia associated with N/S 0.9% was not observed. Acidosis and elevated lactate values within the first 3 days were linked to high FO ($p<0.05$, $p=0.021$). Creep fluids, comprising various fluid types, contributed significantly to positive fluid balance and FO ($p<0.001$). Cumulative balance and FO were notably higher on the 3rd ($p=0.005$, $p=0.003$) and 7th ($p=0.018$) days of hospitalization in patients who died. Pathological mRAI scores (6–40) were associated with a higher percentage of AKI (KDIGO 2, day 3) (36.7% vs. 19.6%, $p=0.046$). Abnormal mRAI (present in 49% of patients) correlated with increased ICU (42.9% vs. 21.6%, $p=0.019$) and hospital mortality ($p=0.002$). mRAI showed a stronger predictive ability for ICU mortality compared to other renal function markers within the first 24 h (AUC 0.76 (0.62–0.89), $p=0.002$).
**Conclusions:** Creep fluids contribute significantly to FO during the initial ICU days. Cumulative balance and FO are associated with mortality. The mRAI index emerges as a crucial predictive tool for AKI occurrence and better predicts ICU mortality compared to other early renal function markers.



Area Under the Curve

| Test Result Variable(s) | Area | Std. Error[a] | Asymptotic Sig.[b] | Asymptotic 95% Confidence Interval Lower Bound | Asymptotic 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|
| Creatinine Day 1 | 0.407 | 0.083 | 0.259 | 0.244 | 0.571 |
| Clearance Creatinine Day 1 | 0.501 | 0.084 | 0.993 | 0.336 | 0.666 |
| Urea Day 1 | 0.548 | 0.084 | 0.557 | 0.383 | 0.714 |
| KDIGO Day 1 | 0.525 | 0.083 | 0.765 | 0.362 | 0.687 |
| RAI Day 1 | 0.647 | 0.077 | 0.073 | 0.497 | 0.798 |
| mRAI Day 1 | 0.758 | 0.069 | 0.002 | 0.623 | 0.893 |

a. Under the nonparametric assumption
b. Null hypothesis: true area = 0.5



**Fig. 1 (abstract 000679)** ROC analysis predicting ICU patient mortality, comparing classical renal function markers within the first 24-h of hospitalization with RAI and mRAI indices in ICU

**Reference(s)**
1. Matsuura R, Srisawat N, Claure-Del Granado R, Doi K, Yoshida T, Nangaku M, et al. Use of the Renal Angina Index in Determining Acute Kidney Injury. Kidney Int Rep. 2018 3;3(3):677–83

**Topic:** Acute Kidney Injury and haemofiltration

## 000680

### AFTER admission bundle – implementing documentation for invasively ventilated patients presenting to intensive care

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000680

**Introduction:** Critically ill patients requiring invasive ventilation on admission must have concise documentation on presentation to the intensive care unit (ICU) to avoid patient safety issues, ensure appropriate initial investigations are performed and to communicate information with the wider multi-disciplinary team.
The AFTER bundle was developed by the critical care team at the Queen Elizabeth University Hospital (QEUH) in Glasgow to provide a brief yet comprehensive way of documenting the integral information of patients admitted ICU who required intubation and ventilation on admission. The components of the bundle included: airway grade using the Cormack-Lehane scale, functional status prior to admission, endotracheal tube (ETT) review on chest X-ray, review of ECG, and if relatives or next of kin had been informed of their admission.
**Objectives:** To establish the AFTER bundle as part of the ICU admission proforma, and to assess compliance with completion of the bundle.
**Methods:** Data was retrospectively reviewed in 436 patients admitted to ICU at QEUH who required invasive ventilation between May 2023 and March 2024.
**Results:** Over the course of the 11 months, there was a general improvement in completed documentation of airway grade (57.4% vs 90.2%) and functional status (63.0% vs 86.3%). There was again a general rise in completed documentation of ETT reviews on chest X-ray from May 2023 (33.3%) to March 2024 (52.9%). An overall decline in ECGs performed (92.6% vs 64.7%) and reviewed (90.7% vs 64.7%) on admission was noted. Relatives or next of kin being updated upon admission have been relatively static (77.8% vs 76.5%). Overall, the completion of the AFTER bundle has remained relatively static – 22.2% vs 23.5%.
**Conclusions:** The overall compliance of completion of the AFTER bundle was low and static. This was due to differing compliance rates of different components of the bundle; the reasons for this included misunderstanding of what should be documented, investigations already requested but pending, and no immediate available next of kin information. In certain cases, resuscitation took priority over

documentation and so workload may have prevented full completion of the bundle. Better awareness of what constitutes each part of the bundle should be implemented; this has already started by being included during the induction of new doctors rotating through to ICU (including emailing 'pre-induction packs') and the implementation of a general admission bundle for both medical and nursing staff.

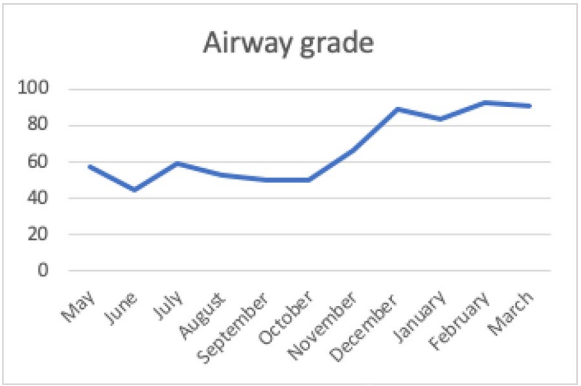


**Fig. 1 (abstract 000680)** Documentation of airway grade

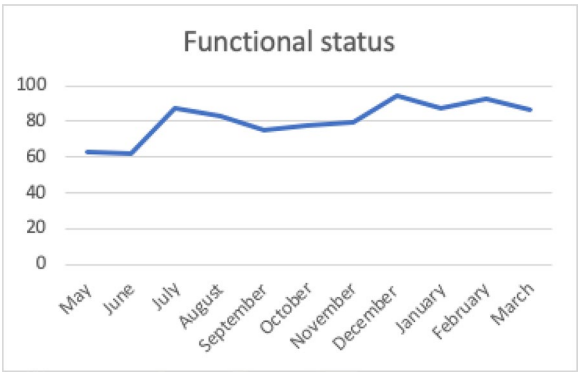


**Fig. 2 (abstract 000680)** Documentation of functional status

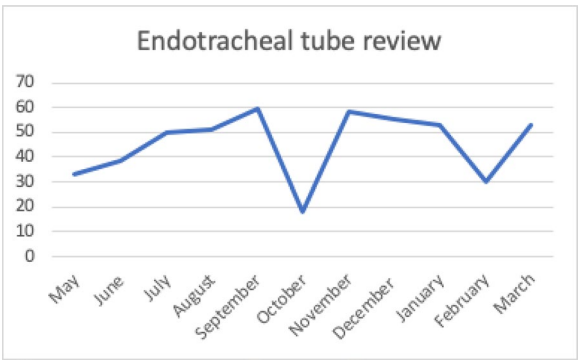


**Fig. 3 (abstract 000680)** Documentation of endotracheal tube review on chest X-ray

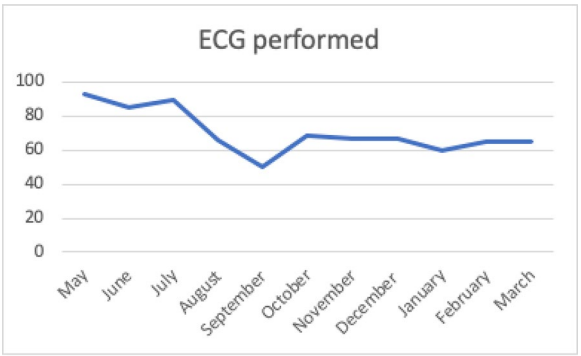


**Fig. 4 (abstract 000680)** Documentation of ECG performed

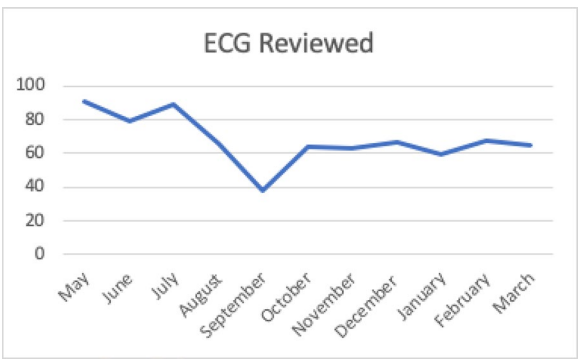


**Fig. 5 (abstract 000680)** Documentation of ECGs reviewed

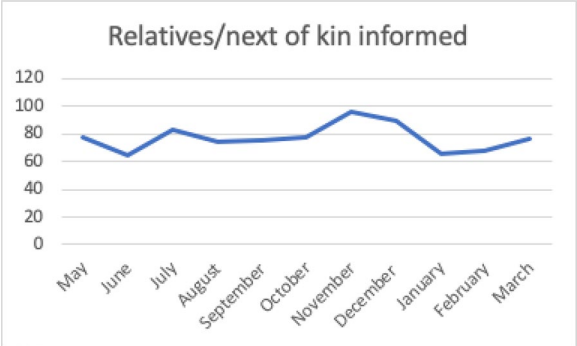


**Fig. 6 (abstract 000680)** Documentation of relatives or next of kin informed of ICU admission

**Reference(s)**

1. Nil
2. Nil

**Topic:** Information systems and Data Science

**000681**

**Association of PaO2/FiO2 ratio with mortality: optimal cutoffs and impact of the level of respiratory support**

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000681

**Introduction:** The ratio of arterial oxygen partial pressure to the fraction of inspired oxygen (P/F ratio) is commonly used to evaluate the severity of respiratory failure (RF) in organ dysfunction scores, such as the Sequential Organ Failure Assessment (SOFA) score [1]. However, the optimal cutoffs for the P/F ratio are unknown, as is the impact of the level of respiratory support provided.
**Objectives:** We determined four cutoffs rounded to the nearest 25 mmHg value for the P/F ratio to split the cohort into five categories of worsening RF. We also studied the impact of the level of respiratory support on the association between the P/F ratio and hospital mortality.
**Methods:** We conducted a registry study on patients admitted to the intensive care unit (ICU) at Kuopio University Hospital, Finland, between January 2013 and July 2018. Postoperative non-emergency surgical patients were excluded.
The lowest P/F ratio during the first 24 h in the ICU was recorded. The level of respiratory support was determined: no respiratory support, conventional oxygen therapy (COT), non-invasive ventilation (NIV), and invasive mechanical ventilation (IMV). Optimal cutoffs for the P/F ratio were determined using the Contal and O'Quigley method [2] to define mild, moderate, severe, and very severe RF in relation to hospital mortality.
The suitability of the cutoffs was assessed by measuring the accuracy of predicting hospital mortality using the Area Under the Receiver Operating Characteristic (AUROC). The accuracy of the cutoffs proposed was then compared to the respiratory SOFA score. The comparison was done using the DeLong method.
**Results:** The number of study patients was 5848 and the overall mortality was 12.9%. The best four cutoffs proposed for predicting hospital mortality were < 300 mmHg for mild, < 225 mmHg for moderate, < 150 mmHg for severe, and < 75 mmHg for very severe RF. The number of patients decreased, and mortality increased towards more severe RF categories (Table 1).

**Table 1 (abstract 000681)**

| | No RF | Mild RF | Moderate RF | Severe RF | Very Severe RF |
|---|---|---|---|---|---|
| Proportion of patients | 30.5% | 27.8% | 25.8% | 13.3% | 2.7% |
| Mortality | 7.0% | 8.8% | 14.1% | 25.9% | 45.5% |

The cutoffs proposed were more accurate (AUROC 0.667, 95% Confidence Interval [CI] 0.646–0.688) compared to the respiratory SOFA score (AUROC 0.653, 95% CI 0.632–0.674), $p = 0.02$. Mechanical respiratory support (NIV/IMV) was associated with increased hospital mortality in a univariable logistic regression analysis (Odds Ratio [OR] 1.47, 95% CI 1.28–1.66), but not in a multivariable model adjusting for P/F ratio (OR 1.11, 95% CI 0.90–1.32).
Visual inspection of hospital mortality plotted against P/F ratio corroborated the higher mortality in patients on NIV or IMV, but also suggested that almost all patients with P/F ratio < 150 mmHg were on NIV or IMV. Furthermore, the association of P/F ratio with mortality was less clear at values > 225 mmHg.
**Conclusions:** The P/F ratio cutoffs of 75 mmHg, 150 mmHg, 225 mmHg, and 300 mmHg appear suitable to determine the level of RF. The cutoffs proposed outperformed the respiratory SOFA score in hospital mortality prediction accuracy. Mechanical respiratory support was associated with higher hospital mortality but did not have independent predictive value when adjusted for P/F ratio, possibly because almost all patients with P/F ratio < 150 mmHg were on mechanical respiratory support in this cohort.

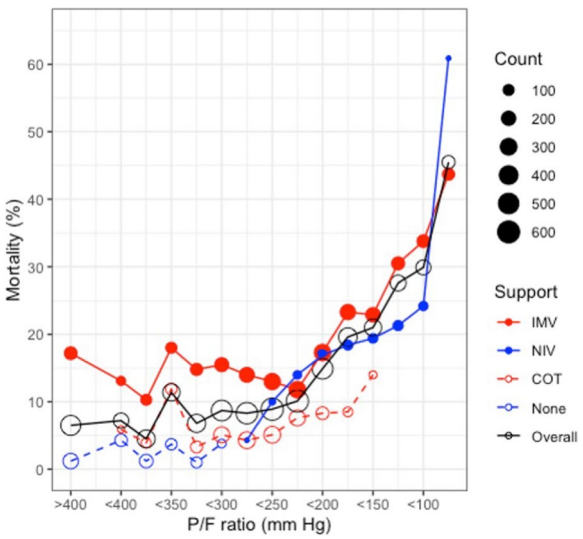


**Fig. 1 (abstract 000681)** The association of the P/F ratio with mortality in patients with different levels of respiratory support, distributed in 25 mmHg increments. The size of the circle represents the number of patients in each stratum with different P/F ratios. Data points with < 20 patients are omitted for clarity

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000682

### Fluid accumulation in severe trauma admitted to the intensive care unit (ICU), correlation with mortality

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000682

**Introduction:** Establishing adequate fluid management is assential in critically ill patients, both insufficient and excessive volumes worsen the prognosis. Especially fluid accumulation is associated with severe complications such as metabolic acidosis, coagulopathy, bleeding, organ dysfunction, and death. Many authors recently claim in their publications that restrictive fluid therapy (RFT) may be better for the outcome of severe trauma patients. Hence the purpose of this study is to evaluate their survival and mortality.
**Methods:** Prospective observational cohort study, during 2022–2023, at Hospital General de Cd. Victoria "Dr. Norberto Treviño Zapata", Tamaulipas, Mexico. Patients with Severe Trauma over 18 years old, were admitted to the ICU. They were classified into 2 groups; having fluid accumulation greater than 1.5 L prior to admission to the ICU, and a group without exposure. We excluded patients previously resuscitated at another institution. We evaluated mortality, fluid accumulation, acute renal failure, lactate, coagulopathy, hours of ventilation, prolonged stay in the ICU. We evaluate continuous variables with ± SD means in independent and related groups with T student, categorical variables with proportions, using Chi(X2) and relative risk.
**Results:** Follow-up of 50 patients admitted with Severe Trauma. Age 37 ± 13 (18–63), male 82%, etiologist: craniocerebral trauma 56%, lung 10%, cardiovascular 4%, solid abdominal organs 22%, hollow viscus 8%, previous to ICU admission: Surgery 48%, no surgical 52%, shock origin: hypovolemic 46%, vasodilated 22%, corrected shock 32%, TAM < 60 mmHg: 73 ± 48 (12–288) minutes, Mechanical ventilation 88%, norepinephrine 72%, vasopressin 8%.
water total accumulation at ICU admission: 3166 ± 2248 (600–10840) ml, ICU stay. 12 ± 5.5(3–15) days, VMi 7.0 ± 5 (2–12) days, APACHE 19.1 ± 6.9 (6–39), SAPS II 41.1 ± 13.9 (10–76), SOFA 8.16 ± 4.9 (4–16)).
Albumin entry-exit (3.2 ± 0.08; 3.72 $p < 0.03$). PaO2/FiO2 in–out (321–362 mmHg $p > 0.880$). MORTALITY. 58%.

| variable accumulation > 1500ml | Survivings (n = 21) | No survivings (n = 29) | p-value < 0.05 |
|---|---|---|---|
| APACHE II | 17.4 ± 6.6 | 21.5 ± 6.7 | 0.035 |
| SOFA | 8.0 ± 3,3 | 9.57 ± 3.6 | 0.129 |
| MAP < 60mmHg. (t/minut) | 58.7 ± 48.2 | 87.7 ± 61.3 | 0.004 |
| Vasodilated Shock | 80% (10) | 20% (2) | 0.009 |
| Vasoconstrict shock | 60% (n = 14) | 39%(n = 09) | 0.015 |
| Risk Factor Model Incluiding mortality | RR | IC-95% | p-value < 0.05 |
| > 1500 ml | 2.89 | 1.10–7.25 | 0.005 |

**Conclusions:** Most had low urine output, associated by fluid accumulation greater than 1500 ml, resulting increasing risk of mortality.

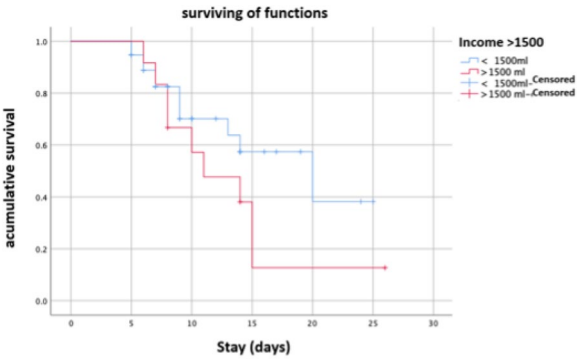


**Fig. 1 (abstract 000682).**

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**Topic:** Trauma

## 000685

### Single-cell sequencing-based exploration of changes in the immune profile and molecular mechanisms of sepsis patients developing Alzheimer's disease

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000685

**Introduction:** Sepsis can lead to cognitive impairment, but there is no specific test or treatment directly targeting cognitive impairment in sepsis. Previous studies by the project team have found that the onset of sepsis causes an increase in brain tissue Aβ. Many laboratories have proposed the hypothesis that peripheral blood mononuclear cells are part of the pathogenesis of neurodegenerative diseases. However, little is known about the altered distribution of immune cells in the peripheral blood of septic patients progressing to AD, and the state of immune cell-specific function remains unclear.
**Objectives:** In order to investigate the major cellular and generative mechanisms of peripheral Aβ secretion at the time of sepsis progression to AD peripheral blood mononuclear cell subpopulation changes and onset. We plan to analyze scRNA transcriptome from public databases of Sepsis, AD patients, and normal older adults to assess changes in cellular subpopulation abundance, cellular localization of gene expression, and activation of signaling pathways during the presubjective phase of the study.
**Methods:** Public databases were searched and included: scRNA sequencing data of PBMC from Sepsis, AD and normal elderly (Fig. 1, 2A). Combining the gene count matrix and cell classification information, we used the "Seurat" R package to generate the objects. To characterize the tissue distribution of meta-clusters, odds ratios (OR) were calculated for indications of preference (or propensity distribution) as well as the ratio of the actual number of cells observed to the expected number of cells for each cell cluster in each tissue (Ro/e) was used to quantify the degree of preference of each subpopulation for the tissue. We explored the preference of different cell subpopulation sources according to the STARTRAC method of Zhang Zemin's team.

**Results:** 27 cell clusters and highly disease-specific clusters were revealed after individual visualization of cells from sepsis, AD cases, or healthy individuals (Figure 2B-C). Cells were categorized into nine immune cell subtypes, which were further annotated according to the expression of marker genes (Figure 2D-E). Compared with sepsis, patients with AD had decreased numbers of monocyte/macrophage subsets and increased numbers of T cells and NK cells (Figure 3A-B). The tissue distribution of meta-clusters showed that each subpopulation and defined cell type had different preferences (Figure 4A-B). Cellular subpopulation analysis revealed that the progression of sepsis to AD was characterized by a decrease in the number of monocytes/macrophages, hematopoietic stem cells (HSCs), and platelet subpopulations, and an increase in the number of T/NKT and B-cell subpopulations (Figure 5A). Cellular localization of gene expression showed that the APP was highly expressed in the C11, C18, C20, C21, C22, C26, and C05 cell subpopulations, i.e., Monocytes/macrophages, platelets, HSC, and undefined cell subpopulations (Figure 5B-D). Combining the above results, we concluded that Monocyte/macrophage-associated cell clusters C20 and C22, platelet subpopulation C11 and HSC subpopulation C18 may be highly correlated with the progression of Sepsis to AD (Figure 5E-F). We will follow up with cell trajectory analysis and signaling pathway analysis of the above cell subpopulations to elucidate the cell subpopulation alterations and related signaling pathways involved in the progression of Sepsis to AD in peripheral blood.

**Conclusions:** On the basis of the above analysis of PBMC sequencing data from sepsis and AD patients, we directly analyzed gene expression at the single-cell level to gain a deeper understanding of the composition, cellular state, and cellular dynamic transitions of PBMCs in sepsis and AD patients. By analyzing the distribution of immune cell subpopulations and cellular subpopulations of different abundance encoding the Aβ amyloid gene in the peripheral blood of sepsis patients at the onset of sepsis, AD patients, and normal elderly patients, and by identifying the different cellular subpopulations and specifically expressed genes based on scRNA-seq analyses, we aimed to point out the key molecular biomarkers in the blood of certain sepsis patients progressing to AD, to provide a subsequent mechanistic study and to observe whether protein and pathway associations and immune-related functional alterations exist prior to sepsis and AD.

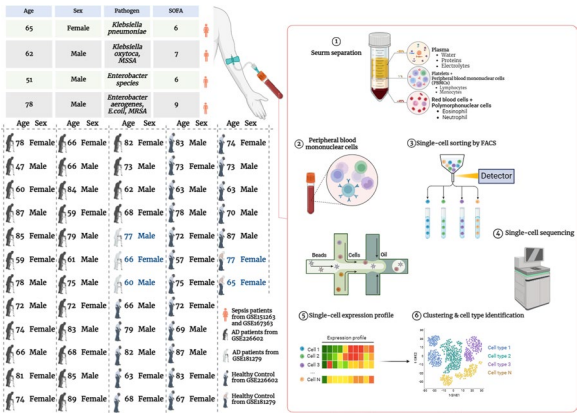


**Fig. 1 (abstract 000685)** Data included in this study and single-cell sequencing process

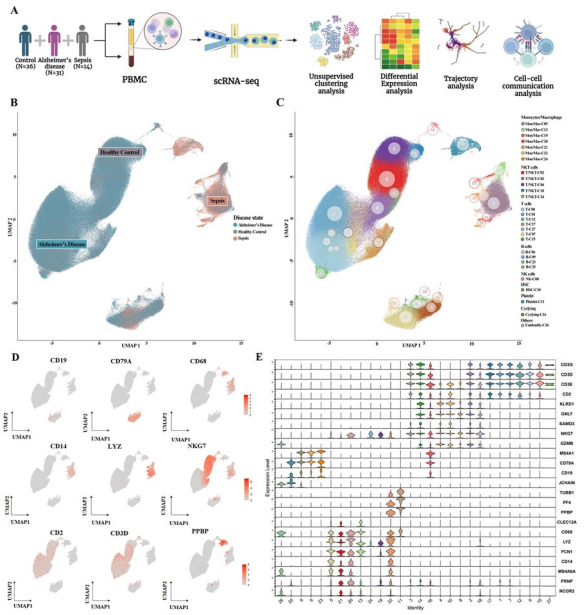


**Fig. 2 (abstract 000685)** Single-cell mapping of PBMC from normal tissues, septic patients, and Alzheimer's Disease. (A) UMAP profiles of scRNA-seq from 71 samples (26 normal controls, 31 AD patients, and 14 sepsis patients) visualized to show 3 disease states; (B) UMAP analysis showing sample distribution; and (C) UMAP atlas visualization of scRNA-seq transcriptome displayed the annotation and color codes for 27 immune cell subclusters; (D) Typical cell-surface markers defining B cells, Monocytes/macrophages, NKT cells, NK cells, T cells, platelets and HSCs; (E) Violin plots indicated expression level of canonical annotation marker gene. PBMCs, Peripheral blood mononuclear cell; UMAP, Uniform Manifold Approximation and Projection; scRNA-seq, single-cell RNA sequencing; Mac/Mon, macrophage/monocyte; HSC, hematopoietic stem cell; NK, natural killer

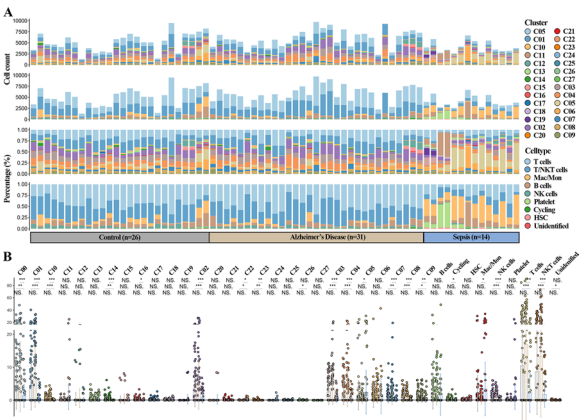


**Fig. 3 (abstract 000685)** Cell Counts from Normal Tissue, Alzheimer's Disease, and Sepsis Patients. (A) Proportions and cell counts for each cell cluster and cell subtype across disease types; (B) Quantitative bar graphs showing comparisons of percentages of each cell cluster and immune cell type between HC, AD, and sepsis patients. Statistical analysis was performed using an unpaired two-sided Student's t-test. Data are expressed as mean ± SD. NS, $P > 0.05$; *, $P < 0.05$, **, $P < 0.01$, ***, $P < 0.001$, ****, $P < 0.0001$. The variability in absolute cell counts of different cell subpopulations in AD and Sepsis can be seen in the figure,

suggesting that the immune cell expression profile of their PBMCs is altered after Sepsis develops into AD

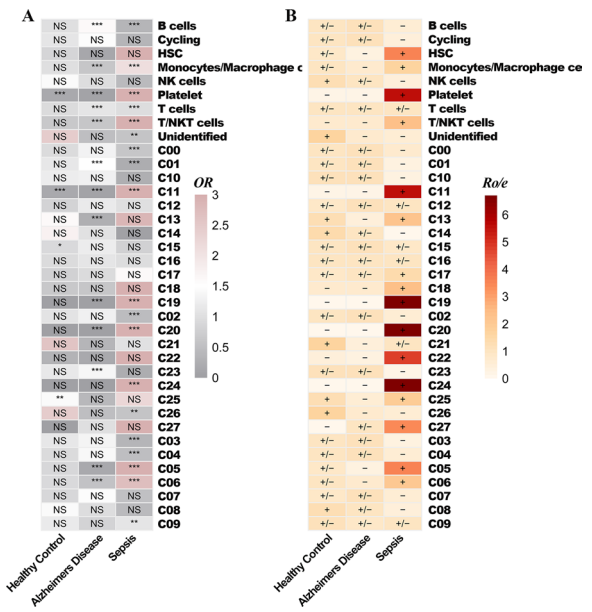


**Fig. 4 (abstract 000685)** Correlation of cell subpopulations with PBMC tissue origin. (A) Heatmap showing ORs of cell clusters present in each tissue, OR > 1.5 indicates that the cell group is more preferred to be distributed in the corresponding tissue; (B) Heatmap showing the ratio (Ro/e) of the actual observed to expected number of cells in each cell cluster in each tissue, + indicates that a particular cell cluster proportionally has a higher number in the group equivalent to the other two groups with preference for that tissue, ± indicates no preference, — indicates less number in the reorganized group compared to the other groups. odds ratios (OR, odds ratio) indicate a preference, and we explored the preference of different cell subpopulations origins according to the STARTRAC method of Zemin Zhang's team. To characterize the tissue distribution of meta-clusters, odds ratios (OR) were calculated and used to indicate preferences. Specifically, for each combination of meta-cluster i and tissue j, a 2 by 2 contingency table was constructed, which contained the number of cells of meta-cluster i in tissue j, the number of cells of meta-cluster i in other tissues, the number of cells of non-i meta-clusters in tissue j, the number of cells of non-i meta-clusters in other tissues. Then Fisher's exact test was applied to this contingency table, thus OR and corresponding p-value could be obtained. P-values were adjusted using the BH method implemented in the R function p.adjust. We found that all ORs > 1.5 or ORs < 0.5 had adjusted p-values < 1e-10. Hence, a higher OR with a value > 1.5 indicated that meta-cluster i was more preferred to distribute in tissue j, a lower OR with a value < 0.5 indicated that meta-cluster i was preferred not to distribute in tissue j

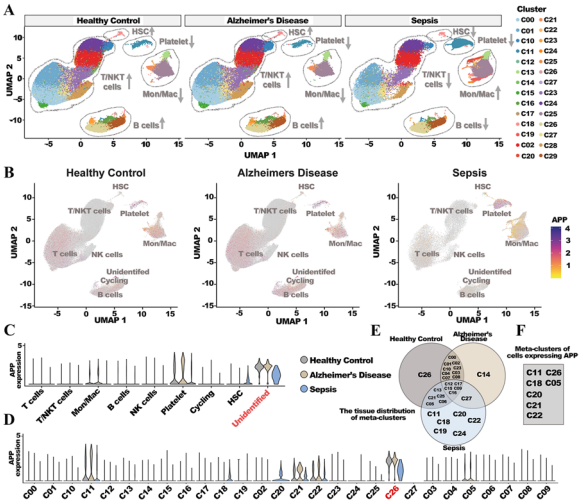


**Fig. 5 (abstract 000685)** Sepsis progression to AD peripheral blood subpopulation changes and APP-expressing cellular localization. (A) UMAP plot showing cellular subpopulation changes in healthy control, AD and sepsis patients; (B) UMAP plot showing cellular localization of APP expression; (C) Violin plot demonstrating APP gene expression high and low in different cellular subpopulations; (D) Violin plot demonstrating APP expression is highly expressed in different cellular subpopulations; (E) Venn diagram showing the preference of healthy control, AD and Sepsis for different cell clusters characterizing the changes in the subpopulation of BMCs in which Sepsis develops into AD, with C11 being platelets, C18 being HSCs, C19/C20/C22/C24 being monocytes/macrophages, and C14 being NKT cells; (F) APP high-expressing cell subpopulations, of which C20/C21/C22/C05 are all monocytes/macrophages. From the tissue preference and APP expression subpopulation preference, it was concluded that the progression of Sepsis to AD was associated with a decrease in the types of monocyte/macrophage subpopulations, an increase in the types of B cell subpopulations, an increase in the types of T/NKT cell subpopulations, a decrease in the number of platelet cells, and an increase in the number of hematopoietic stem cells. Among them, the monocyte/macrophage-associated cell clusters C05/C19/C20/C21/C22/C24, platelet C11, and hematopoietic stem cell C18 may be highly associated with the progression of Sepsis to AD

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**Topic:** Sepsis

### 000687

### Ivabradine use in critical care: a systematic review

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**Introduction:** In patients with acute illness, compensatory tachycardia initially serves to maintain adequate cardiac output, oxygen delivery, and tissue oxygenation but may persist despite appropriate fluid and vasopressor resuscitation or may be secondary to inotropic therapy. Sustained tachycardia is a predictor of adverse outcomes in critical illness. Ivabradine, a highly selective inhibitor of the sinoatrial node's pacemaker current (I*f* or "funny" current), mitigates heart rate by modulating diastolic depolarization slope without affecting contractility.
**Objectives:** To report the existing evidence on the use of ivabradine in critically ill patients.
**Methods:** A systematic literature search was performed up to September 2023 in the MEDLINE/PubMed® database. The search included only original human studies published in English in peer-reviewed journals. The search was performed using the following terms: ("ivabradine"[MeSH Terms] OR "ivabradine"[All Fields]) AND (("critical care"[MeSH Terms] OR ("critical"[All Fields] AND "care"[All Fields]) OR "critical care"[All Fields] OR ("intensive"[All Fields] AND "care"[All Fields]) OR "intensive care"[All Fields])). The trial protocol is registered in PROSPERO (CRD42023449267), in adherence with to the *Preferred Reporting Items for Systematic Reviews and Meta-Analysis—Protocols* (PRISMA-P) guidelines.
**Results:** After the first screening procedure, 39 studies were assessed for eligibility on a total of 93 records identified after the initial research (Table 1). Among these, 29 were excluded; 9 studies (4 randomized controlled trial, 5 case report/series), including a total of 234 patients, were included in the qualitative analysis. Ivabradine showed a potential role for improving hemodynamics in patients with multiple organ failure [1 study] and cardiogenic shock (e.g. due to myocardial infarction or myocarditis) [4 studies], in those with mechanical circulatory support, low cardiac output syndrome [2 studies] following tachycardiomyopathy after heart transplant or heart surgery, and septic shock [2 studies]. In addition, the combination of dobutamine with ivabradine has been explored to capitalize on dobutamine's positive inotropic action while mitigating its positive chronotropic effects, resulting in a more efficient cardiac cycle and improved hemodynamics.
**Conclusions:** At present, the use of ivabradine in critically ill patients has been poorly described. Future studies dealing with potential advantages or adverse events related to this drug use in these heterogeneous patients' populations are required.

**Table 1 (abstract 000687)** Study screening flowchart

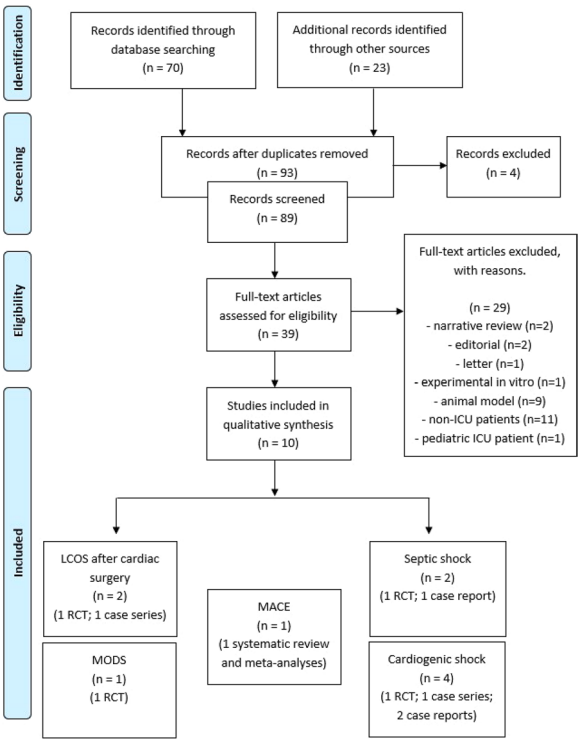


**Table 2 (abstract 000687)** Included studies characteristics

| Authors | Year | Study structure | Sample Size | Sample characteristics | Hemodynamic Monitoring |
|---|---|---|---|---|---|
| *Colombo C.N.J. et al.* | 2022 | Case series | 6 ICU patients (with a matched cohort of patients with similar characteristics as control group) | Cardiogenic shock due to acute myocardial infarction (2), fulminant myocarditis (1), drug intoxication (1) and acute decompensated heart failure (2). VA-ECMO implanted within 6 h of admission. | TTE (2 patients with PAC) |
| *Nguyen L.S. et al.* | 2018 | phase 2, multi-center, single-blind, randomized controlled trial | 19 ICU patients, post cardiac surgery (14 ivabradine group; 5 placebo group) | Pre-operative LVEF ≤ 40% and sinus rhythm, who developed LCOS requiring dobutamine infusion after elective CABG with CPB, who subsequently developed tachycardia (HR > 100 bpm). | PAC CCO |
| *Datta P.K. et al.* | 2021 | Single-centre, prospective, open label, randomised controlled trial | 60 ICU patients (30 in ivabradine group; 30 in control group) | Septic shock with an HR > 95 bpm, requiring noradrenaline support to maintain MAP ≥ 65 mmHg despite adequate fluid resuscitation. | TTE |
| *Nuding S. et al.* | 2018 | Prospective, single-center, open-label, randomized, controlled, two-arm phase II trial | 70 ICU patients | MODS diagnosed in the previous 24 h (APACHE II score ≥ 20) either caused by a coronary (STEMI, NSTEMI) or non-coronary etiology (sepsis/septic shock), with sinus rhythm ≥ 90 bpm and contraindications to β-blockers. | PAC/PICCO/Vigileo |
| *Vitale D. et al.* | 2010 | Case series | 15 ICU patients (post cardiac surgery) | LCOS after CPB (CABG + valvular surgery) who needed inotropic support (as incremental steps: Dobutamine 2–10 μg/kg/min; adrenaline 0.03 – 0.1 μg/kg/min; IABP) and developed sinus tachycardia (HR > 90 bpm). | PAC |
| *Zwicker C. et al.* | 2010 | Case report | 1 ICU patient | A 37 year-old heart-transplant recipient (2 years earlier) who developed cardiogenic shock due to tachycardia-induced cardiomyopathy, requiring noradrenaline, dobutamine, levosimendan and IABP. | PAC |
| *Barilla F. et al.* | 2016 | Single-centre, prospective, open label, randomised controlled trial | 58 Cardiac ICU patients (28 in standard treatment group and 30 in Ivabradine + standard treatment group) | Cardiogenic shock complicating acute myocardial infarction, LVEF < 40 %, sinus rhythm with HR ≥ 75 bpm, systolic blood pressure ≤ 100 mmHg. All patients underwent primary PCI, treatment with inotropic drugs and IABP. | TTE |
| *De Santis V. et al.* | 2014 | Case report | 3 ICU patients | Sepsis-related MODS after cardiac surgery; sinus tachycardia (HR > 90 bpm). | PAC, TEE |
| *Franke J. Et al.* | 2011 | Case report | 2 ICU patients | Cardiogenic shock due to myocarditis. Pt. 1: IABP+ levosimendan + Dobutamine 10 μg/kg/min, synus tachycardia (mean HR 130 bpm); Pt. 2 dobutamine 3.7 μg/kg/min, synus tachicardia (mean HR 120 bpm). | TTE (+ non-specified invasive CO monitoring for patient 1) |

PAC Pulmonary Artery Catheter; PAC CCO Pulmonary Artery Catheter with Continuous Cardiac Output monitoring; LVEF Left Ventricular Ejection Fraction; LCOS Low Cardiac Output Syndrome (CI < 2.2 L.min$^{-1}$.m$^{-2}$ despite fluid resuscitation and normothermia); CABG Coronary Artery Bypass Graft; CPB Cardiopulmonary Bypass; MAP Mean Arterial Pressure; TTE Trans-Thoracic Echocardiography; TEE Transesophageal Echocardiography; STEMI ST-elevation Myocardial Infarction; NSTEMI Non ST-elevation Myocardial Infarction; IABP Intra-Aortic Balloon Pump; PCI Percutaneous Coronary Intervention; MODS Multiple Organ Dysfunction Syndrome;

**Topic:** Cardiovascular issues in ICU

### 000690

### Development of optimal treatment strategies for sepsis using reinforcement machine learning in continuous spaces

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000690

**Introduction:** The optimal strategy for fluid resuscitation and hemodynamic management in sepsis treatment remains uncertain. We developed and validated an artificial intelligence (AI) decision-making model using a machine learning approach in continuous spaces to provide real-time guidance for sepsis treatment.
**Methods: Data source and population:** Patients diagnosed with sepsis from the electronic ICU collaborative research database (eICU-CRD) (training cohort) and the medical information mart for intensive care-IV (MIMIC-IV) (validation cohort) were included.
**Variables, medical actions, and outcome:** A total of 36 variables and 5 medical actions (fluid, three categories of vasopressors, and hydrocortisone) were incorporated into the model training process. We identified the time at which patients fulfilled all of the inclusion criteria as the onset time and divided the 24 h after the onset time into twelve 2-h intervals.
**Imputation:** The Self-Attention Imputation for Time Series was employed **(**Fig. 1).
**Development of the AI model:** We developed an AI model based on offline and deep reinforcement learning. Our model architecture comprised four main components: a history capture model, a generative model, a perturbation model, and Q-networks. The offline reinforcement problem of optimal decision-making in a continuous state-action space was effectively solved based on the time-series data of 41 clinical metrics for 12 intervals for each patient (Figs. 2 and. 3).
**Results: Patients:** Overall, 13,564 and 6,660 patients with sepsis from the eICU and MIMICIV databases, respectively, were included.
**Calibration of the AI model:** Good model calibration was verified through the visualization of the correlation between the return of the clinician's policy and patients' 90-day mortality, as depicted in Fig. 4A, B, C, D illustrate the average returns observed for both survivors and non-survivors.
**Impact of AI model on mortality:** After propensity score matching, the subgroup of patients (25%) with treatments most closely resembling the AI decision exhibited a significantly lower mortality rate, compared with the subgroup (25%) least similar in the eICU cohort (OR 0·45 [0·37–0·54], $p < 0·001$) and MIMIC-IV cohort (OR 0·73 [0·59–0·90], $p < 0·001$). We also found that patient mortality increases as the disparity between the clinician's strategy and that of the AI model, which demonstrated the validity of our model (Fig. 5).
**Comparison between the AI model and clinicians' strategy:** The differences between the AI model and the clinician's fluid intake, the rate of the three types of vasopressor, and whether hydrocortisone was applied within 24 h of the onset time are illustrated in Fig. 6. The AI model tended to prescribe less fluids, particularly after the first 6 h of sepsis. For the first class of vasopressors, the strategy of the AI model was approximately the same as that of the clinicians. For the second and third classes of vasopressors, the model tended to administrate larger dosages than the clinicians. The proportion of glucocorticoid usage in the AI model was similar to that of clinicians.
**Conclusions:** Our model, developed using AI algorithms guided by sequential data, offers personalized and clinically interpretable treatment decisions for sepsis with the aim of reducing mortality rates. Our findings aid in enhancing the accuracy of treatment decisions, paving the way for future real-time medical behavioral optimization driven by AI.

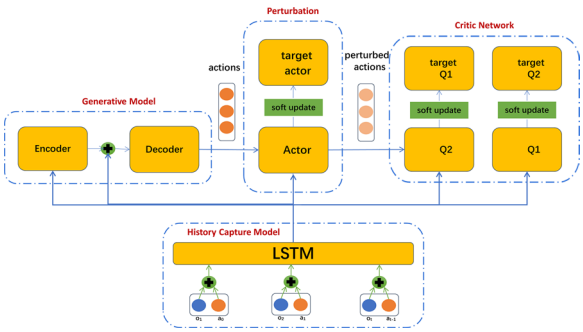


**Fig. 3 (abstract 000690)** Model Construction

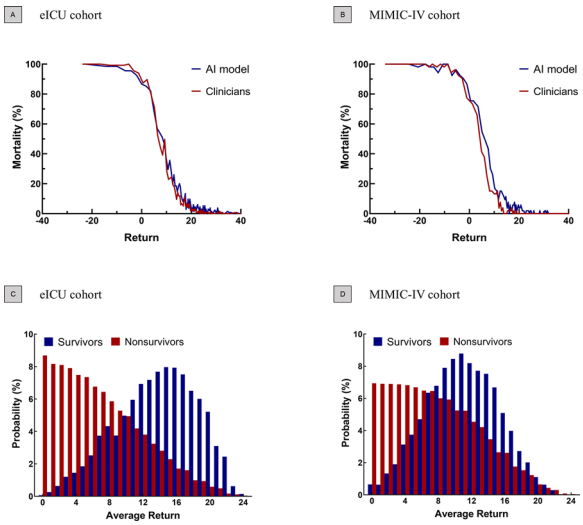


**Fig. 4 (abstract 000690)** Correlation between Q value and return and mortality
In Fig. 4, both "return" and "average return" represent the reward values associated with specific actions taken in medical decisions. Return presents the actual data of reward values corresponding to each patient's treatment actions, while average return divides the reward values into 25 parts, assigning a scalar value from 0 to 24 to each part. This process transforms the continuous distribution of reward values into a discrete scenario. Fig0.4A and B illustrate the relationship between the return and 90-day mortality in the bootstrapped 10,000 data from the eICU and MIMIC-IV cohort. Returns of actions were sorted into 100 bins, and the mean observed mortality (blue line for AI model, red line for Clinicians) was computed in each bin. Treatments with a low return were associated with a high mortality risk, whereas treatments with a high return led to better survival rates. Fig0.4C and D depict the average return in survivors and non-survivors in the bootstrapped 10,000 data from the eICU and MIMIC-IV cohorts. Among survivors, a higher proportion of patients had higher returns, while among non-survivors, a higher proportion of patients had lower return.

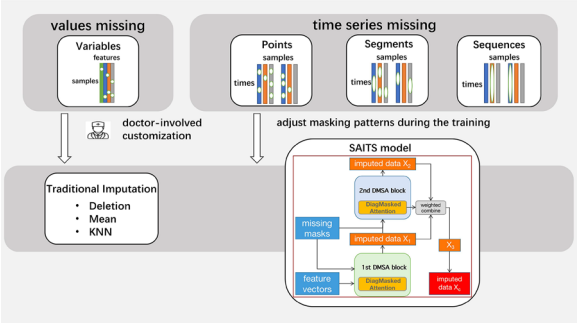


**Fig. 1 (abstract 000690)** Process of imputation
Continuous time series of patient data, including treatment at each time step, were used for modeling the AI treatment policy. A self-attention-based imputation method was adopted to complete the time series data with a long sequence missing pattern for some features. Patient survival at hospital discharge defined reward. Offline deep reinforcement learning was used to generate and estimate optimal treatment strategies—the AI policy. To encourage the model more Given the completed states of a patient, the trained model could predict the the optimal continuous and discrete treatment. The results were evaluated on two independent datasets from the eRI database.

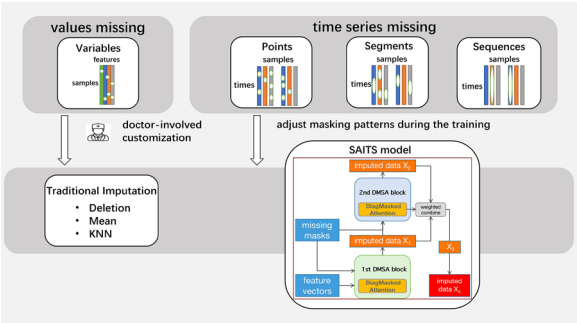


**Fig. 2 (abstract 000690)** Development and evaluation of the AI model
Utilizing a time-series data of 36 clinical variables and 5 medical actions (fluid, three categories of vasopressors, and hydrocortisone) within 24 h of sepsis onset, we developed a real-time AI decision model in the eICU and MIMIC-IV datasets. Patient survival at 90 days after ICU admission is defined as a reward. Reinforcement learning was used to estimate and evaluate optimal treatment strategies.

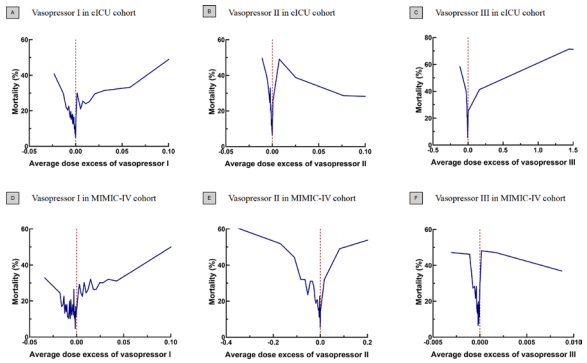


**Fig. 5 (abstract 000690)** Comparison of average dose excess received per patient of vasopressors with corresponding mortality
Comparison of how mortality varies with the difference between the dose recommended by the AI policy and the dose used by the clinicians. When the difference is smaller, we see lower observed mortality rates, suggesting that patient survival can be improved when clinicians act on the learned policy in AI. Vasopressor I (A), Vasopressor II (B), Vasopressor III (C) in the eICU cohort and Vasopressor I (D), Vasopressor II (E), Vasopressor III (F) in the MIMIC-IV cohort.

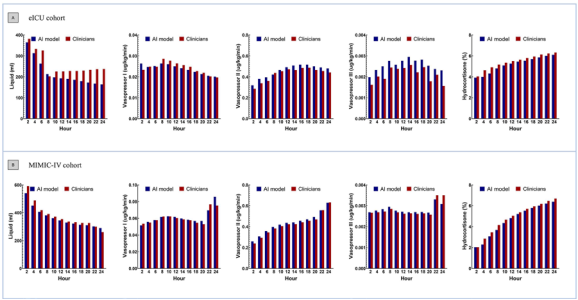


**Fig. 6 (abstract 000690)** Comparison between the AI model and clinicians' strategy in the eICU and MIMIC-IV cohort
Fluid input, vasopressor I, vasopressor II, vasopressor III, and hydrocortisone in the eICU cohort; (B) Fluid input, vasopressor I, vasopressor II, vasopressor III, and hydrocortisone in the MIMIC-IV cohort.

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11. This research was funded by the National Key R&D Program of China(2020AAA0109603), National Natural Science Foundation of China (Grant No·82202366), Clinical Medicine Plus X—Young Scholars Project, Peking University, the Fundamental Research Funds for the Central Universities (PKU2022LCXQ031), and Wu Jieping Medical Foundation Runze Fund for Critical Care Medicine (NO320·6750·2022–2-34).

**Topic:** Sepsis

## 000691

### Opening *Pandora*`s box by generating intensive care diary entries through artificial intelligence

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000691

**Introduction:** Intensive care diaries have a positive effect on the mental state of patients and relatives by closing memory gaps and improving the understanding of their experiences (3). Nevertheless, this intervention is not implemented in practice all overdue several challenges like staff shortages and a lack of time (1). The increasing integration of AI in our everyday lives and in the nursing care sector means that there is great potential to support or assist nurses in their activities. Assistance within the intervention by AI could also be a way of dealing with the problems associated with the implementation of the intervention (4). Specifically, AI could be an opportunity to write personalized diary entries based on medical and nursing records (5).
**Objectives:** The purpose is to develop a hypothetical study protocol for a multicenter, mixed-methods study to understand the impact and usability of AI-generated diary entries for ICU patients (2).
**Methods:** Patients with a stay of more than 72 h receive both a handwritten diary written by trained nursing staff and an AI generated diary. After discharge, the AI-generated diary entries will be created from the medical and nursing records using AI-supported software and printed out as a diary. Before the diaries are handed over, the entries are checked by trained nurses. It is transparently communicated whether it is the AI-generated diary or the handwritten diary (Fig. 1). Within three months after discharge, an appointment is arranged to hand over and read together with the family and trained staff. An interview raised the experiences, concerns and thoughts of the patients and relatives. In addition, the usability of the intervention is assessed by a questionnaire (2).
**Results:** The expected results could be that patients and relatives point out the differences or similarities of language and content. In addition, concerns regarding data processing and the use of AI can be mentioned, as well as ideas and suggestions as to how they would like to see it used. Possible effects on the results of using AI must be considered. Nursing is person-centred, personal, and individual. Therefore, diary entries are also a highly personalized and intimate intervention that has an impact on the nurse-patient relationship. In addition, different perspectives, such as ethical, nursing, legal and technical aspects, must be taken into consideration (2).
**Conclusions:** It is possible to generate personal diary entries by using AI-technology. However, this raises different questions and concerns from multiple perspectives, especially from the ethical and professional nursing side. As researchers, this and many more aspects should be thoroughly discussed before a real study is initiated. After all, what impact would it have if AI were to demonstrate a better aspect than the human intervention? (2).

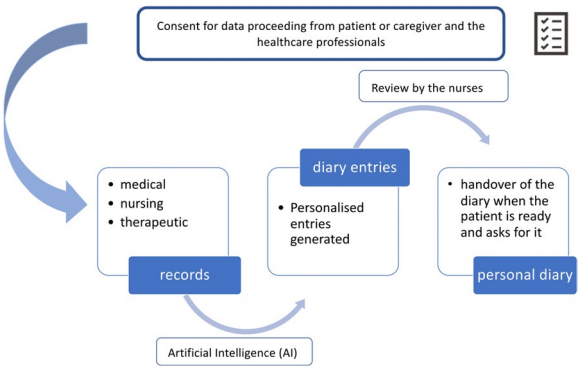


**Fig. 1 (abstract 000691)** Concept visualisation

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**Topic:** Nursing care and physiotherapy

## 000692

### Causes of death and hemodynamic profiles in ARDS patients fatalities due to SARS-CoV-2

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000692

**Introduction:** Previous studies have shown that patients with the Acute Respiratory Distress Syndrome (ARDS) primarily die from sepsis and rarely from refractory acute respiratory failure (1,2). However, the mechanism of circulatory failure due to sepsis has never been explored.
**Objectives:** This study aimed to (i) determine the primary mechanism leading to death, (ii) explore the mechanism of circulatory failure before death and (iii) assess how respiratory failure acts as a mediator between sepsis and circulatory failure in patients with ARDS secondary to SARS-CoV-2.
**Methods:** We included patients admitted to the intensive care unit of Limoges Teaching Hospital (France) between March 2020 and June 2021 with ARDS secondary to SARS-CoV-2 and who died. We

determined the presence of severe or irreversible organ dysfunction in 8 systems according to previously used definitions (1,2) in the 48 h preceding death. The primary cause of death was defined and adjudicated by two independent physicians based on the failure that contributed most to death or to the decision to withdraw life support. A search for sepsis according to Sepsis-3 criteria was conducted within 7 days prior to death. Hemodynamic conditions of patients with circulatory failure who had echocardiography in the 72 h prior to death were reviewed. Mediation analysis was performed to study the potential mediation effect of a respiratory failure—defined by either a respiratory acidosis (pH < 7.1 and or PaCO2 > 100 mmHg) or severe sustained hypoxemia (PaO2 < 40 mmHg)—on the relationship between sepsis and severe circulatory shock (Figure A).

**Results:** Forty-nine patients (35%) of the 172 admitted died. Eighteen (37%) were identified with sepsis with a median time to death of 3 days. Seventeen patients (35%) died with irreversible circulatory and respiratory failure, 13 (27%) with isolated irreversible circulatory failure, and only 3 (6%) with isolated irreversible respiratory failure (Figure B). The causes of death differed according to whether or not sepsis had been identified prior to death. Circulatory failure was the main cause of death in 94% of patients with sepsis, compared to 52% of non-sepsis patients ($p = 0.007$). Deaths attributed to respiratory failure were more frequent in patients without sepsis (29% vs. 6%, $p = 0.007$). Neurological failure accounted for 6 deaths (12%). The introduction of vasopressors occurred a median of 3 days before death. Hemodynamic profiles prior to death were similar between patients with and without sepsis, with right heart dysfunction being the predominant finding (Figure C). A hyperkinetic LV profile was seen in 47% of cases, while only 11% had LV systolic dysfunction. Mediation analysis revealed a significant direct relationship between sepsis and circulatory failure, with a modest mediation effect of respiratory failure (Figure D).

**Conclusions:** Our study reveals that in patients with ARDS secondary to SARS-CoV-2, the primary cause of death is circulatory failure, predominantly precipitated by sepsis. Mediation analysis reveals a modest, albeit non-significant, mediation effect of respiratory failure on this relationship.

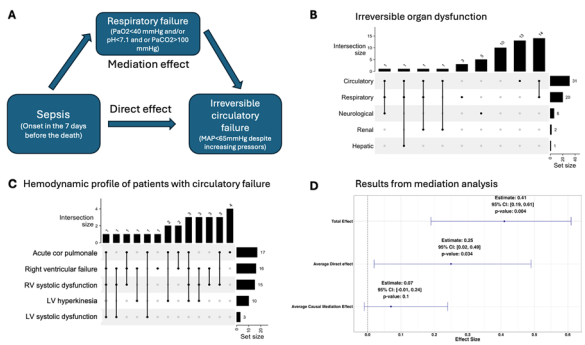


**Fig. (abstract 000692)** Directed acyclic graph illustrating the relationship between sepsis and circulatory failure, with a focus on the mediating role of respiratory failure. **B.** UpSet plot showing the irreversible organ dysfunction depicted in each patient. **C.** UpSet plot illustrating the hemodynamic profiles of patients who developed circulatory failure prior to death. **D.** Forest plot presenting the outcomes of a mediation analysis, examining the influence of respiratory failure on the link between sepsis and circulatory failure

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**Topic:** Cardiovascular issues in ICU

## 000693

## Long-term outcomes after extracorporeal membrane oxygenation in the Netherlands

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000693

**Introduction:** Extracorporeal membrane oxygenation (ECMO) is increasingly utilized in intensive care units (ICU), providing essential support for patients with respiratory or cardiac failure. However, there is limited knowledge about long-term outcomes and quality of life after ECMO.

**Objectives:** To report on five-year survival, health-related quality of life (HRQoL), and work-status of patients who received venoarterial ECMO, venovenous ECMO or extracorporeal cardiopulmonary resuscitation (ECPR).

**Methods:** This is a follow-up study of a previously conducted and published prospective multicenter observational cohort study on the survival and cost-effectiveness of ECMO (ref 1). Patients received ECMO support or ECPR between August 2017 and July 2019. The study was performed in ten university hospitals and major non-university hospitals in The Netherlands. Mortality rates were obtained by consulting the Dutch municipal records database. All patients from the original study cohort, who were still alive after five years, received a questionnaire. HRQoL was assessed using the EuroQol-5D-5L questionnaire and work status was assessed using the productivity cost questionnaire.

**Results:** A Kaplan–Meier analysis (Figure 1) shows high mortality in the initial year after ECMO, but thereafter plateauing survival curves. Of the initial 428 included participants, 194 (45%) were alive after one year and 155 (36%) were alive after five years. Five-year survival was 45% in patients who received ECMO for respiratory support, 42% for cardiac support and 26% for ECPR. The mean age at the initial ICU admission of the five-year survivors was 52 years (SD 14). ECMO duration was 186 h (SD 208), Length of ICU stay was 24 days (SD 19), and in-hospital stay was 36 days (SD 25). 77 patients (50%) received ECMO on a cardiac indication, 58 patients (37%) for respiratory failure and 20 (13%) were ECPR patients.

All five-year survivors received a questionnaire by mail, which was returned by 105 (67%) participants. Five-year HRQoL was rated higher than one-year HRQoL, with a median EQ-index value of 0.82 (IQR 0.73 – 1.0) compared to 0.81 (IQR 0.68–0.91). HRQoL on a visual analogue scale (0—100) was rated 75 ((median) IQR 65–85), which was the same as the score after one year. After five years, the majority of patients are either employed (30%) or retired (31%), with 22 individuals (25%) declared unfit for work.

**Conclusions:** The patient category undergoing ECMO or ECPR has a high mortality despite ECMO utilization. However, in the survivors, the risk of mortality diminishes and stabilizes after the first year of ECMO support. Long-term HRQoL is generally acceptable, although with some impairment in day-to-day functioning. Additionally, some patients can to return to work.

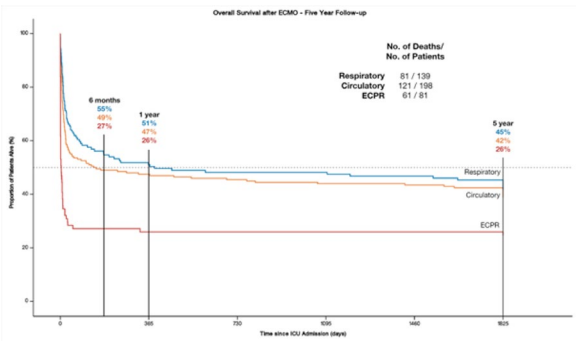


**Fig. 1 (abstract 000693)** Kaplan–Meier analysis

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2. Walter vd Bergh received an Zon Mw grant for the cost-effectivess study in ECMO

**Topic:** Health Services Research and Outcome

## 000694

### Prone positioning in severe ards early reduces cardiac preload and afterload in patients with or without acute cor pulmonale

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000694

**Introduction:** Prone positioning (PP) in patients ventilated for moderate-to-severe acute respiratory distress syndrome (ARDS) has shown hemodynamic benefit by unloading the right ventricle (RV) after 18 h (1). However, the immediate central hemodynamic impact of changing cardiac loading conditions induced by the initiation of PP, especially in the presence of acute cor pulmonale (ACP), has been little studied (2,3).
**Objectives:** The aim of the study was to assess the early impact of PP on ventricular function using three-dimensional transesophageal echocardiography (TEE-3D) in patients ventilated for severe ARDS.
**Methods:** We retrospectively studied patients under invasive mechanical ventilation for severe ARDS secondary to COVID-19 who required a PP session. A TEE-3D was performed just before and within the hour following the initiation of PP. Hemodynamic and respiratory parameters were collected simultaneously at the time of each assessment. ACP was defined as the combination of RV dilation (end-diastolic RV/left ventricular [LV]area $\geq 0.6$) and a paradoxical septal motion. Measurements were made independently by two experts from different centers and their reproducibility was assessed by measuring the intraclass coefficient (ICC).
**Results:** Between March 2020 and December 2021, 24 patients were studied. Eleven patients (45%) had isolated RV dilation and 13 (55%) had ACP. After PP, systolic arterial pressure slightly decreased from 139 mmHg (IQR [119,150]) to 132 mmHg (IQR [117–144], $p=0.037$), and systemic vascular resistance from 1841 mmHg/L/min (IQR [1492,2380]) to 1517 mmHg/L/min (IQR [1428,1803], $p=0.050$). Pulmonary compliance and driving pressure improvements were more pronounced in patients without ACP versus those with ACP. Specifically, the mean difference in static compliance improvement was +25% (CI95%: [−10,60]), and the improvement in driving pressure was -20% (CI95% [-41,1]). PP significantly unloaded both ventricles (Figure A and B). The ejection fraction of both ventricles remained stable, as well as the RV free-wall longitudinal strain (Figure C). Median RV/LV end-diastolic volume ratio was unchanged (Figure D), confirming homogeneous unloading of both ventricles by PP. PP induced a significant decrease in the right atrioventricular pressure gradient (Figure E) and a significant increase in RV-pulmonary artery coupling (Figure F). Results were similar in patients with and without ACP. Inter-observer reproducibility for ventricular volume measurement in TEE-3D was excellent (ICC for RV end-diastolic volume measurement: 0.92, $p<0.001$).
**Conclusions:** In patients ventilated for severe COVID-19 related ARDS, PP early unloads the two ventricles, and significantly reduces RV afterload while increasing RV-PA coupling.

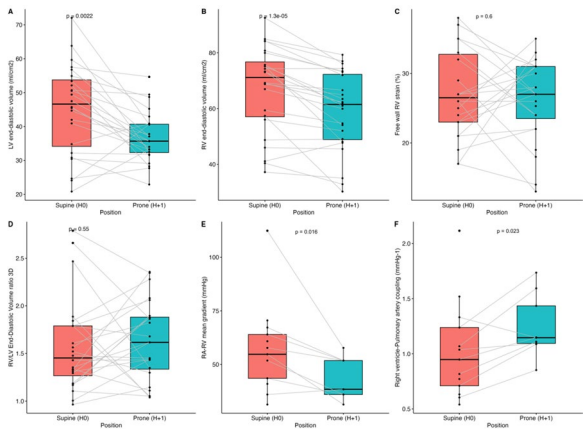


**Fig. (abstract 000694)** Box plot comparing RV and LV function parameters before prone positioning and within the hour following prone positioning

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**Topic:** Cardiovascular issues in ICU

## 000696

### Hyperinflammatory and hypoinflammatory phenotypes are present in critically ill patients with pneumonia and have different microbiologic profiles

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000696

**Introduction:** Latent class analysis (LCA) has identified two inflammatory phenotypes in acute respiratory distress syndrome (ARDS) and sepsis with divergent biological, clinical, and therapeutic features (1). However, the generalizability of these inflammatory phenotypes to patients with severe pneumonia is unknown, and differences in microbiologic profile between these phenotypes remain incompletely understood.
**Objectives:** To use LCA to identify underlying latent molecular subphenotypes in severe pneumonia and characterize their clinical and microbiological features.
**Methods:** We studied two observational cohorts (EARLI or mBAL) of patients ($n=415$) with clinically and radiologically confirmed pneumonia and admitted to the intensive care units of two hospitals in San Francisco (2). We performed LCA using clinical data and plasma biomarkers from a day of enrollment as class-defining variables. We compared the concordance of the new latent classes with previously identified ARDS phenotypes using a validated parsimonious classifier model (3). We evaluated differences in clinical outcomes and respiratory pathogen microbiology between classes.
**Results:** We found that a 2-class model best fit the data ($p=0.074$). The 71 (17%) patients with a hyperinflammatory phenotype had higher in-hospital mortality (61% vs 18%, $p<0.0001$), elevated plasma inflammatory biomarkers, creatinine, and bilirubin levels, and lower blood pressure (Figure A). The parsimonious classifier model performed with an area under the ROC curve of 0.80, indicating overlap with previously identified phenotypes. Respiratory and blood cultures were more often positive in hyperinflammatory pneumonia (Figure B and C). *Enterobacterales* species, *Staphylococcus aureus* and *Streptococcus pneumoniae* were the most commonly identified pathogens from respiratory culture in this group. *S. pneumoniae* was also more common in blood cultures from the hyperinflammatory group compared to the hypoinflammatory group (13% versus 2%, $p=0.001$). Viral PCR testing was performed in 21% of patients in both phenotypes, and there were no significant differences in the identification of respiratory viral pathogens by phenotype ($p>0.9$).
**Conclusions:** Using LCA, we identified two inflammatory phenotypes in severe pneumonia, characterized by differences in mortality, inflammatory biomarkers, and clinical microbiology. These phenotypes demonstrate similarities to previously identified inflammatory phenotypes of ARDS and sepsis, supporting the idea that these phenotypes are present across syndromic diagnoses in critically ill patients.

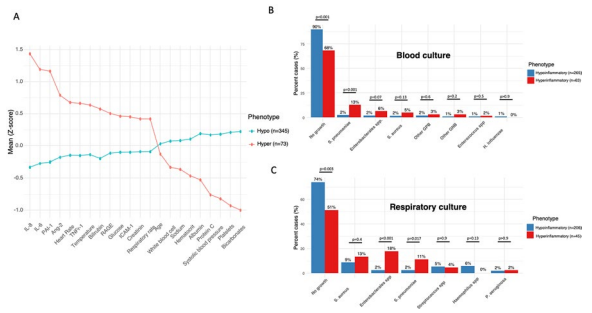


**Fig. (abstract 000696)** Average values per variable determined by latent class analysis, highlighting differences between inflammatory phenotypes in severe pneumonia. **B.** Comparison of positive blood culture pathogens rates between phenotypes among patients who underwent blood culture drawn. P-values (Fisher's Test) are used to compare the proportions of each pathogen between phenotypes among those sampled. **C.** Comparison of positive respiratory culture pathogens rates between phenotypes among patients who underwent respiratory sampling (bronchoalveolar lavage or tracheal aspirate).P-values (Fisher's Test) are used to compare the proportions of each pathogen between phenotypes among those sampled

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4. Bruno Evrard was funded by La Société de Réanimation de la Langue Française, L'Institut Servier, La fondation Monahan, and La fondation Philippe

**Topic:** Sepsis

## 000697

### Unilateral lung injury model in pigs: PEEP management through esophageal pressure

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000697

**Introduction:** Acute respiratory distress syndrome (ARDS) is the most common pulmonary complication in critically ill patients that often results in unfavorable outcomes. A unilateral development of acute lung injury (ALI) is observed in approximately 23% of ARDS patients.
**Objectives:** So far, no research guiding PEEP through esophageal pressure in unilateral ALI was performed.
**Methods:** Separation of lungs in mechanically ventilated pigs was established by a modified double lumen tube. ALI was induced in the left lungs by 0.3% Triton X-100 lavage. After induction of ALI, pigs were randomized to PEEP 5 cmH2O (A) or a PEEP that corresponds to a transpulmonary positive end-expiratory pressure (TPPEsExp) between 1–3 cmH2O (B) and were ventilated for 6 h. We characterized ALI by microscopic lung injury score (LIS) as defined by the ATS by two blinded pathologists. Results are presented as mean ± standard deviation.
**Results:** Twelve pigs were randomized to the study groups. At baseline, no relevant differences in lung mechanics were observed. After 6 h mechanical ventilation of both lungs with a tidal volume of 6 ml/kg bodyweight in group A PEEP was 5 ± 0 vs 10.8 ± 2.1cmH2O in group B; TPPEsExp was -2.6 ± 2 in group A and 1.2 ± 1.7cmH2O in group B; mechanical power in group A was 18.6 ± 2.7 vs group B 18.1 ± 1.7 J/min; driving pressure was in A: 12.3 ± 1.7 vs B: 9 ± 1.4cmH2O; respiratory system compliance was in A: 23.2 ± 5.7 vs in B: 31.8 ± 3.4 ml/cmH2O.In lower lung lobes LIS were: group A right: 0.22 ± 0.07; B right: 0.17 ± 0.09; group A left: 0.49 ± 0.10; B left: 0.52 ± 0.14; Upper lobes LIS were: A right: 0.18 ± 0.1 B right: 0.2 ± 0.07; A left: 0.38 ± 0.16 B left: 0.3 ± 0.1.
**Conclusions:** In our strict unilateral ALI model a PEEP management corresponds to a transpulmonary positive end-expiratory pressure (TPPEsExp) between 1–3 cmH2O increased respiratory compliance

and decreased driving pressure at the same level of mechanical power. Nonetheless, after 6 h no differences in LIS could be observed.

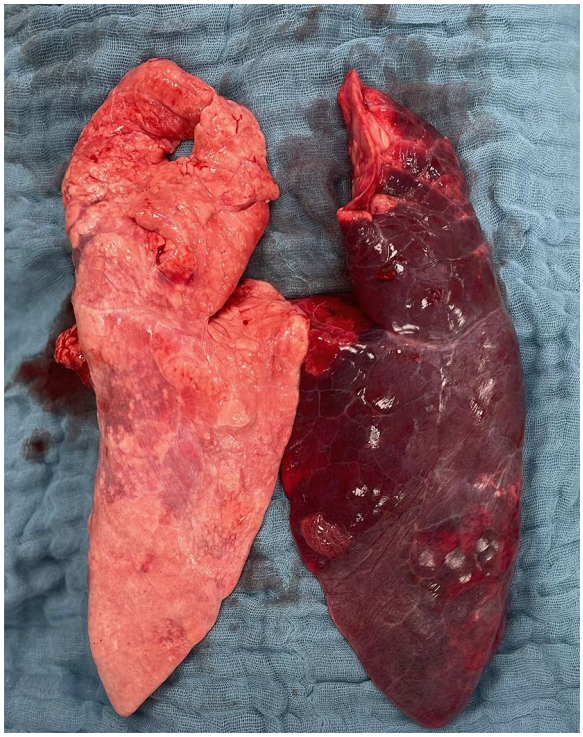
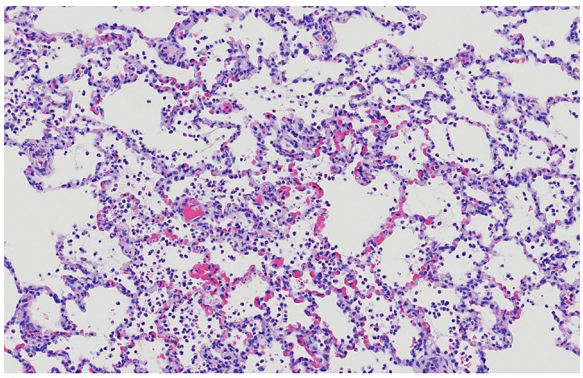
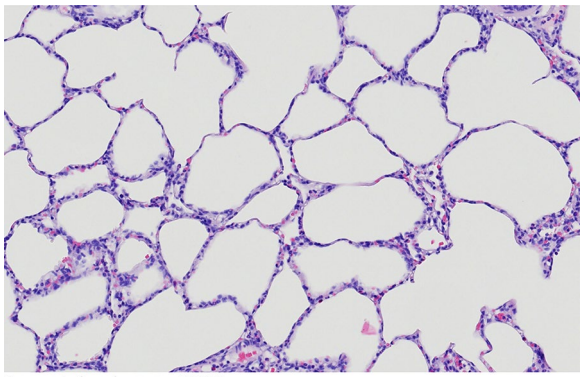


**Fig. (abstract 000697)** Macroscopic aspects



Representative microscopy: LIS 0.65

**Fig. (abstract 000697)** Representative microscopy 1



Representative microscopy: LIS 0.11

**Fig. (abstract 000697)** Representative microscopy 2

**Reference(s)**

1. German Center for Lung Research (DZL)

**Topic:** Acute respiratory failure and mechanical ventilation

## 000698

### Exploring the effects of hyperoxic intermittent stimuli on reticulocyte levels: a randomized pilot study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000698

**Introduction:** Anemia is a prevalent issue among hospitalized patients, particularly in critically ill patients and in those undergoing surgery, including oncological procedures [1]. This condition often necessitates red blood cell transfusions, which carry inherent risks. With the rising incidence of cancer and aggressive treatments, the demand for transfusions has increased, posing challenges exacerbated by a dwindling blood donor pool. The normobaric oxygen paradox (NOP) has emerged as a potential avenue to increase EPO levels, offering therapeutic promise [2]. While some studies support its efficacy, research in this area remains limited, especially in clinical settings.
**Objectives:** This study aims to assess the effectiveness of a normobaric oxygen paradox (NOP) protocol in stimulating erythropoiesis, as measured by changes in reticulocyte counts, in cancer patients undergoing abdominal surgeries.
**Methods:** This is a prospective, single-center, controlled, randomized pilot study. A total of 49 patients undergoing abdominal surgery were retrospectively evaluated from a precedent trial performed at the Bordet Institute from February to November 2011. Adult patients undergoing abdominal oncological surgeries and who were admitted to the intensive care unit (ICU) for at least 24 h were enrolled, excluding those with severe renal insufficiency or who received transfusions during the study period. Participants were randomized into two groups at the admission to the ICU: a normobaric oxygen paradox (NOP) group and a control (CTR) group. The NOP group received 60% oxygen for two hours on days 1, 3, and 5 post-surgery, during the recovery in the ICU and the ward when discharged, while the CTR group received standard care.
**Results:** The final analysis included 33 patients (median age 62 [IQR 58–66], 28 (84.8%) males), with no withdrawals or deaths during the study period. No significant differences were observed in baseline surgical characteristics or perioperative outcomes between the two groups. In the NOP group ($n = 16$), there was a significant rise ($p = 0.03$), along the study period, in the percentage of reticulocyte

levels in comparison to the CTR group ($n=17$), with median values of 36.1% (IQR 20.3–57.8) versus -5.3% (IQR −19.2 to 57.8), respectively, suggesting enhanced erythropoiesis. Despite this, the increases in hemoglobin and hematocrit levels did not significantly differ between the groups. Finally, the duration of surgery exhibited a statistical tendency (p 0.08) to be negatively correlated with the difference in hematocrit levels at the end of the study period.
**Conclusions:** This pilot study provides preliminary evidence supporting the potential of normobaric oxygen therapy in stimulating erythropoiesis in cancer patients undergoing abdominal surgeries. While the NOP protocol resulted in increased reticulocyte counts, further research with larger sample sizes and multi-center trials is warranted to confirm these findings and explore the optimal oxygen therapy regimen and long-term effects. If validated, normobaric oxygen therapy could offer a non-invasive and cost-effective approach to managing postoperative anemia, reducing reliance on blood transfusions and recombinant erythropoietin therapy, which could be of interest, especially in critically ill patients.

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**Topic:** Transfusion and haemostasis disorders

## 000699

### *Beta*-lactam antibiotic concentrations and the acquisition of multi-drug resistant bacteria in critically ill patients

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000699

**Introduction:** Antimicrobial resistance (AMR) is a worldwide healthcare emergency [1]. Adequate drug regimens result in drug concentrations able to kill bacteria and reduce bacterial growth [2]. However, whether insufficient beta-lactam antibiotic concentrations can be associated with AMR emergence remains controversial [3].
**Objectives:** The aim of this study was to assess the impact of insufficient beta-lactam levels on the acquisition of AMR in critically ill patients.
**Methods:** Retrospective single-center cohort study including patients admitted to the intensive care unit of a tertiary University hospital from 2009 to 2014, who required a broad-spectrum beta-lactam antibiotic and had at least one therapeutic drug monitoring (TDM). Patients were categorized as having inadequate drug levels if the trough concentration (Cmin) fell below the clinical breakpoint for Pseudomonas aeruginosa (i.e., 8 mg/L for cefepime/ceftazidime, 16 mg/L for piperacillin/tazobactam and 2 mg/L for meropenem). AMR was defined according to breakpoints recommended by the European Committee on Antimicrobial Susceptibility Testing (EUCAST) using the disk diffusion method.
**Results:** A total of 444 patients (male gender, $n=313$, 71%; mean age $58\pm15$ years) were enrolled in the study. Patients received piperacillin/tazobactam ($n=168$), ceftazidime/cefepime ($n=58$) or meropenem ($n=218$); among them, 65 (15%) had insufficient drug levels. Nine of these 65 (13.8%) patients with insufficient antibiotic levels acquired at least one pathogen with AMR within 15 days of TDM, when compared to 84/379 (22%) in the other group (OR 0.56 [95% CI 0.27–1.19]; p = 0.13). In a multivariable competing-risk analysis including male gender, APACHE score on admission, previous colonization by other MDR bacteria, urinary catheter, central venous catheter, mechanical ventilation, previous hospitalization, previous surgery, insufficient antibiotic levels were not associated with AMR acquisition (sHR 0.84 [95% CI 0.42–1.68]). Similar results were found when a higher threshold, to define insufficient drug levels, was used (Cmin < 4 times the clinical breakpoint).
**Conclusions:** In this study, insufficient beta-lactam levels were not independently associated with AMR acquisition. Future prospective studies are needed to evaluate better the relationship between low drug levels and antibiotic resistance acquisition.

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**Topic:** Infections and prevention

## 000701

### Relationship between manifestation of hepatic encephalopaty and severity of liver failure 2022–2023

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000701

**Introduction:** The liver plays a crucial role in filtering toxins from the blood, but when it's impaired, toxins can accumulate and affect brain function. Disturbances in the urea cycle play a significant role in the pathophysiology of the condition. This can lead to a range of symptoms, from mild confusion and forgetfulness to severe disorientation, personality changes, and in extreme cases, coma.
Hepatic encephalopathy (HE) is a condition that affects brain function due to liver disease. HE is a complication in 70% of patients with liver cirrhosis. HE can be a serious and life-threatening condition, close to 30% is the one-year mortality of patients with HE in the Republic of Moldova.
**Objectives:** Our goal of this study is to determine the correlation between the grade of HE and the stage of liver failure.
**Methods:** The retrospective study was carried in ICU, MCH "Sf. Treime" during 2022–2023. All patients with hepatic failure were managed by clinical protocols and guidelines.
The severity of hepatic encephalopathy (HE) was assessed using the scoring system: West Haven Criteria.
**Results:** During the years 22–23, 1,515 patients with hepatic insufficiency were admitted to the MCH "Sf. Treime", in ICU total $n=188$ (12.5%) of patients with liver cirrhosis and hepatic encephalopathy age $56{,}21\pm10{,}17$.
Immediately admitted from Emergency Care Unit 63 patients (33.5%) with HE grade IV West Haven criteria (WHC). $N=125$(66.4%) patients were transferred from the Department of Hepatology with EH grade I-IV WHC.
$N=123$ patients with cirrhosis of the liver with positive liver enzyme test, low prothrombin and albumin levels, moderate or severe ascites, and thrombocytopenia. $N=75$ (60, 97% + 3.17)of them with HE gr IV WHC, $n=42$ (22,34% + 2.37.1) with grade HE II-III WHC, $n=6$ ($3.19\%\pm1.01$) with HE gr I WHC.

N = 65 patients with a normal rate of prothrombin level, thrombocytes and protein, liver enzymes with a normal rate or slightly elevated, without ascites. $N = 43(22.87\% \pm 2.1)$ of them with HE gr I-II WHC, $n = 15$ (7.97% ± 2.01) with HE gr III WHC and $n = 7$ (3.27% ± 2.16) patients with HE grade III-IV WHC.
No strong correlation was found between laboratory parameters and severity of HE ($p = 0.025$).
**Conclusions:** The degree of severity of HE doesn't depend on the stage of liver failure. The presence of desorders of standard laboratory parameters in liver failure can't be an indicator of severe HE.
It is important to define ammonium level and aminoacids profiles in urea cycle disorders.

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000702

### Correlation and accuracy of bioelectrical impedance variables with computed tomography for muscle mass evaluation in critically ill elderly patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000702

**Introduction:** Quantification of muscle mass is relevant in clinical practice, especially in elderly patients. Although computed tomography (CT) is considered the "gold standard" for muscle mass quantification, it is not a practical method. In these cases, bioelectrical impedance (BIA) would be a more applicable and practical tool.
**Objectives:** To study the correlation between BIA and muscle area measured on CT and the accuracy of BIA in discriminating elderly patients with adequate muscle area on CT.
**Methods:** Diagnostic study carried out in patients older than 65 years admitted to a general ICU of a private hospital who underwent tomography of the thoracic region and BIA from Dec/2021 to Jun/2022. The quantification of the muscle area was performed at the T12 level with specific software (CoreSlicer©). BIA was performed up to 7 days after CT and the estimate of muscle mass was calculated using the Talluri equation (MMTalluri). The data measured with BIA and the muscle area in the CT were correlated with Spearman's correlation. Area under the ROC curve (AROC) analysis was applied to assess the accuracy of BIA in identifying patients with adequate muscle area on CT.
**Results:** We included 48 patients (median age 81 years [IQR 74–88], 65% male, 73% admission of medical cause, 27% died during hospitalization). CT at T12 showed a muscle area of 74.5 cm2 [IQR 61.3–90.8 cm2], and 54.2% had a low muscle area. Correlations of skeletal muscle area by CT and BIA variables were significant for skeletal muscle mass ($r = 0.74$; $p < 0.001$), lean body mass ($r = 0.72$; $p < 0.001$), MMTalluri ($r = 0.72$; $p < 0.001$) and phase angle ($r = 0.36$; $p < 0.012$). However, only phase angle (AROC 0.68, 95% confidence interval 0.51–0.84) and MMTalluri (AROC 0.67, 95% confidence interval 0.51–0.83) were discriminative for detecting adequate muscle area.
**Conclusions:** The results of this study suggest that BIA has, at best, a modest accuracy for assessing the skeletal muscle area in critically ill elderly patients. In these cases, other methods of assessing the quantity of muscle mass are suggested.

**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000706

### Audit of blood glucose control amongst adult intensive therapy unit patients in a district general hospital

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000706

**Introduction:** Hyperglycaemia after critical care admission is associated with increased in-hospital mortality [1]. In the United Kingdom, the Royal College of Anaesthetists defines hyperglycaemia as a blood glucose level greater than 10 mmol/L, and states that, in best practice, insulin should be given to adult patients in critical care in cases where blood glucose levels are greater than 10 mmol/L for more than 6 h [2]. Within Buckinghamshire Healthcare NHS Trust, setting blood glucose targets forms part of the daily review checklist for patients on the Intensive Therapy Unit (ITU).
**Objectives:** To measure and improve compliance with the local policy of setting blood glucose targets daily and the national standard of commencing insulin therapy in ITU patients who have been hyperglycaemic for more than 6 h.
**Methods:** Data that had been collected as part of routine clinical care were harvested from the digital record-keeping software. Each patient day was taken as an individual data point. Each patient day was audited for the documentation of blood glucose targets, and whether appropriate insulin therapy had been commenced within 6 h of hyperglycaemia being recorded. A baseline data set was collected from 11th March to 17th March 2024. An intervention was subsequently implemented whereby members of the medical team were reminded daily at the morning handover meeting to document all daily targets when reviewing patients. A re-audit was performed looking at data from 18th March to 24th March 2024.
**Results:**

**Table 1 (abstract 000706)** Patient days pre and post-intervention with documented blood sugar targets, hyperglycaemic events, and insulin therapy

| | Total patient days | Patient days with a documented blood sugar target | Patient days with a documented blood sugar > 10 mmol/L for > 6 h | Patient days where insulin therapy was started within 6 h of hyperglycaemia |
|---|---|---|---|---|
| Pre-intervention | 61 | 16 | 28 | 18 |
| Post-intervention | 60 | 43 | 19 | 16 |

Table 1 shows that pre-intervention a blood sugar target was documented in only 26% of the daily reviews audited, compared to 72% post-intervention. This translated into a significant improvement in the proportion of hyperglycaemic episodes being treated with insulin. In the first week of data collection insulin therapy was commenced promptly in 18 of the patient days audited, out of the 28 patient days which showed hyperglycaemia lasting more than 6 h (64%). Post-intervention this rose to insulin treatment being commenced promptly in 16 out of 19 patient days in which hyperglycaemia was documented (84%).

**Conclusions:** The intervention implemented as part of this audit cycle was effective in improving compliance with both the local and national standards around the monitoring and treatment of hyperglycaemia in critical illness. Whilst causality cannot be proven, it is possible that the improved documentation of blood sugar targets led to the increased recognition and treatment of hyperglycaemia that was evident in the second week of data collection.

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3. Nil

**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000707

## Gender differences in very old patients' ICU treatment preferences: preliminary analysis of survey free-text comments

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000707

**Introduction:** Gender disparities in intensive care provision are well-known and they have so far been attributed mainly to biological and social factors (1). Gender differences in the patients' own treatment intensity preferences are not well described (2,3). In a scenario-based questionnaire of 202 Norwegian outpatients aged ≥ 80 years, we found that the ICU admission preferences of very old patients varied widely and that the male gender increased the likelihood more than two-fold that respondents would opt for ICU admission in the hypothetical event of acute critical illness (4). These gender differences were supported by analyses adjusted for age, marital status, religion, healthcare professional background, comorbidity, frailty, and health-related quality of life.

**Objectives:** We aimed to describe gender differences by analyzing free-text comments that elaborated on the underlying rationale of the respondents' ICU admission choices.

**Methods: We conducted a postal survey of a purposive sample of potential ICU candidates aged ≥ 80, exploring their ICU admission preferences in several hypothetical scenarios of acute critical illness. For each scenario, there were three mutually exclusive response options: (i) wishing to be admitted to ICU, (ii) wishing not to be admitted to ICU, and (iii) wishing to not engage in the decision. Additionally, space was provided for free-text comments. For this substudy, we analyzed free-text comments using Systematic Text Condensation (5), a method for thematic cross-case analysis of qualitative data inspired by phenomenology and further developed for the medical context as a pragmatic procedure within the social constructivist tradition. Using an explanatory sequential approach, we present preliminary findings from the qualitative analysis and descriptive respondent gender statistics.**

**Results:** Very elderly outpatients ($n = 202$; 55% females) made choices pertaining to 590 hypothetical clinical scenarios and provided 331 free-text comments [188 (57%) of female respondents] elaborating the rationale for and considerations underpinning their ICU admission choices. By analyzing these free-text comments, we identified four preliminary main categories:

1. Wishing for the impossible (e.g. being in control despite being comatose).
2. Trust, mainly in the health care providers and the health care system, but also in family members and in higher powers.
3. The course of life comprises three sub-categories: age itself, accepting the end of life, and being considerate towards future generations.
4. Hope, comprising four sub-categories: hope for comfort, hope for cure/survival, hope for dignified closure and priority for quality of life over length of life.

Figure 1 shows gender distribution within categories and sub-categories. We collapsed sub-categories with comparable gender distribution and small numbers.

**Conclusions:** In this purposive sample, we identified gender differences regarding the values and notions underlying very old survey respondents' ICU admission choices in the hypothetical event of acute critical illness. These findings add to existing evidence (2,3). Further research is needed to explore and better understand gender differences regarding very old patients' treatment intensity preferences. Our findings indicate that variations in the patients' personal goals of treatment might provide an additional explanation for gender differences in ICU provision.

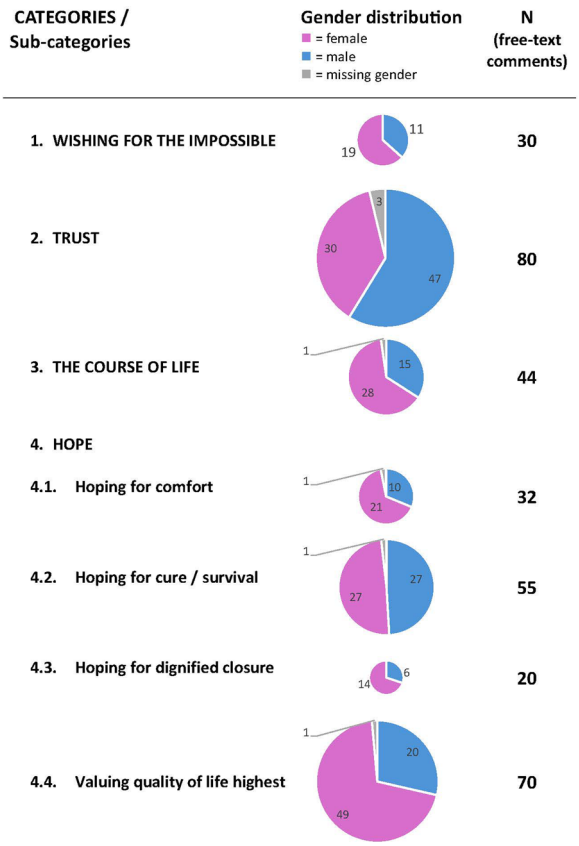


**Fig. 1 (abstract 000707)** Very old survey participants' rationale for ICU admission preferences in the hypothetical event of acute life-threatening illness and gender distribution of free-text comments

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**Topic:** Ethics and end of life care

## 000708

### Does organ transplantation center establishment have an impact on consent rates for cadaveric organ donation at an university hospital In Eskisehir, Turkiye

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000708

**Introduction:** Organ transplantation represents a crucial therapeutic option for patients with end-stage organ failure. This procedure can be performed either from living or deceased donors. However, obtaining consent for deceased donor organ transplantation, particularly from first-degree legal relatives, remains a challenge in Turkey. Several reasons contribute to organ rejection, including limited cases of death from lung and heart failure, misconceptions regarding brain death versus coma, lack of trust in healthcare services, fear of organ trafficking, expectation of miracles, low socio-educational levels, and socio-cultural attitudes influenced by religious pressures.
**Objectives:** This study aims to investigate the influence of a center's establishment as an organ transplantation facility on the consent rates for organ donation among relatives of patients. Specifically, we focused on analyzing the changes in consent rates following the establishment of the transplantation center at Eskisehir Osmangazi University Hospital in 2018. To achieve this objective, we compared the demographic data of patients diagnosed with brain death between 2018 and 2023 with those between 2014 and 2017. Additionally, we examined the consent rates for organ donation among family members during these periods.
**Methods:** Data from patients diagnosed with brain death between 2018 and 2023 at Eskisehir Osmangazi University were collected and analyzed. The demographic information and consent rates for organ donation among family members were compared with those from a previous study conducted between 2013 and 2017 in Eskisehir. Moreover, a comparative analysis was conducted between Eskisehir and Bursa, two provinces with similar socio-cultural backgrounds, regarding consent rates for organ donation.
**Results:** Between 2018 and 2023, a total of 57 patients were diagnosed with brain death at Eskisehir Osmangazi University Hospital. Among them, 19 relatives consented to organ donation, while 38 relatives refused consent for organ donation. The consent rate for organ donation in Eskisehir increased from 25.7% (2013–2017) to 33.3% (2018–2023). However, due to insufficient data on patients diagnosed with brain death, the observed increase cannot be deemed statistically significant. Therefore, further studies involving larger patient cohorts are necessary to validate these findings.
**Conclusions:** The establishment of an organ transplantation center appears to positively impact the consent rates for organ donation among relatives of patients diagnosed with brain death. However, comprehensive studies involving larger patient populations are warranted to confirm these findings and address the existing limitations in data collection.

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**Topic:** Brain death, organ donation and transplantation

## 000709

### Acute hypoglycemic sulfonamides poisoning in intensive care: epidemiological, clinical characteristics and outcomes

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000709

**Introduction:** Acute intoxication with hypoglycemic sulfonamides (HGS) is life-threatening poisoning due to the potential of hypoglycemia with its neurological complications and sequelae.
**Objectives:** Describe the epidemiological, clinical, therapeutic, and prognostic characteristics of acute intoxications with hypoglycemic sulfonamides (HGS) admitted to the intensive care unit.
**Methods:** This was a retrospective descriptive study conducted in a toxicology Intensive Care Unit over a period of 5 years (2019–2023). We included patients admitted to the ICU for intoxication with HGS. Patients with polydrug poisoning involving HGS and another drug interfering with carbohydrate metabolism, particularly metformin, were excluded.
**Results:** Thirty-six patients were included. The mean age was $26 \pm 10$ years. Eight patients (22%) were children. The gender ratio was 0.5. Six patients (17%) were diabetic, of whom 5 were treated with HGS. Twelve patients (33%) had a psychiatric history and 15 patients had a history of at least one suicide attempt. It was a suicidal act in all cases. Glimepiride intoxication accounted for 66% of cases ($n = 24$) and glibenclamide intoxication for 33% of cases ($n = 12$), with average presumed ingested doses of $50 \pm 32$ and $41 \pm 28$ mg, respectively. Hypoglycemia was the main reason for admission, present in 35 patients with an average onset time of 4 h. The mean initial capillary blood glucose was 0.5 mg/dl [0.23–1.4]. The main symptoms of hypoglycemia noted were asthenia (38%), profuse sweating (36%), and headaches (19%). No patient experienced seizures or coma. Eighteen patients (50%) presented with hypokalemia at admission. Our management focused on continuous glucose serum infusion, with an average administered glucose quantity of $113 \pm 75$ g/24 h. No patient received octreotide. The average length of hospital stay was 3 days. All patients survived.
**Conclusions:** Anti-diabetic medication intoxications are becoming more common in the intensive care unit. For hypoglycemic sulfonamide-induced acute poisoning, serious complications can be avoided with prompt and appropriate care.

**Topic:** Poisoning/Toxicology/Pharmacology

## 000710

### Adult generalized tetanus: successful experiences from a resource limited centre in a developing country

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000710

**Introduction:** Tetanus is a preventable, yet life-threatening neurologic disorder characterized by trismus and muscle spasms(1). Although it is a rare disease in modern times, due to vaccination practices, it remains prevalent in developing countries (1).
**Objectives:** In this study we aimed to share our experience of managing five patients of adult generalized tetanus, over the past one year.
**Methods:** It was a single-center, retrospective study, evaluating the medical records of patients who presented to the emergency room with the diagnosis of Tetanus between April 2023 to March 2024. For diagnosis, we used the WHO definition which employs clinical assessment, consideration of factors like history of the wound and presence of symptoms such as lockjaw, muscle spasms, and rigidity of the neck or abdomen(2). For data analysis, we used hospital records, covering demographics, injury type, incubation period, antibiotic use, need for mechanical ventilation, tetanus antitoxin/immunoglobulin dosage, sedative/analgesic administration, muscle relaxants used, ICU and hospital stay duration, presence of autonomic instability, pneumonia, and other complications. Tetanus severity was graded using the Ablett system: Grade 1(mild), mild to moderate trismus with no respiratory compromise; Grade 2 (moderate), moderate trismus and moderate respiratory compromise with an increased respiratory rate (>30 breaths per min); Grade 3(severe), severe trismus with increased respiratory rate (>40 breaths per min) and tachycardia (>120 beats per min); Grade 4 (very severe), severe manifestations with autonomic dysfunction(3).
**Results:** Of the five patients, 4 were male and all 5 were from rural areas. 4 patients recovered and one patient died. The mean age was 43 years. None of them had any history of prior vaccination. Out of the five patients, 1 patient had moderate disease, 2 patients had severe disease and 2 patients had very severe disease. All the patients required mechanical ventilation. The mean duration of onset of disease from the day of injury was 13.2 days. Autonomic instability was seen in 3 patients and pneumonia developed in 4 patients during their course of hospital stay. Median duration of hospital stay was 38 [IQR:29.5–51.1] days. Patients in the Severe group needed prolonged mechanical ventilation and heavy sedation combined with muscle relaxants. All five patients developed critical illness myopathy due to prolonged hospital stay and the use of muscle relaxants. Improvement in muscle weakness was observed during the follow-up visits. All the patients received human tetanus immunoglobulin on admission and were vaccinated with tetanus toxoid during follow-up. Wound debridement was done in two cases.
**Conclusions:** Although the incidence of tetanus is decreasing globally, it remains prevalent in developing countries. Patients presenting with severe generalized tetanus require prolonged ICU stay.


**Fig. (abstract 000710)** (A) Wound on the thumb (B) Wound on the dorsum of the foot (C) Locked Jaw (D) Opisthotonus posturing

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**Topic:** Infections and prevention

## 000711

## Nursing praxis and clinical decision-making in intensive care: an anthropological study on the rituals and practices of nurses at a hospital in Greece

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000711

**Introduction:** Caring for critically ill patients in the Intensive Care Unit (ICU) presents special challenges to the staff because of the complexities of the technology utilized and the critical illness of the patient. [1–3] This study explores nursing praxis at an ICU in Greece and critically discusses the power relations in which the nurses acted as carers and clinical decision-makers, as well as the kind of meanings and identities that emerged in the cultural ethos of critical care.[4] Clinical Decision-making is an important aspect of ICU nursing, and whether nurses participate in it has been a long-standing subject of inquiry. [5–9].
**Objectives:** To understand how power relations, rituals, and practices determine the care delivered at a hospital in Greece, with a particular focus on the participation – formal and informal—of nurses in the clinical decisions of the ICU team.
**Methods:** This study falls within the realm of critical medical anthropology and phenomenology. Data were collected via two-year participant observation at a teaching ICU in Greece and via 20 in-depth interviews. Interviews were analyzed according to the thematic approach of Braun and Clarke.[10] The study was completed in 2021.
**Results:** "Routine", that is scheduling of care and work on a day-to-day basis, emerged as a technology of discipline. For example, "bed-baths" and “bedmaking” were part of a strict “monochronic” routine every morning, and were consistent with a culture of hierarchy and exclusion, in which the nurses on this particular unit were subjectified as agents of basic somatic (bodily) care rather than specialist care. This deterred nurses from formally participating in the clinical decisions of the ICU team. However, ethnographic fieldnotes and narratives of the nurses also led to the following findings: a) during the rituals of bed-baths and bed-making, nurses were in total synch with their patient’s care needs as they entered their polychronic time dimension; b) morning bed-baths facilitated the creation of a "zone" of privacy; c) nurses acted as agents of critical care, as the "ears" and "eyes" of doctors and patients through “nursing gaze”; d) nurses were subjectified as visible negotiators of care and treatment in the case of emergency and rapid patient deterioration; and e) the cultural habitus of intensive care activated a discourse of compassionate care.
**Conclusions:** In this study, ICU nurses were found to settle power relations and strengthen their negotiating power towards the doctors by applying their specialist knowledge in practice. On the other hand, most of the time they acted as informal clinical decision-makers and rendered themselves more "visible" via their compassionate patient care. This particular finding in Greece constitutes a significant differentiation from similar studies in other countries.

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11. This study has been partially funded by the University of West Attica, Athens, Greece

**Topic:** Nursing care and physiotherapy

**000713**

## Advancing antibiotic stewardship in severe community-acquired pneumonia: machine learning insights from the MIMIC-IV database

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000713

**Introduction:** Severe community-acquired pneumonia continues to be a major health challenge globally, contributing significantly to morbidity and mortality rates. The administration of empirical antibiotic therapy is a common approach, yet it is increasingly complicated by the emergence of multidrug-resistant pathogens, notably Methicillin-resistant Staphylococcus aureus (MRSA) and Pseudomonas aeruginosa. This rise in resistance complicates effective antibiotic management. Hence, we advocate for the application of machine learning techniques to analyze extensive clinical datasets, such as MIMIC-IV. This approach has the potential to create predictive models that could assist healthcare professionals in early identifying patients at elevated risk of developing infections caused by these resistant pathogens using data from the first 72 h of admission.
**Methods:** We conducted a retrospective analysis of severe pneumonia cases using the MIMIC-IV database, focusing on a cohort of 940 unique hospital admissions involving critically ill patients. The study extracted an array of patient data for analysis, including demographics (race, insurance status, marital status, age), clinical variables (length of hospital stay, temperature, heart rate, respiration rate, oxygen saturation, systolic and diastolic blood pressure), and microbiological data (specimen types, tests conducted, results, and timing of test requests post-admission to the Emergency Department (ED)). These data points were used for the development of predictive models employing various supervised machine learning algorithms: Multi-Layer Perceptron (simple neural network), Random Forest Classifier, Extra Trees Classifier, and Gradient Boosting Classifier. These models aimed to predict the presence of Gram-Positive Bacteria, Gram-Negative Bacteria, and more specifically, MRSA and Pseudomonas in microbiology test results within the first 72 h of admission. To address data imbalance, model performance was assessed using the macro F1-score across a fivefold cross-validation process.
**Results:** Our analysis encompassed 940 hospital admissions where patients were diagnosed with severe pneumonia, totaling 6,949 microbiological tests. Within this dataset, 124 tests confirmed MRSA, while 797 identified Pseudomonas infections. The performance of our predictive models was encouraging, with the Random Forest Classifier achieving the highest macro F1-score of 84.11%. In contrast, the Gradient Boosting Classifier had the lowest performance, with a macro F1-score of 76.01%.
**Conclusions:** Our research underscores the significant potential of supervised machine learning algorithms in identifying the likelihood of MRSA or Pseudomonas aeruginosa as the causative agent in severe pneumonia. These predictive models can serve as essential tools for healthcare providers, enabling more precise antibiotic selection, which in turn supports antibiotic stewardship initiatives and helps combat the rise of antimicrobial resistance. Integrating these models into clinical workflows could markedly enhance patient management, minimizing the unwarranted use of broad-spectrum antibiotics. To ensure these models can be effectively adopted in everyday clinical practice, further prospective studies for their validation and refinement are crucial.

**Topic:** Sepsis

**000715**

## Comparison of risk factors and outcome for candidemia versus bacteremia in critically ill patients: a retrospective multicenter study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000715

**Introduction:** Candidemia is an alarming problem with increasing prevalence in critically ill patients admitted to an intensive care unit (ICU) associated with morbidity and mortality. However, the risk factors and outcomes associated with candidemia may vary compared to those associated with bacteremia.
**Objectives:** This study aimed to identify critically ill patients at high risk of candida versus bacterial bloodstream infections (BSI) and assess their characteristics and outcomes.
**Methods:** This was a multicenter retrospective observational case–control study on critically ill patients admitted to the ICU of three large Greek hospitals in Crete. Each eligible patient with candidemia (case) was matched to a control with bacteremia and to a second control with no BSI.
**Results:** Overall, 403 patients were enrolled, 91 with candidemia (C-BSI), 157 with bacteremia (B-BSI), and 155 with no-BSI. Candida species included C. albicans ($N=24$, 26.4%) mainly with 15% resistance to azoles, and C. non-albicans ($N=67$, 73.6%), mainly with 25.6% resistance to echinocandins. Risk factors associated with C-BSI included immunosuppression ($p=0.006$), total parenteral nutrition ($p=0.03$), previous fungal colonization ($p<0.001$), and Candida score ($p<0.001$), while demographic factors were not found to significantly contribute to the development of BSI. Clinical severity was significantly higher on the day of infection for B-BSI group (SAPS-II score C-BSI 47 vs. B-BSI 55 vs. no-BSI 34, $p=0.005$). The timeframe between ICU admission and BSI (C-BSI 24 days vs. B-BSI 14 days, $p=0.001$), mechanical ventilation duration (C-BSI 35 days vs. B-BSI 23 days vs. no-BSI 14 days, $p<0.001$), ICU stay (C-BSI 35 days vs. B-BSI 24 days vs. no-BSI 14 days, $p<0.001$)

and hospital stay (C-BSI 42 days vs. B-BSI 31 days vs. no-BSI 20 days, $p<0.001$) were longer in candidemia group (Fig 0.1). Patients with increased Candida score (OR 2.0, p = 0.006), with longer duration of mechanical ventilation (OR 1.14, $p=0.03$), and lower clinical severity (SAPS-II) on the day of BSI (OR 0.9, $p=0.006$), were more likely to develop candidemia than bacteremia. Mortality was 74.7% in C-BSI, 72.6% in B-BSI, and 57.4% in non-BSI ($p=0.004$). Increased Candida score (AUROC 0.634, 95% CI 0.520–0.747, $p=0.021$) and clinical severity on the day of BSI (SAPS-II AUROC 0.770, 95% CI 0.675–0.866, $p<0.001$) were identified as mortality predictors.
**Conclusions:** Immunosuppression, elevated candida score, prolonged mechanical ventilation, and extended ICU stay emerge as discernible risk factors for the development of candidemia as opposed to bacteremia. These results can aid in identifying patients who are most likely to benefit from empiric antifungal therapy.

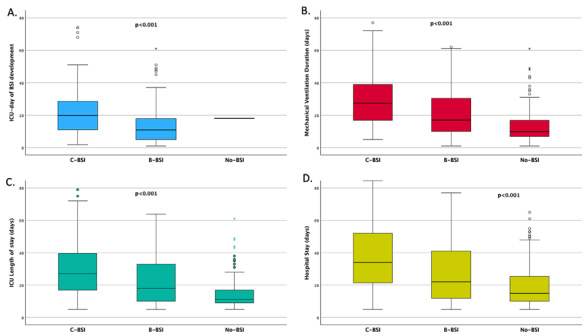


**Fig. 1 (abstract 000715)** Timeframe between admission and bloodstream infection (A), mechanical ventilation duration (B), ICU length of stay (C), and hospital length of stay (D) in patients with candidemia (C-BSI), with bacteremia (B-BSI), and with no bloodstream infection (No-BSI)

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**Topic:** Infections and prevention

## 000716

### Discordance between physical and cognitive problems among critical COVID-19 survivors: a 1-year prospective cohort

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000716

**Introduction:** Frailty, persistent symptoms, physical and cognitive problems are frequent after critical COVID-19. However, their co-occurrence and post-discharge trajectories are unknown.
**Objectives:** To study the concordance between physical and cognitive problems after hospital discharge due to critical COVID-19 during a 1-year follow-up.
**Methods:** Prospective cohort study in COVID-19 patients admitted to ICU and discharged alive from the hospital. Participants were assessed for frailty (assessed using the Clinical Frailty Scale), persistent COVID-19 symptoms (duration ≥ 2 months), and cognitive impairment (harmonized 10-point Cognitive Screener) at 1, 3, 6, 9, and 12 months post-discharge. Concordance between physical and cognitive problems was evaluated with proportions and Cramer's V bias-corrected. Clusters of physical and cognitive impairment were defined using sequential analysis, and Cohen's kappa coefficient evaluated the agreement.
**Results:** We followed 428 participants for one year (mean age of 64 years, 57% males, and 61% required invasive mechanical ventilation). Physical and/or cognitive problems were experienced in 80% of responders at least once during follow-up (263/331 participants), and half reported any problem even after one year. Most participants experienced health problems in a single health domain, with co-occurrence less than 8% in every assessment (Cramer's V bias-corrected less than 0.08 in any assessment) [Figure]. The sequential analysis identified three clusters each of cognitive and physical trajectories with no agreement (kappa = 0).
**Conclusions:** Critical COVID-19 survivors frequently experience physical and/or cognitive problems, yet these conditions and their trajectories are discordant. Multidimensional evaluations post-ICU discharge can aid in delivering tailored rehabilitation programs.

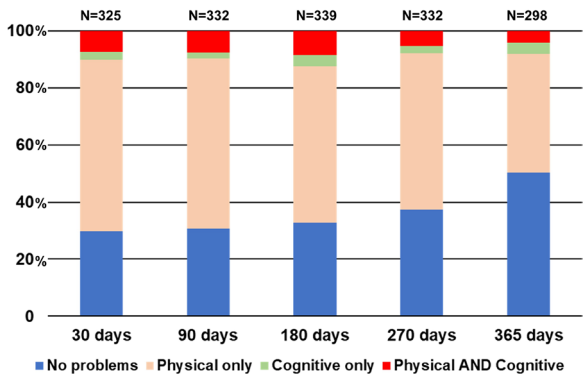


**Fig. (abstract 000716)** Prevalence and cooccurrence of physical and/or cognitive problems in critical COVID-19 survivors during one-year follow-up

**Topic:** Health Services Research and Outcome

## 000718

### Perioperative risk factors for acute kidney injury and renal replacement therapy following lung transplantation in ICU: a retrospective analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000718

**Introduction:** Acute kidney injury (AKI) after lung transplantation (LTx) is common and associated with increased mortality, particularly in those requiring renal replacement therapy (RRT).
**Objectives:** This retrospective analysis aimed to identify perioperative risk factors for AKI and RRT immediately after LTx, with a secondary focus on evaluating outcomes in the AKI and RRT population in the intensive care unit (ICU).
**Methods:** A cohort of 465 adult patients who underwent LTx at Vall d'Hebron University Hospital from January 1, 2018, to December 31, 2022, was analyzed. Patient characteristics and postoperative outcomes in the ICU were compared using chi-square, Fisher's exact test, Mann–Whitney U test, and logistic regression, as appropriate. Multivariate analysis was conducted including all statistically significant variables in the univariate analysis. Survival analysis using Kaplan–Meier

curves and comparison using log Rank tests were also performed. All statistical analyses were conducted using SPSS versión 23.0 (IBM, New York, US).

**Results:** A total of 109 patients (23.4%) had AKI postoperatively, with 28 needing RRT (6.4%). Factors associated with higher AKI and RRT rates included cardiopulmonary bypass (CPB), prolonged CPB, elevated lung allocation score (LAS), lung retransplantation, postoperative bleeding, polytransfusion, delayed chest closure, extracorporeal membrane oxygenation (ECMO) use, and PGD grade 3 on days 1, 2, and 3 (Table 1). Multivariate analysis identified retransplantation, delayed chest closure, PGD grade 3 at 24 h, and CPB as independent risk factors (Table 2). Outcomes showed prolonged mechanical ventilation and ICU stay (Figure 1), accompanied by significantly higher ICU mortality rates (3.7% vs 16.5% vs 53.6% -no AKI vs AKI vs RRT-), compared using survival curves (Figure 2).

**Table 1 (abstract 000718)** Univariate analysis of risk factors for presenting AKI or requiring RRT

| | Acute Kidney Injury | | Requiring RRT | |
|---|---|---|---|---|
| **Variable** | **OR (95% CI)** | ***P* value** | **OR (95% CI)** | ***P* value** |
| Age | 0.988 (0.970–1.007) | 0.216 | 0.977 (0.948–1.006) | 0.122 |
| LAS | 1.025 (1.011–1.040) | 0.001 | 1.036 (1.015–1.056) | 0.001 |
| CPB | 2.896 (1.827–4.589) | < 0.001 | 17.791 (6.607–47.911) | < 0.001 |
| CPB duration (mins) | 1.002 (1.002–1.013) | 0.004 | 1.006 (1.001–1.011) | 0.030 |
| Delayed chest closure | 2.156 (1.081–4.301) | 0.029 | 1.612 (1.092–2.380) | 0.016 |
| Reintervention for bleeding | 3.815 (2.151–6.766) | < 0.001 | 7.202 (3.251–15.955) | < 0.001 |
| Polytransfusion | 1.984 (1.286–3.061) | 0.002 | 5–501 (2.195–13.786) | < 0.001 |
| Retransplantation | 4.243 (1.780–10.118) | 0.001 | 7.125 (2.540–19.989) | < 0.001 |
| ECMO | 4.667 (2.546–8.556) | < 0.001 | 10.319 (4.617–23.062) | < 0.001 |
| PGD 3 at day 1 | 10.540 (5.006–22.194) | < 0.001 | 31.033 (4.101–234.841) | < 0.001 |
| PGD 3 at day 2 | 8.163 (4.333–15.380) | < 0.001 | 26.889 (6.162–117.329) | < 0.001 |
| PGD 3 at day 3 | 8.068 (4.253–15.304) | < 0.001 | 28.284 (6.347–126.038) | < 0.001 |

**Table 2 (abstract 000718)** Multivariate analysis of risk factors for presenting AKI or requiring RRT

| | Acute Kidney Injury | | Requiring RRT | |
|---|---|---|---|---|
| **Variable** | **OR (95% CI)** | ***P* value** | **OR (95% CI)** | ***P* value** |
| Retransplantation | 4.162 (1.385–12.512) | 0.011 | 6.188 (1.462–26.199) | 0.013 |
| PGD 3 at day 1 | 2.324 (1.358–3.977) | 0.002 | 3.398 (1.195–9.659) | 0.022 |
| CPB | - | - | 7.143 (2.18–23.406) | 0.001 |
| Delayed chest closure | 2.387 (0.977–5.833) | 0.056 | 3.394 (1.180–9.765) | 0.023 |

**Conclusions:** AKI and RRT are significant postoperative complications, associated with higher mortality rates. Identifying independent risk factors emphasizes the need for targeted interventions to improve outcomes and reduce morbidity and mortality in ICU.

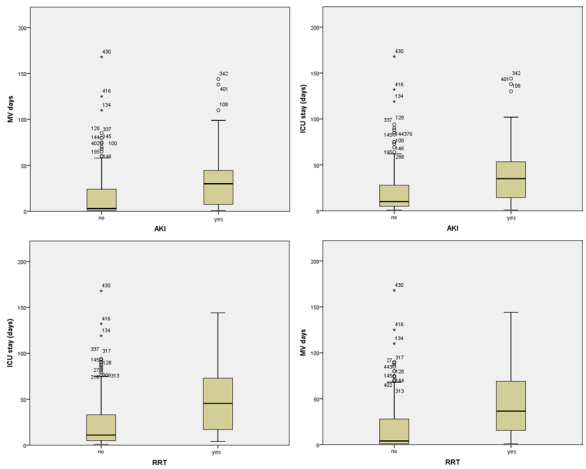


**Fig. 1 (abstract 000718)** The box plots display longer mechanical ventilation times and longer stays in the ICU in the population with AKI and in those requiring RRT

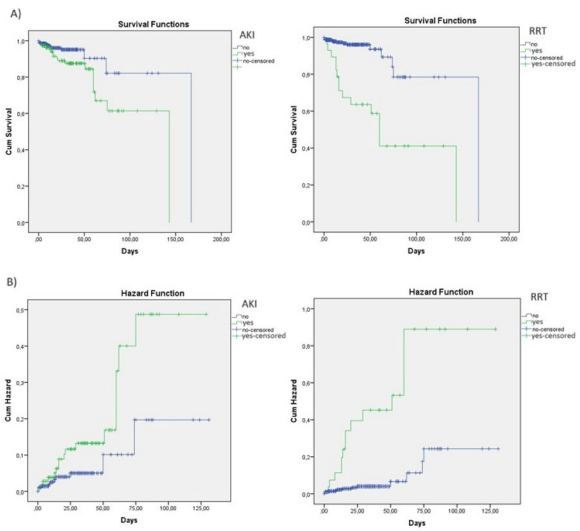


**Fig. 2 (abstract 000718)** A) Kaplan Meier curves showed lower survival in patients with acute renal failure (left) and need for RRT (right). As analyzed in the survival curves with a p-value of 0.016 in the log-rank of AKI and $p < 0.001$ in the log rank of RRT B) Hazard ratio curves show a higher cumulative risk in patients with AKI (left) and RRT (right)

**Topic:**: Perioperative care

## 000719

### Effects of low positive end-expiratory pressure and pressure support on ventilation distribution during spontaneous breathing trial: Final result

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**Introduction:** The effect of positive end-expiratory pressure (PEEP) of 5 mmHg and/or pressure support (PS) of 5 mmHg, referred to as 'minimal or no ventilator support' in daily practice during SBT on ventilation distribution is unknown. At ESICM 2023, we presented an interim report on the effect of PEEP and/or PS on ventilation distribution in various subgroups during SBT. We now present the final report of this study for 102 patients.
**Objectives:** This study aimed to investigate the effect of PEEP and 5 cmH2O PS on regional ventilation during SBT in various patient groups using Electrical impedance tomography (EIT).
**Methods:** Patients on mechanical ventilation who were planned to be extubated were included in this study and classified into 5 groups (group 1: COPD, group 2: reduced left ventricular function, group 3: obesity, group 4: low BMI, group 5: others). A 30-min SBT was divided into three 10-min phases to assess changes in ventilation distribution in the supine position. Phase 1 with a PEEP and PS of 5 mmH2O; Phase 2 with a PEEP of 0 mmH2O and PS of 5 mmH2O; and Phase 3 with T-piece. During SBT, respiratory impedance changes in the ventral and dorsal regions were recorded on EIT. All participants were extubated after passing the SBT.
**Results:** Between April 1, 2022, and March 31, 2024, 102 patients were enrolled. The mean age was 71.0 years, 67.3% were male. On admission, diagnoses were as follows: sepsis (25.5%), heart failure (18.6%), intracranial hemorrhage (15.7%), and respiratory failure (10.8%). Notably, 12% of the patients reintubated within 72 h post-extubation. In Groups 3 and 5, total lung ventilation significantly decreased when PEEP and PS were removed. In Group 4, dorsal ventilation increased significantly when PS was removed. Interestingly, this group also showed a trend towards increased ventral ventilation when PEEP was removed, although this was not statistically significant. In Groups 1 and 2, no significant differences in the effects of PEEP and PS could be detected. The change in ventilation distribution after extubation is now being analyzed and will be reported at ESICM 2024.
**Conclusions:** These results indicate that the effect of PEEP on ventilation distribution significantly depends on the patient's BMI and that even low PEEP and PS, considered physiologically minimal, can affect ventilation distribution in patients during SBT.

**Topic:** Acute respiratory failure and mechanical ventilation

## 000721

### Impact of cyclic ketogenic enteral feeding on postoperative muscular reconstitution of the critically ill: KetoNifast- study

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**Introduction:** Fasting in enteral feeding induces repair pathways such as ketogenesis, mitochondrial biogenesis, anti-inflammatory and antioxidant defenses promoting physical reconstitution in critically ill patients.(1, 2) Fasting-mimicking cyclic, enteral feeding with 12 h of nighttime fasting is sufficient to generate a metabolic fasting response without risking a caloric deficit especially if enhanced by additional supplementation of exogenous ketones.(2, 3) However, little is known about the impact of cyclic, ketogenic enteral feeding on the physical postoperative reconstitution of the critically ill.
**Objectives:** Equicaloric, cyclic enteral daytime feeding with ketogenic nighttime fasting (supported by exogenous ketone salt supplementation (ß-hydroxybutyrate)) compared to continuous standard enteral nutrition as per patients' nutritional requirements does improve muscular reconstitution of critically ill patients.
**Methods:** A prospective, monocentric, randomized, interventional study including all ICU patients > 18 years requiring enteral nutrition post elective surgery (Ethical approval 22-1398_1). Exclusion criteria are organ failure, state post pancreatectomy, metabolic disorders, autoimmune diseases, pregnancy/breastfeeding, and contraindications against enteral nutrition. All patients are randomized to either 1) 24 h conventional enteral nutrition (control group) or to 2) cyclic enteral feeding with ketogenic nighttime fasting (interventional group). The interventional group receives 12 h daytime feeding followed by 12 h of nighttime fasting supported by exogenous ketone salt supplementation. The primary endpoint of this study is the physical reconstitution of the patient measured by the daily urea-creatinine ratio and the delta of the ICU mobility Scale (0–10 points) before ICU-admission and at ICU discharge. Secondary endpoints are length of mechanical ventilation (LOMV) and length of ICU stay (ICULOS).
**Results:** So far inclusion of 13 patients (7 control group vs 6 interventional group) with a mean age of 74.00 ± 11.82 vs 65.17 ± 8.33 yrs, a sex distribution of 42,9% vs 33.3% female, a mean BMI of 22.29 ± 3.19 vs 26.79 ± 5.96 and a mean SOFA-score of 7.86 ± 2.67 vs 9.50 ± 1.64. All patients received enteral feeding in concordance with their indirect calorimetric requirements without any adverse events. Ketone levels in the interventional group ranged between 0.1–1.0 mmol/l. The urea-creatinine ratio (marker for muscle wasting) was similar in both groups at the beginning of the study, but higher in the standard versus the interventional nutrition group after the fourth postoperative day (see Figure). Regarding the secondary endpoints: LOMV (53.71 ± 101.27 h vs 135.33 + 184.46 h) and ICULOS (3.71 ± 4.92 vs 10.00 ± 8.99 days) were shorter in the control vs interventional group. There was no difference of the delta ICU mobility Scale (8.29 ± 0.76 vs 8.33 ± 0.82 points).
**Conclusions:** Cyclic enteral feeding with nighttime fasting and ketosis did not show any adverse side effects and was able to meet the nutritional requirements. ICULOS and LOMV seemed to be longer in the interventional vs control group, whereas the urea-creatinine ratio presented to be higher from the fourth postoperative day onward in the control group. Given the small sample size so far these results should only be evaluated as trends and more data is required to confirm these trends.

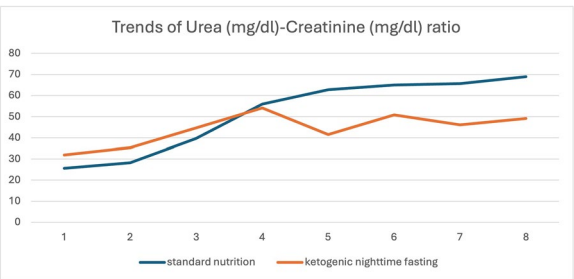


**Fig. (abstract 000721)** ATrends of the urea-creatinine ratio in the control (standard, continuous, enteral nutrition) vs interventional group (ketogenic nighttime fasting)

**Fig. (abstract 000721)** Study Logo

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5. This study was supported by the ESICM Nutrition Learning Pathway Research Award sponsored by Fresenius Kabi 2022.


**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000722

## Outcome of Sepsis-associated liver injury in critically ill adult patients with sepsis: a nationwide, prospective cohort study


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**Introduction:** Sepsis-associated liver injury (SALI) often occurs in patients with sepsis due to microcirculatory changes and inflammation-induced cell dysfunction of the liver [1]. However, the prognostic significance of remains unclear in sepsis.

**Objectives:** To explore the association between SALI and clinical outcomes in critically ill adult patients with sepsis.

**Methods:** This nationwide, prospective study analyzed critically ill adult patients with sepsis admitted to 15 general or tertiary hospitals in South Korea between September 2019 and December 2022. Patients with liver cirrhosis or lacking data on total bilirubin or prothrombin time were excluded. SALI was defined as total bilirubin $\geq$ 2 mg/dL and prothrombin time $\geq$ INR 1.5 [2]. The primary outcome was mortality at 28 days according to SALI status.

**Results:** Of the 4830 patients eligible for analysis, 399 (8.3%) developed SALI. There was no difference in the likelihood of 28-day death (adjusted Hazard ratio [HR] 1.11; 95% Confidence interval [CI] 0.89–1.38) between patients with SALI and patients without SALI, after adjusting for covariates (Figure 1). The use of cubic spline models to examine the association between total bilirubin level and the risk of death within 28 days did not alter the hazard ratios in both patients with SALI and without SALI ($p$-value for nonlinear = 0.950) (Figure 2). However, patients with a total bilirubin $\geq$ 2 mg/dL at ICU Day 2 (adjusted HR 1.47; 95% CI 1.23–1.74) and 3 (adjusted HR 1.84; 95% CI 1.52–2.23) were associated with higher 28-day mortality compared to patients with a total bilirubin < 2 mg/dL (Figure 3).

**Conclusions:** In patients with sepsis, SALI was not associated with 28-day mortality. However, hyperbilirubinemia (total bilirubin $\geq$ 2 mg/dL) at ICU Days 2 and 3 was associated with higher mortality at 28 days of ICU.

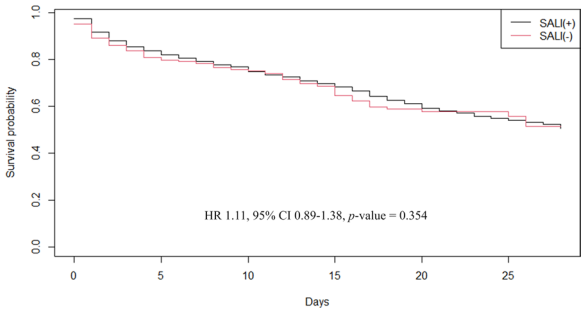


**Fig. 1 (abstract 000722)** Survival probability within 28 days according to Sepsis associated with liver injury. SALI; Sepsis associated liver injury, HR, hazard ratio; CI, confidence interval. 28-day survival probability was calculated by multivariate Cox Proportional hazard regression model with adjustment for age, comorbidities (Neurologic disease, liver disease, kidney disease, hematologic malignancy, and solid tumor), initial sequential organ failure assessment score, type of infection (urinary and other infection), laboratory findings (hemoglobin, platelet count, aspartate aminotransferase, alanine aminotransferase, total bilirubin, albumin, prothrombin time, c-reactive protein, and lactate), adjunct steroid, and source control

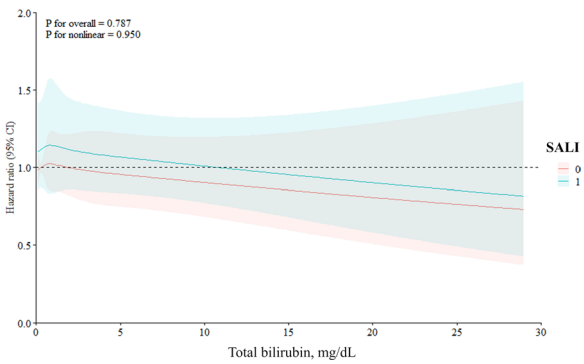


**Fig. 2 (abstract 000722)** Restricted cubic spline curve of total bilirubin for 28-day mortality in patients according to Sepsis associated with liver injury. Graphs show hazard ratios for 28-day death according to the level of total bilirubin adjusted for age, comorbidities (Neurologic disease, liver disease, kidney disease, hematologic malignancy, and solid tumor), initial sequential organ failure assessment score, type of infection (urinary and other infection), laboratory findings (hemoglobin, platelet count, aspartate aminotransferase, alanine aminotransferase, albumin, prothrombin time, c-reactive protein, and lactate), adjunct steroid, and source control. A restricted cubic spline Cox proportional hazards regression model was conducted with 4 knots at the 5th, 35th, 65th, 95th percentiles of total bilirubin (reference is the 5th percentile). Red and Green Solid lines with shadow shape indicate Hazard ratios with 95% Confidence intervals in patients with SALI and without SALI, respectively. SALI; Sepsis associated with liver injury; CI, confidence interval

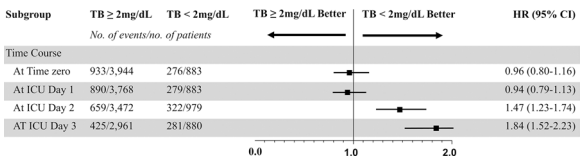


**Fig. 3 (abstract 000722)** Subgroup analyses for 28-day mortality across the level of total bilirubin from time zero to ICU Day 3. TB; Total bilirubin, HR, hazard ratio; CI, confidence interval, ICU; Intensive care unit. The 28-day mortalities were adjusted for age, comorbidities (Neurologic disease, liver disease, kidney disease, hematologic malignancy, and solid tumor), initial sequential organ failure assessment score, type of infection (urinary and other infection), laboratory findings (hemoglobin, platelet count, aspartate aminotransferase, alanine aminotransferase, albumin, prothrombin time, c-reactive protein, and lactate), adjunct steroid, and source control using multivariate Cox proportional regression models

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**Topic:** Sepsis

## 000723

### GREAT-ix: identifying and promoting excellence in critical care

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**Introduction:** A reporting system to recognise positive professional behaviour is an essential component of clinical governance. The QEUH GREAT-ix project launched in January 2020 and attempted to:
· Boost staff morale.
· Celebrate staff that perform well.
· Apply Safety-II concepts to maximise corporate learning.
**Objectives:** To identify, promote, and learn from excellence in the daily practice of staff in Critical Care at the Queen Elizabeth University Hospital.
**Methods:** Following a successful pilot, the GREAT-ix project was introduced across all Critical Care Units. Educational events were delivered and executive buy-in was gained from senior management. Submissions were initially paper-based via 'post-box', then upgraded to an electronic QR code-based submission portal in August 2022. 188 GREAT-ix have been submitted since the transition to electronic submissions was made.
A GREAT-ix team was formed, tasked with promoting submissions, creating and disseminating certificates and publicizing newsletters.
GREAT-IX submission data are maintained and analyzed to allow the identification and reinforcement of themes consistent with excellent practice.
**Results:** This project has been well-received with considerable engagement by the MDT. A total of 188 GREAT-ix submissions have been received since the project went electronic in August 2022. The following qualitative categories were the most highly represented in an analysis of all submissions, with excellence in;

1. Excellence in Patient Care (68).
2. Excellence in Teamwork (50).
3. Excellence in the Support of Colleagues (28).
4. Excellence in Leadership (31).
5. Excellence in the Provision of End-of-Life Care (11).

**Conclusions:** Since its launch 4 years ago, 298 GREAT-ix certificates have been issued. This learning-from-excellence mechanism has become a routine and core part of our clinical governance process. Engagement remains high, allowing outstanding staff and team performance to be captured and celebrated. Promoting the positive professional behaviours represented in submissions is vital and should be reinforced, particularly in recent times of crisis.

**Topic:** Information systems and data science

## 000726

### Evaluation of the use of alfentanil infusions in a general adult critical care unit

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000726

**Introduction:** Sedative and analgesic medications via bolus or infusion are frequently required in critical care units to facilitate invasive ventilation and patient comfort. Careful titration of opioid medication is required to balance the potential benefits and risks from significant and potentially prolonged doses. We reviewed the use of Alfentanil infusions within our unit in order to assess whether routine practice may be improved.
**Methods:** Retrospective data was extracted for all patients in our general adult Critical Care Unit between 01/08/21 and 01/08/22 who received alfentanil infusions. Patients without height and weight data were excluded. Alfentanil infusion rates and doses were assessed on initiation and at intervals over the first 72 h. We calculated actual doses as well as dose/kg/hr for both actual and ideal body weight (IBW).
We undertook contemporaneous anonymized survey of the Critical Care medical, nursing, and pharmacy multi-disciplinary team (MDT) to review current attitudes in the use of alfentanil. Responses were collected in April 2024.
**Results:** We reviewed data for 306 patients and excluded 25 patients with incomplete height or weight data leaving 281 patients in the final analysis.
197 patients (70%) were initiated on a dose of $\geq$ 2.5mg/hour with the median starting dose being 2.5mg/hr [IQR 2.0–3.5mg/hr]. There was no decrease in median dosing over at least the first 72 h of infusion. The initial median dose per Kg IBW was 38mcg/kg/hr [31-53mcg/kg/hr] with a wide variation (min 7mcg/kg/hr, max 134mcg/kg/hr).
We observed only a weak positive correlation between the starting dose and IBW (r 0.0.19, $p < 0.05$). Figure 1 shows the initial dose of Alfentanil /Kg IBW versus Actual body weight. Figure 2 shows the median Alfentanil dose/hour for the first 72 h after initiation of infusion.
Survey responses were collated from 84 members of the MDT. 46 respondents (55%) identified 2.5mg/hr (5mls/hr) as the rate of alfentanil most ventilated patients were initiated on. 7 respondents (8%) identified weight as a dosing parameter utilised to select this rate. Commonly offered reasons for not subsequently decreasing the alfentanil dose included patient discomfort (31%), ventilator dyssynchrony (14%) and fear of the risk of loss of airway (13%).
**Conclusions:** Bedside practice of setting infusion rates for alfentanil rather than a weight or ideal body weight-based dosing may contribute to the observed alfentanil doses. The range of IBW dosing observed indicates neither actual or ideal body weight has a strong influence on initial dosing strategy. Infusion rates remained similar over the first 72 h and survey responses suggest a reluctance to reduce dose for fear of causing patient discomfort, ventilator dyssynchrony, or accidental extubation, but may also represent a failure to respond to routinely measured sedation and pain scores.

Further quality improvement work may be useful in developing more patient-specific dosing strategies and may assist in the avoidance of over-sedation.

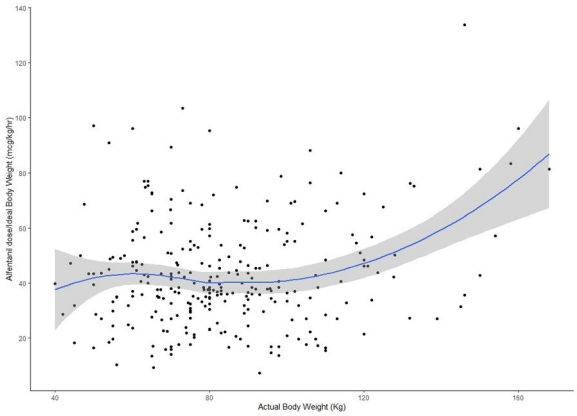


**Fig. 1 (abstract 000726)** Initial Dose of Alfentanil (mcg/Kg/hour Ideal Body Weight) versus Actual Body Weight (Kg) in Critical Care Patient

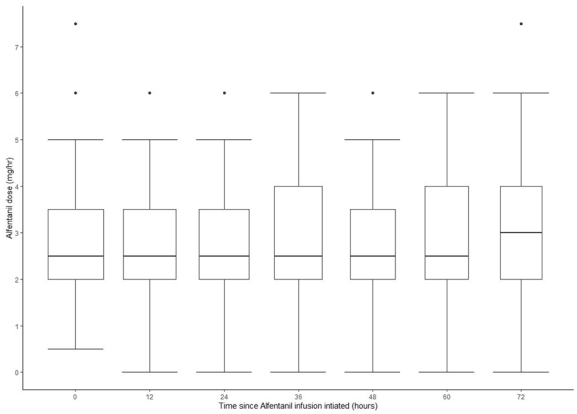


**Fig. 2 (abstract 000726)** Box Plot showing Alfentanil Dosing (mg/hour) over first 72 h in Critical Care Patients

**Topic:** Sedation, analgesia and delirium

## 000727

### The influence of mobilisation components on disability following critical illness: a secondary analysis of a prospective cohort study

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**Introduction:** Mobilising patients in intensive care (ICU) is considered part of standard care(1,2), yet guidance on its implementation (frequency, intensity, timing) remains sparse despite the large evidence base(2,3,4).
**Objectives:** To determine the impact of mobilisation components (frequency, intensity, and timing) during an ICU stay on disability levels at 3- and 6-month post-admission.
**Methods:** Post-hoc analysis of patients from three ICUs in Victoria, Australia from a prospective cohort study determining predictors of death or disability following critical illness, conducted between August 2017 and January 2019. As part of this study, patients mechanically ventilated for > 24 h completed blinded telephone interviews reporting health and disability using the 12-level World Health Organization Disability Assessment Schedule 2.0 questionnaire at baseline, 3- and 6 months. Mobilisation components (frequency, intensity via the Intensive Care Mobility Scale [IMS], and time till the first active session [defined as an IMS ≥ 1]) were obtained retrospectively from medical records. Multivariable linear regression analyses determined the influence of mobilisation components on disability progression following critical illness.
**Results:** Analysis of 397 participants (64% male, mean age 54 ± 16yrs) with a mean ICU stay of 9 ± 8 days showed active mobilisation (i.e. IMS ≥ 1) occurring every 2 ± 2 days, with the first active session nearly 4 ± 3 days post-ICU admission. Univariable analysis showed that all mobilisation components were significantly associated with 3mth disability, but only intensity and timing influenced 6mth disability (Table 1). Multivariable regression identified intensity as an independent factor in decreasing disability at both 3- and 6 months after adjusting for age, sex, illness severity, and admission diagnosis, while delaying active mobilisation significantly increased disability (Table 1). The number of mobilisation sessions completed did not independently affect disability.

**Table 1 (abstract 000727)** Influence of mobilisation components on progression of disability following critical illness

| | Univariable analysis | | | | | | Multivariable analysis | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Outcome | 3mth | | | 6mth | | | 3mth | | | 6mth | | |
| | *β* | 95% CI | *p* | *β* | 95% CI | *p* | *β* | 95% CI | *p* | *β* | 95% CI | *p* |
| **IMS level achieved** | -4.04 | -5.34, -2.74 | < 0.0001 | -2.98 | -4.4, -1.56 | < 0.0001 | -2.21 | -2.57, -0.85 | 0.001 | -2.15 | -3.69, -0.61 | 0.005 |
| **Time till active mobilisation** | 1.76 | 0.82, 2.7 | 0.0002 | 1.14 | 0.18, 2.1 | 0.019 | 1.31 | 0.37, 2.25 | 0.006 | 1.13 | 0.11, 2.15 | 0.029 |
| **Frequency of mobilisation sessions** | -0.19 | -0.29, -0.09 | < 0.0001 | -0.10 | -0.20, 0.00 | 0.056 | -0.03 | -0.13, 0.13 | 0.505 | 0.06 | -0.06, 0.18 | 0.35 |

*β* Unstandardised regression coefficient (beta), *CI* Confidence Interval, *IMS* Intensive Care Mobility Scale, *p* probability level

**Conclusions:** Increasing intensity and prompt mobilisation implementation during an acute ICU admission was associated with decreased disability in survivors at 3- and 6 months post-ICU admission, although there may be unknown confounders.

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5. Although this study received no funding, the original cohort study (PREDICT) received a National Health and Medical Research Council of Australia grant (GNT1132976).

**Topic:** Nursing care and physiotherapy

## 000728

### Feasibility of respiratory oscillometry in patients with acute hypoxemic respiratory failure

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000728

**Introduction:** Oscillometry is a respiratory function test used to measure total respiratory impedance during tidal breathing revealing resistive and elastic properties of the lung that may provide useful information about illness trajectory. Elevated lung reactance area (AX) reflects increased lung elastance and heterogeneous distribution of lung compliances across the airway calibers, likely due to inflammatory injury and small airway obstruction (1).
**Objectives:** To assess the feasibility of oscillometry and describe lung mechanics in non-intubated patients with acute hypoxemic respiratory failure (AHRF).
**Methods:** Adult patients with AHRF receiving non-invasive respiratory support with fractional inspired oxygen concentration ($FiO_2$) $\geq$ 0.4 and flow $\geq$ 6 L/min underwent oscillometry at baseline and after resolution of AHRF. The primary endpoint was the number of enrolled patients who completed the baseline measurement. Continuous data are medians (25th, 75th percentile) unless stated otherwise.
**Results:** Between July 2022 and August 2023, ten patients were enrolled. The main barriers to inclusion were inability to cooperate and extreme hypoxemia with FiO2 > 0.8. All recruited patients tolerated oscillometry. At baseline, FiO2 was 0.8 (min 0.4, max 0.8), and oxygen saturation (SpO2) of 94% dropped to a nadir of 82% at the end of oscillometry and recovered within 2 min. Lung elastance was increased, with AX of 25 (15, 32) cm H2O/L (462 [327, 610]% predicted). Resistance was largely not altered, except for two patients with COVID-19, where it was increased. We found no association between baseline AX and SpO2/FiO2. Hypoxemia resolved in nine patients and follow-up oscillometry was obtained in eight participants. In four patients, higher baseline AX of 33 (31, 37) cm H2O/L (547 [362, 727]% predicted) was linked to faster resolution of AHRF (7 [min 5, max 13] days) and marked improvement in lung elastance (follow-up AX 15 [13, 16] cm H2O/L or 246 [145, 340]% predicted). By contrast, the other four patients with lower baseline AX of 14 [12, 17] cm H2O/L (462 [354, 498]% predicted) showed longer time to resolution of AHRF (18 [min 2, max 27] days) and unchanged lung stiffness despite clinical improvement (follow-up AX 17 [14, 20] cm H2O/L or 536 [402, 607]% predicted).
**Conclusions:** Respiratory mechanics can be assessed in non-intubated patients with AHRF by oscillometry in carefully selected patients. The extent of the increase in lung elastance was not related to the degree of hypoxemia. The impairment of lung mechanics persisted after the resolution of hypoxemia in some, though not all, patients. This may suggest varying disease trajectories elucidated by oscillometry.

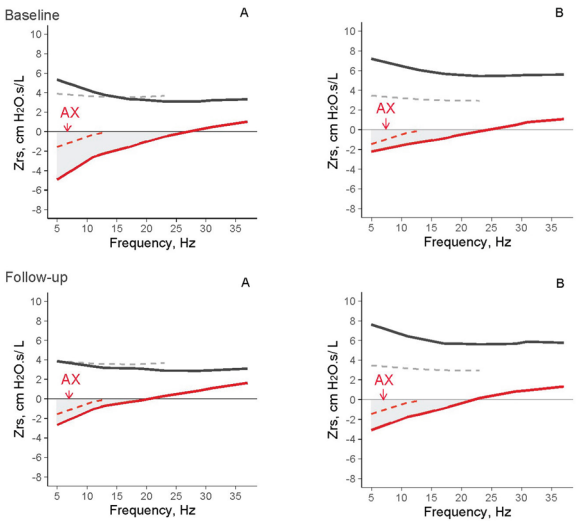


**Fig. (abstract 000728)** Example of oscillometry in a patient with acute hypoxemic respiratory failure secondary to community-acquired pneumonia (panels A) and COVID-19 (panels B) at baseline and follow-up. Respiratory resistance and reactance are depicted in black and red, respectively. Dashed lines indicate predicted values. AX is the reactance area

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000731

### causal effect of genetically predicted eosinophil levels on sepsis and mortality risk: a two-sample mendelian randomization analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000731

**Introduction:** Although several observational studies have investigated the relationship between eosinophil levels and the risks of sepsis and mortality, the findings have been inconclusive, and the causal associations remain uncertain.
**Objectives:** The aim of this study was to use the Mendelian randomization (MR) approach to thoroughly examine the potential causal links between eosinophil levels and the risks of sepsis and its associated mortality.
**Methods:** We conducted a bidirectional two-sample MR investigation using genome-wide association study summary statistics of the eosinophil levels (eosinophil count, eosinophil percentage of white cells, and eosinophil percentage of granulocytes), sepsis, and sepsis mortality at 28 days. The inverse-variance weighted (IVW) method was used as the primary analytical approach to establish reliable causality. In addition, we performed sensitivity and multivariable MR analyses to examine the stability of the IVW results.
**Results:** Our results showed that the genetically predicted decreased eosinophil count (sepsis: odds ratio [OR] = 0.930, 95% confidence interval [CI] 0.872–0.992, $P$ = 0.028; sepsis mortality: OR = 0.832, 95% CI 0.719–0.963, $P$ = 0.014), eosinophil percentage of white cells (sepsis:

OR = 0.911, 95% CI 0.854–0.972, $P = 0.005$; sepsis mortality: OR = 0.814, 95% CI 0.705–0.939, $P = 0.005$), and eosinophil percentage of granulocytes (sepsis: OR = 0.918, 95% CI 0.861–0.979, $P = 0.009$; sepsis mortality: OR = 0.821, 95% CI 0.712–0.947, $P = 0.007$) were causally related to increased risks of sepsis and sepsis-related mortality at 28 days. These findings remained stable even after conducting various sensitivity and multivariable MR analyses. In addition, our reverse MR results showed that the risks of sepsis and its associated mortality were not associated with eosinophil levels.

**Conclusions:** Our research highlights the importance of considering eosinophil levels when assessing the risks of sepsis and its related mortality. Additional studies are necessary to confirm these findings and investigate the underlying mechanisms.

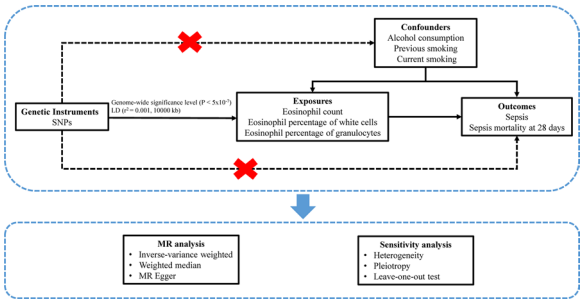


**Fig. 1 (abstract 000731)** Design of the MR study. MR, Mendelian randomization; SNP, single-nucleotide polymorphism; LD, linkage disequilibrium

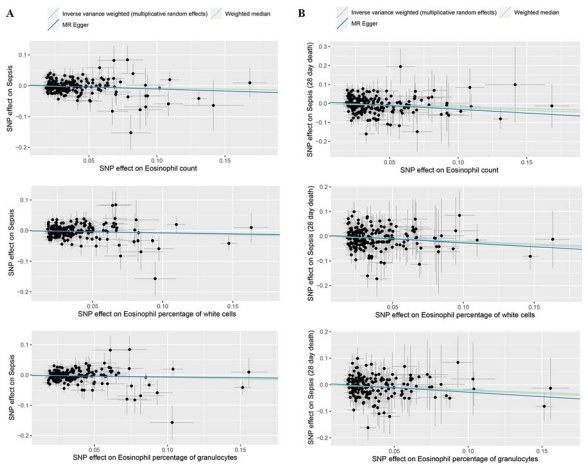


**Fig. 2 (abstract 000731)** Scatter plot of the MR analysis showing the relationships of eosinophil levels with risks of sepsis (A) and sepsis-related mortality (B). MR, Mendelian randomization; SNP, single-nucleotide polymorphism

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**Topic:** Sepsis

## 000732

### Unveiling the interplay of elastase and neutrophil recruitment in acute lung injury

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000732

**Introduction:** Acute lung injury (ALI) is a critical inflammatory condition with global implications, characterized by dysregulated accumulation and persistent activation of neutrophils. Neutrophil releases inflammatory mediators such as neutrophil elastase (NE), which exacerbates ALI. Our previous research has demonstrated that inhibiting NE decreased neutrophil infiltration and ameliorated lung injury in vivo. However, the underlying mechanism linking NE to neutrophil recruitment remains unclear.

**Objectives:** The aim of this study was to investigate the impact of NE on neutrophil migration both in vivo and in vitro.

**Methods:** In a lipopolysaccharide (LPS)-induced ALI mice model, immunohistochemical staining was employed to identify the distribution of NE. Subsequently, the effect of NE on neutrophil recruitment was evaluated using an NE inhibitor (NEi). Furthermore, human lung microvascular endothelial cells (HULECs) were directly exposed to human recombination NE. Gene expression levels of CXCL1, CXCL2, and CXCL3, crucial for neutrophil recruitment to the inflammatory site, were quantified by quantitative real-time polymerase chain reaction. The expression of I-kappa-B-alpha (IKB-α), a regulator of nuclear factor kappa B (NF-κB) activation, was assessed via western blotting. The pharmacological inhibitor BAY 11–7082 was utilized to inhibit NF-κB activation in vitro.

**Results:** Our in vivo experiments revealed that NEi treatment significantly suppressed the upregulation of NE induced by LPS. Additionally, NEi intervention effectively attenuated the elevated expression of CXCL1, CXCL2, and CXCL3 in the lungs of ALI mice. In vitro findings indicated that NE increased the expression of CXCL1, CXCL2, and CXCL3, as well as phosphorylated IKB-α levels. Treatment with BAY 11–7082 successfully inhibited the production of CXCL1, CXCL2, and CXCL3 in HULECs.

**Conclusions:** These results highlight the significant role of NE in activating the NF-κB signaling pathway, thereby promoting the upregulation of CXCL1, CXCL2, and CXCL3 expression which facilitates neutrophil recruitment and perpetuates ALI pathogenesis. Our study provides insights into potential therapeutic strategies in critical care settings by shedding light on the intricate interplay between neutrophil migration and NE in ALI progression.

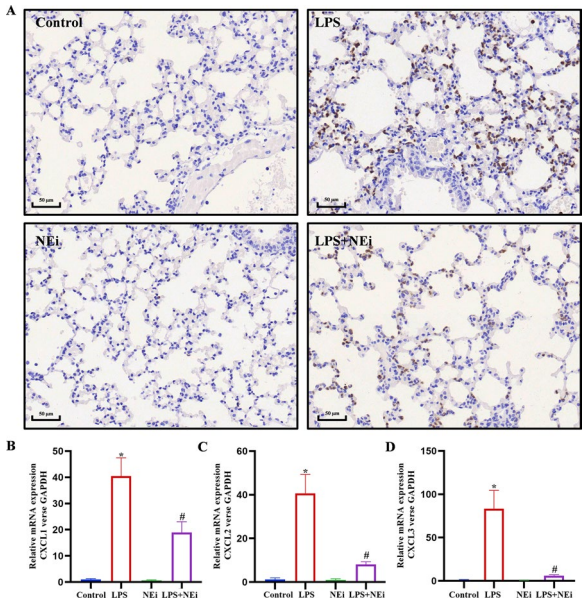


**Fig. 1 (abstract 000732)** The elevated NE facilitated neutrophil recruitment on LPS-induced ALI mice. (A) Characteristic immunohistochemical images of NE in the lung. scale bar, 50 μm, n = 3. (B-D) The mRNA expression of CXCL1, CXCL2, and CXCL3 in lung tissue samples. n = 5, *$P < 0.05$, vs. Control group; #$P < 0.05$, vs. the LPS group. NE, neutrophil elastase, LPS, lipopolysaccharide, ALI, acute lung injury, CXCL, C-X-C motif chemokine, NEi, neutrophil elastase inhibitor

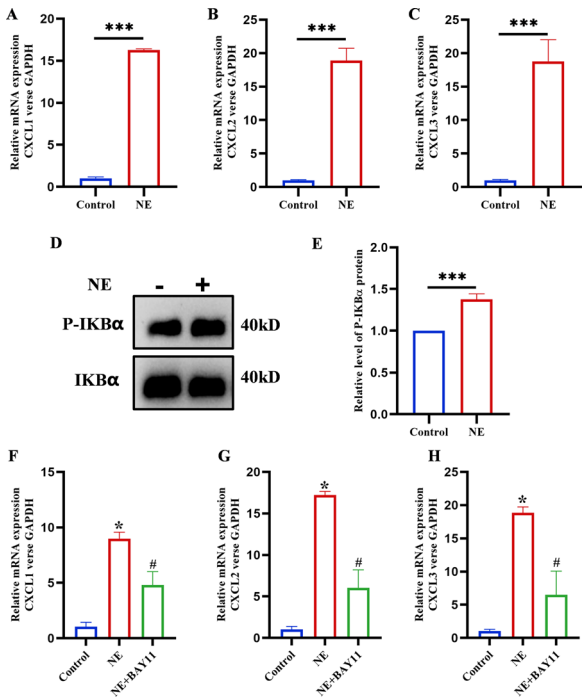


**Fig. 2 (abstract 000732)** NE induced the expression of CXCL1, CXCL2, and CXCL3 through NF-κB pathway in vitro. (A-C) The mRNA expression of CXCL1, CXCL2, and CXCL3 in HULECs. (D-E) Protein expression levels of phosphorylated IKB-α in HULECs. (I-K) The mRNA expression of CXCL1, CXCL2, and CXCL3 in HULECs after inhibiting NF-κB signaling pathway by BAY 11–7082. $n = 3$. *$P < 0.05$ and ***$P < 0.0001$, vs. Control group; #$P < 0.05$, vs. NE group. NE, Neutrophil elastase, CXCL, C-X-C motif chemokine, HULECs, Human Lung Microvascular Endothelial Cells

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**Topic:** Sepsis

## 000733

### Efficacy of recombinant human soluble thrombomodulin on for reducing the occurrence of circuit coagulation in continuous kidney replacement therapy for septic AKI

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000733

**Introduction:** Continuous kidney replacement therapy (CKRT) is an essential therapeutic modality that is used to remove accumulated fluid and waste products in patients with acute kidney injury (AKI) and to remove chemical mediators in patients with sepsis. However, CKRT circuit coagulation often occurs, especially in cases with low platelet counts, which reduces the filtration function of the hemofilter, and frequent coagulation necessitates circuit replacement, resulting in problems such as downtime and insufficient blood purification volume due to the interruption of CKRT. Administration of recombinant human soluble thrombomodulin (rhTM) has been reported to have certain effects on renal damage and coagulation abnormalities in septic AK1), 2). However, the effect of rhTM on circuit coagulation during CKRT remains to be determined.
**Objectives:** The aim of this study was to clarify the efficacy of rhTM for reducing the occurrence of circuit coagulation in CKRT for septic AKI patients.
**Methods:** We carried out a retrospective observational study. The study subjects were patients with septic AKI who were admitted to the ICU between January 2012 and December 2020 and underwent CKRT. The definition of sepsis was according to Sepsis-33) and AKI was defined by the KDIGO guidelines4). The patients with a platelet count of 52,500/μL or less were included in this study. We obtained information on the characteristics of patients including age and sex, SOFA score, APACHE II score, focus of infection, length of ICU stay, shock, number of ventilation days, number of days of CKRT, circuit coagulation, life-time of hemofilter, KDIGO classification, and disseminated intravascular coagulopathy (DIC) as well as laboratory data. The primary outcome was circuit coagulation during the CKRT. Logistic regression analysis using propensity score as the adjusted variable was also performed to determine the risk estimates for the association between rhTM administration and circuit coagulation. The hemofilter's lifetime curves obtained through Kaplan–Meier analysis were compared by using the log-rank test.
**Results:** A total of 126 patients were included and 77 patients were excluded due to the exclusion criteria. Forty-nine patients were eligible for the study. Circuit coagulation occurred in 51.0% of the patients. The rhTM and non-rhTM groups consisted of 13 patients (26.5%) and 36 patients (73.5%), respectively. The circuit coagulation rate was significantly lower in the rhTM group than in the non-rhTM group (odds

ratio [OR], 0.18; 95% CI 0.04–0.86; $P=0.032$). The lifetime of the hemofilter was significantly longer in the rhTM group than in the non-rhTM group (OR, 1.06; 95% CI 1.01–1.11; $P=0.032$), which was further supported by findings of Kaplan–Meier analysis ($P=0.020$). Moreover, the number of CKRT-free days was significantly greater in the rhTM group than in the non-rhTM group (odds ratio [OR], 1.12; 95% CI 1.03–1.22; $P=0.011$).

**Conclusions:** This study showed that rhTM therapy during CKRT for septic AKI reduced the occurrence of circuit coagulation and extended the lifetime of the hemofilter. Furthermore, rhTM administration was associated with increased CKRT-free days.

Further study should be initiated to expand the study on the efficacy of rhTM administration in septic AKI patients for circuit coagulation inhibition during CKRT.

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**Topic:** Acute Kidney Injury and haemofiltration

## 000734

### The correlation between period of anemia and duration of mechanical ventilation in patients admitted to the surgical intensive care unit


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000734


**Introduction:** Anemia is common in critically ill patients, particularly those requiring mechanical ventilation (MV). While previous studies showed the association between anemia and poor outcomes during prolonged MV, the impact of anemic duration on MV duration remains unclear. This study aimed to evaluate the correlation between period of anemia and MV duration in patients admitted to the surgical intensive care unit (SICU).

**Methods:** This was a retrospective study conducted in the SICU at a tertiary university hospital in Bangkok, Thailand, between December 2020 and January 2023. Patients aged ≥ 18 requiring MV support for > 96 h were included. Patients whose data missing or those readmitted to the SICU were excluded. Period of anemia was defined as the ratio of days with hemoglobin < 8 g/dL to days with MV support. Patients were categorized into no anemia (period of anemia = 0) and anemia group (period of anemia > 0) for comparison. The correlation between the period of anemia, as well as the amount of red blood cell (RBC) transfusion and MV duration, were evaluated using linear regression analysis controlling for potential confounding factors such as age, illness severity, and organ dysfunction. Hospital mortality and its associated risk factors were analyzed using multivariate logistic regression analysis.

**Results:** Of 235 patients, 72 (51.4%) patients experienced anemia during MV support. The anemia group significantly had lower average hemoglobin level during MV support (9.3 ± 5.1 g/dL vs. 11.3 ± 2.1 g/dL, $P<0.001$) but no difference in MV duration (median 8 [IQR 6–11] days vs. median 7 [IQR 6–8] days, $P=0.05$). They also received significantly more RBC transfusion ($P<0.001$). The period of anemia and the amount of RBC transfusion showed no correlation with MV duration ($r=0.01$ and $r=0.261$, respectively). Period of anemia was associated with increased hospital mortality (odds ratio 1.03, 95% confidence interval 1.01–1.05).

**Conclusions:** There was no correlation between the period of anemia as well as the amount of RBC transfusion and MV duration in patients receiving MV support > 96 h in the SICU. Therefore, the strategy of administering transfusion to anemic patients receiving MV to facilitate weaning should not be supported. However, period of anemia was associated with increased hospital mortality. Appropriate perioperative management of anemia should be emphasized to improve outcomes in these patients.

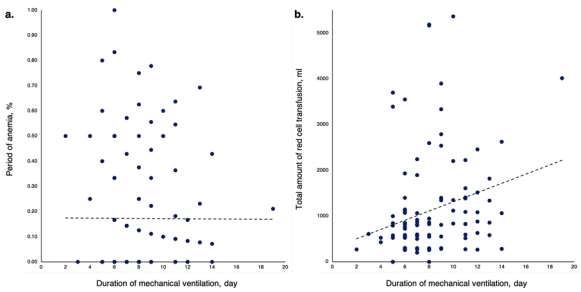


**Fig. (abstract 000734)** Correlation between (a.) period of anemia and (b.) total amount of red cell transfusion and duration of mechanical ventilation. The period of anemia and the amount of red cell transfusion showed no correlation with duration of mechanical ventilation ($r=0.01$ and $r=0.261$, respectively)

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6. Siriraj Research and Development Fund, Faculty of Medicine, Siriraj Hospital, Mahidol University, Thailand (Grant Number R016531072).


**Topic:** Acute respiratory failure and mechanical ventilation

## 000735

### Emergence time in patients undergoing ambulatory brachytherapy under general anaesthesia: a non-inferiority randomised clinical trial comparing isoflurane with sevoflurane


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000735

**Introduction:** Sevoflurane has taken over the world of ambulatory surgery as the inhalational agent of choice due to its rapid recovery profile [1,2]. Sevoflurane, however, has a much higher cost compared to isoflurane. In short-duration procedures, the difference in emergence time between isoflurane and sevoflurane is not expected to be clinically very different considering the uptake and distribution profiles of these agents with respect to time [3].
**Objectives:** The primary objective was to demonstrate the non-inferiority of isoflurane in terms of emergence time with a non-inferiority margin of 3.2 min at an α of 0.025 and 95% power. The secondary objectives were to compare the consumption of inhalational agents and costs.
**Methods:** After institute ethical committee approval and written informed consent 100 patients with pelvic malignancies presenting for brachytherapy, were randomized to receive either isoflurane or sevoflurane for BIS-targeted (40–60) maintenance anaesthesia through a Laryngeal mask airway post-induction with propofol and fentanyl.
**Results:** The upper limit of the 97.5% CI of the mean difference in emergence time between isoflurane and sevoflurane groups was + 0.63 (below the NIM of + 3.2 min) (Fig. 1). The average cost per case of inhalational anaesthetic consumption was 2.6 (95% CI 2.5 to 2.8) times higher with sevoflurane compared to isoflurane. There was no difference in terms of hemodynamics, time to discharge, and postoperative cognitive dysfunction.
**Conclusions:** Isoflurane is non-inferior to sevoflurane in terms of emergence time in ambulatory brachytherapy procedures (< 30 min) and is potentially cost-effective.

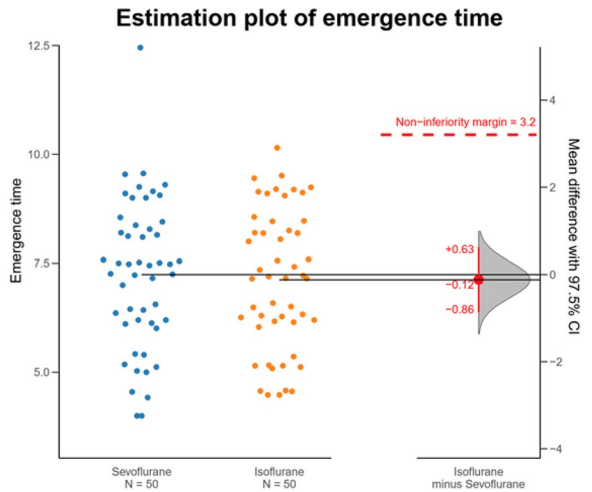


**Fig. 1 (abstract 000735)** Estimation plot demonstrating non-inferiority of Isoflurane compared to Sevoflurane in terms of emergence time

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4. Nil

**Topic:** Perioperative care

## 000736

### Association between left ventricular ejection fraction and insufficient contrast-enhancement of thoracoabdominal CT angiography in patients requiring veno-arterial extracorporeal membrane oxygenation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000736

**Introduction:** In the patients on the veno-arterial extracorporeal membrane oxygenation (V-A ECMO), arterial blood flow comes from two sources; the retrograde blood flow from V-A ECMO and the anterograde blood flow from the patient's native heart. The disruption of balance of these two blood flows can lead to insufficient contrast enhancement on thoracoabdominal computed tomography angiography (CTA), but there were few studies to investigate the association between these two blood flows and the occurrence of insufficient contrast enhancement.
**Objectives:** The aim of this study is to evaluate the association of left ventricular ejection fraction (EF) and ECMO flow with the occurrence of insufficient contrast-enhancement of thoracoabdominal CTA in patients requiring V-A ECMO.
**Methods:** Twenty-nine patients treated with V-A ECMO who underwent thoracoabdominal CTA at Hiroshima University Hospital were retrospectively analyzed. The correlation ratios between the values of EF and ECMO flow, and the degree of contrast enhancement at the internal mammary artery (IMA) level were evaluated. The association between preserved EF (≥ 30%) and the occurrence of insufficient contrast enhancement, defined as less than 200 Hounsfield unit (HU) of the aorta at the IMA level, was also evaluated by Fisher's exact test.
**Results:** The higher values of EF were statistically significantly correlated with lower HU values of aorta (correlation ratio; −0.406 [−0.700 to −0.003], $p = 0.044$). On the other hand, the values of ECMO flow were not correlated with HU values of the aorta. While all 14 patients with reduced EF did not have the occurrence of insufficient contrast-enhancement of CT (0% [0/14]), 46.7% (7/15) of the patients with preserved EF did ($p = 0.006$).
**Conclusions:** Insufficient contrast-enhancement of thoracoabdominal CT angiography did not occur in the patients on V-A ECMO with reduced EF but occurred in those with preserved EF, although ECMO flow was not associated with it. We must be careful with the injection technique in the patients with V-A ECMO with preserved EF.

**Reference(s)**

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**Topic:** Imaging in intensive care

## 000737

### Remimazolam ameliorates LPS-induced apoptosis in acute lung injury based on network pharmacology and experimental validation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000737

**Introduction:** Acute lung injury (ALI) presents a substantial challenge to global health, necessitating urgent attention and innovative solutions. Remimazolam (REM), an emerging sedative, has exhibited promising anti-inflammatory properties that have the potential to improve ALI. Nevertheless, the current dearth of evidence impedes our capacity to definitively determine whether REM can alleviate ALI.
**Objectives:** This study aimed to investigate the effects of REM on ALI and reveal this underlying mechanism.
**Methods:** The LPS-induced ALI mice model was used to assess the impact of REM on lung injury by hematoxylin and eosin (HE) staining. Subsequently, to explore its protective mechanism on ALI, a network pharmacology strategy was performed. Potential targets for REM and ALI were obtained from online databases. The target genes for REM on ALI were determined by taking the intersection of the REM and ALI targeting gene sets. Then, RNA-sequencing (RNA-seq) were used to identify the differentially expressed genes (DEGs) among control, ALI mice treated with and without REM. GO and KEGG pathway analyses were performed for the gene set from network pharmacology and RNA-seq. Finally, TdT-Mediated dUTP Nick End Labelling (TUNEL) staining was conducted on lung tissue sections to assess the impact of REM on apoptosis in mice. Western blotting was performed to evaluate the anti-apoptotic effects of REM on human umbilical vein endothelial cells (HUVECs) and mouse lung alveolar epithelial cells (MLE-12) (Figure 1).
**Results:** HE staining revealed that REM effectively mitigated lung injury in ALI mice (Figure 2A). Network pharmacology showed that a total of 217 REM target genes and 3081 ALI/ARDS target genes were acquired and 80 candidate target genes were identified. RNA-seq analyses revealed 4365 DEGs between control and ALI mice, and 140 DEGs between ALI mice treated with and without REM. GO and KEGG pathway analyses indicated that the therapeutic effects of REM on ALI were significantly enriched in terms related to apoptosis, including intrinsic and extrinsic apoptosis, and endothelial and epithelial apoptosis, et al. Verification experiments in ALI mice showed that REM treatment significantly reduced the elevated number of TUNEL-positive vascular endothelial cells and alveolar epithelial cells induced by LPS (Figure 2B). The results of western blotting revealed that REM markedly decreased the expression of cleaved caspase-3 and increased the expression of Bcl2/Bax ratio in HUVECs and MLE-12, respectively (Figure 2C-D).
**Conclusions:** This study indicated the anti-apoptotic effects of REM on ALI by inhibiting endothelial and alveolar epithelial cell apoptosis, suggesting its promising role in the management of ALI and emphasizing the necessity for further clinical investigations.

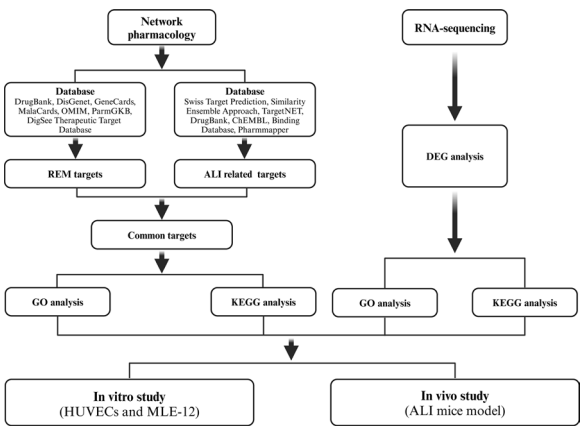


**Fig. 1 (abstract 000737)** Flowchart of the designed analysis of REM against ALI. ALI: acute lung injury, DEGs: differentially expressed genes, HUVECs: human umbilical vein endothelial cell, LPS: lipopolysaccharide, MLE-12: mouse alveolar epithelial cells, REM: remimazolam

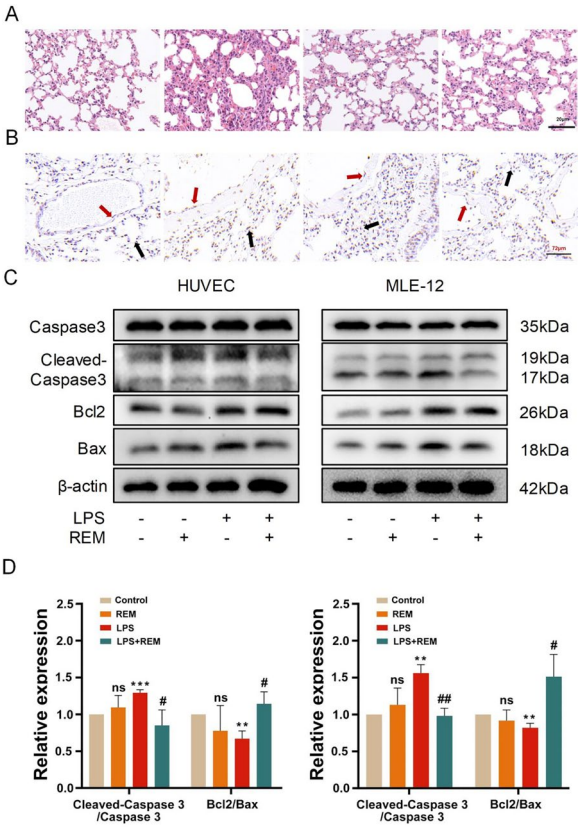


**Fig. 2 (abstract 000737)** REM intervention alleviated lung injury in ALI mice and inhibited the apoptosis of vascular endothelial cells and alveolar epithelial cells. (**A**) The HE staining of lung tissues from mice to evaluate the effect of REM. (**B**) The TUNEL staining on the lung tissue of LPS-induced ALI mice; the black arrow indicated the alveolar epithelial cells, while the red arrow indicated the vascular endothelial cells. (**C-D**) The expression of caspase-3, cleaved caspase-3, Bcl2, and Bax by WB from HUVECs and MLE-12. ALI: acute lung injury, HUVECs: human umbilical vein endothelial cell, LPS: lipopolysaccharide, MLE-12: mouse alveolar epithelial cells, REM: remimazolam, TUNEL: TdT-Mediated dUTP Nick End Labelling. The values represented the means ± SD. $^{**}P < 0.01$ and $^{***}P < 0.001$ vs. the control group, $\#P < 0.05$ vs. the LPS group, ns: $P > 0.05$ vs. the control group

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4. We acknowledge the financial support provided by Top Young Talents Project of the "Special Support Program for High-Level Talents" in Shaanxi, China.

**Topic:** Sedation, analgesia, and delirium

**000739**

**Physiological effects of bi-level high-flow nasal cannula in healthy individuals: a proof of concept trial**

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000739

**Introduction:** High-flow nasal cannula (HFNC) delivers a continuous, unidirectional high flow of oxygen (Uniflow) throughout the respiratory cycle. Despite its positive pressure effects in the nasopharynx, the persistent high flow during expiration imposes additional work of breathing and disrupts the patient's neural respiratory cycle. We devised a bi-level high-flow system (Biflow) allowing separate flow rate adjustments for inspiration and expiration.
**Methods:** Twelve adults (7 male, 5 female, average age 46.3 years) participated in the study. For Uniflow, flow settings of 30 (U30), 40 (U40), and 50 (U50) L/min were tested. In the Biflow, inspiratory flow rates were matched to the Uniflow settings, while expiratory flow rates varied from 10 L/min to 30 L/min. Physiologic parameters, nasopharyngeal pressure, pressure–time product (N-PTP) as an energy cost proxy, end-expiratory lung impedance (EELI), and subject comfort were assessed.
**Results:** Uniflow decreased respiratory rate and elongated expiratory time compared to natural breathing. However, these effects were less pronounced during Biflow (Table 1). Compared with the Uniflow, both expiratory and inspiratory N-PTP were lower during the Biflow (Figure 1). Transcutaneous $CO_2$ was lower during the Biflow compared with natural breathing or Uniflow. EELI did not differ between modes. All participants completed the study protocol without side effects.

**Table 1 (abstract 000739)** Change of synchronized respiratory parameters according to the flow setting

| | Setting | RR (/min) | Inspiratory time (sec) | Expiratory time (sec) | I:E ratio |
|---|---|---|---|---|---|
| Baseline | Natural breathing | 15.6 (13.5–17.4) | 1.3 (1.1–1.4) | 2.3 (1.8–2.7) | 0.5 (0.5–0.6) |
| Flow 30 | U30 | 13.5 (10.0–15.8)* | 1.7 (1.5–2.2)* | 2.9 (2.1–4.0)* | 0.7 (0.5–0.8)* |
| | B30/10 | 13.3 (12.0–18.0) | 1.9 (1.6–2.2)* | 2.4 (1.9–2.6) | 0.8 (0.7–1.0)*,** |
| | B30/20 | 13.9 (13.1–17.9)** | 1.6 (1.3–1.8)* | 2.3 (1.9–2.8)** | 0.7 (0.6–0.9)* |
| Flow40 | U40 | 12.7 (9.1–13.8)* | 1.7 (1.5–2.1)* | 3.1 (2.7–4.8)* | 0.5 (0.5–0.6) |
| | B40/10 | 13.0 (12.3–14.7)** | 1.9 (1.7–2.5)* | 2.5 (2.2–3.0)** | 0.7 (0.7–0.9)*,** |
| | B40/20 | 16.4 (12.7–18.2)** | 1.5 (1.1–2.1)† | 2.2 (1.9–2.9)** | 0.6 (0.5–0.8) |
| | B40/30 | 13.7 (10.5–14.2)**,‡ | 1.6 (1.5–1.9)*,† | 3.0 (2.7–4.5)**,‡ | 0.6 (0.5–0.6)**,† |
| Flow50 | U50 | 10.0 (9.4–13.2)* | 1.8 (1.6–2.0)* | 3.8 (2.7–4.5)* | 0.5(0.4–0.6) |
| | B50/20 | 15.0 (12.9–19.8)** | 1.7 (1.3–2.2)* | 2.4 (1.9–3.1)** | 0.7 (0.6–0.8)*,** |
| | B50/30 | 14.2 (11.0–16.6)**,‡ | 1.7 (1.5–2.2)*,‡ | 2.5 (2.0–2.9)** | 0.7 (0.6–0.9)*,** |

Data are expressed as median and IQR. *$P$-value of < 0.05 compared with natural breathing, **$P$-value of < 0.05 compared with Uniflow.†$P$-value of < 0.05 compared with Biflow 40/10,‡$P$-value of < 0.05 compared with Biflow 40/20 or 50/20.
**Conclusions:** In healthy participants, Biflow showed less interference with the respiratory cycle. Energy cost occurring in the nasopharynx was lower during Biflow compared with Uniflow (KCT0006100).

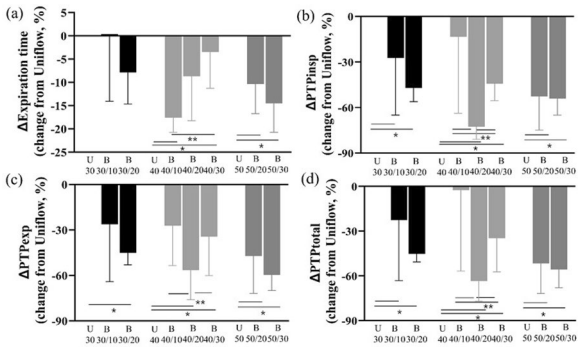


**Fig. 1 (abstract 000739)** Figure 1 Changes in expiratory time and N-PTP. $P$-value of < 0.05 compared with Uniflow, **$P$-value of < 0.05 between Biflow
PTPinsp; inspiratory nasal pressure time product, PTPexp; expiratory nasal pressure time product, PTPtotal; total nasal pressure time product, U; Uniflow, B; Biflow.

**Reference(s)**
1. This work was supported by the Korea Medical Device Development Fund grant funded by the Korea government (the Ministry of Science and ICT, the Ministry of Trade, Industry and Energy, the Ministry of Health & Welfare, the Ministry of Food and Drug Safety) (Project Number: 202011B26).

**Topic:** Acute respiratory failure and mechanical ventilation

**000740**

**Patient data and nurse shifts assessed by objective and subjective workload in intensive care units in a national observational study**

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**Introduction:** Critical care nurses deliver complex and specialized nursing to patients with a wide range of diagnoses and critical conditions. Their daily workload in the intensive care units (ICU) should

be investigated and described. The workload can be assessed by the objective Nursing Activities Score (NAS) (1) for each patient, and subjective scores from nurses by the NASA-Task Load index (NASA-TLX) (2). The items in NASA-TLX represent mental demand, physical demand, temporal demand, overall performance, frustration level, and effort.

**Objectives:** The study aimed to investigate ICU patients and nurses' workload, and to explore correlation between NAS and NASA-TLX.

**Methods:** This prospective observational study was conducted in mixed ICUs, from local to university hospitals in Norway. Data was collected in each unit for 14 days in November 2023 to May 2024. Data from all patients was collected from medical charts (age, reasons for admission and length of stay, NAS per shift), and by a paper-based survey of all nurses on duty (nurse shifts and NASA-TLX –scores) for the same period. Descriptive statistics and correlation analysis were conducted.

**Results:** Results from 6 ICUs (Table 1), show number of ICU beds varies from 3 to 10, units have postoperative, day surgery or recovery beds. The total number of patients was 589 with a length of stay from a median 2:48 h to 4 days 09:23 h and mean age of 55 years. The survey had a response rate per unit from 62 to 99% (Table 2). A total of 2,060 NASA-TLX scores from all shifts were represented. The main findings were a correlation from 0.30 to 0.45 between patients NAS and nurses NASA-TLX. The highest subjective workload was found in ICU-1 and ICU-5, however ICU-4 had the strongest correlation between objective and subjective workload.

**Conclusions:** Workload was assessed in two dimensions, representing a weak to moderate strength of correlation between objective and subjective workload. Factors associated with workload have to be further explored.

**Table 1 (abstract 000740)** Characteristics of 6 ICUs and patients (N = 589) in 14 days study period 2023–2024

| **Table1 Characteristics** | **ICU-1** | **ICU-2** | **ICU-3** | **ICU-4** | **ICU-5** | **ICU-6** |
|---|---|---|---|---|---|---|
| ICU-beds, n | 5 | 10 | 10 | 10 | 4 | 3 |
| Postoperative, day surgery care or recovery beds, n | 11 | - | - | 4 | 18 | 4 |
| **Age**, *Mean (SD)* | 54.1 *(20.1)* | 54.6 *(20.6)* | 52.5 *(18.9)* | 57.8 *(21.5)* | 62.3 *(19.4)* | 55.2 *(24.9)* |
| **ICU-LOS** *Days Hours:minutes* Mean *(SD)* | 10:25 (25:20) | 3 03:47 *(4 09:29)* | 2 15:02 *(3 17:31)* | 90:46 *(98:07)* | 11:24 *(28:46)* | 9:5 *(30:06)* |
| Median *(IQR)* | 5:00 *(2:43-7:03)* | 21:58 *(6:52-4 06:07)* | 1 04:58 *(08:11-2 18:15)* | 2 12:14 *(11:12-5 17:48)* | 3:30 *(2:00-6:37)* | 2:48 *(1:31-5:01)* |
| **Primary cause of admission**, n | 142 | 34 | 40 | 32 | 181* | 160 |
| – Planned surgery, n *(%)* | 110 *(77.5)* | 7 *(20.6)* | 2 *(5)* | 2 *(6.3)* | 58 *(32)* | 70 *(34)* |
| – Acute surgery, n *(%)* | 25 *(17.6)* | 18 *(52.9)* | 18 *(45)* | 8 *(25)* | 80 *(44,2)* | 48 *(23.3)* |
| – Non surgery, n *(%)* | 7 *(4.9)* | 9 *(26.5)* | 20 *(50)* | 22 *(68.8)* | 34 *(18.8)* | 42 *(20.4)* |

ICU= Intensive Care Units, SD=standard deviation, IQR= Interquartile range with 25 and 75 percentiles, LOS=length of stay, n=number, * Missing 9 Primary cause of admission

**Table 2 (abstract 000740)** Nurse shifts and workload, assessed with objective NAS and subjective NASA-TLX, analyzed with Spearman correlation (rho)

| **Table 2** | **ICU-1** | **ICU-2** | **ICU-3** | **ICU-4** | **ICU-5** | **ICU-6** | **Total** |
|---|---|---|---|---|---|---|---|
| Nurse shifts, *n* | 232 | 563 | 552 | 655 | 282 | 327 | 2611 |
| Answers, *n* | 180 | 350 | 345 | 647 | 241 | 282 | 2060* |
| Missing data | 3 | 0 | 0 | 3 | 0 | 9 | 15 |
| Responsrate | 78% | 62% | 62% | 99% | 85% | 86% | 62-99% |
| Nurse Shifts with NAS and NASA-TLX, n | 147 | 237 | 208 | 377 | 215 | 217 | 1395 |
| NAS Scores *Median (IQR)* | 73.0 *(42.6-92.7)* | 147.0 *(134.1-151.8)* | 135.8 *(115.8-145.4)* | 123.6 *(98.3-140.9)* | 91.8 *(65.4-122.9)* | 95.0 *(60.0-114.5)* | - |
| NASA-TLX scores, *Median (IQR)* | 60.1 *(43.5-74.8)* | 46.5 *(36.5-55.0)* | 51.5 *(40.0-63.3)* | 53.3 *(40.2-66.3)* | 57.3 *(45.9-68.7)* | 45.0 *(36.7-56.7)* | - |
| Spearman rho | 0.32 | 0.33 | 0.30 | 0.45 | 0.40 | 0.16 | 0.18 |

ICU= Intensive Care Units, IQR= Interquartile range with 25 and 75 percentiles, LOS=length of stay, n=number, NAS=Nursing Activities Score with scale 0-177%, NASA-TLX=NASA Task Load Index with scale 0-100. *Imputed single-item n= 25

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3. The Norwegian Association Organization of Nurses supports the study with 5,000 Euro.


**Topic:** Nursing care and physiotherapy

## 000742

### The effect of frailty on clinical outcome in critically ill elderly patients with multiple rib fractures


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000742


**Introduction:** As the aging population increases, there has been an increase in the number of elderly trauma patients. Rib fractures occur relatively frequently in these elderly trauma patients and can lead to pulmonary complications. The frailty index is a tool used to assess the vulnerability of the elderly.

**Objectives:** The purpose of this study was to evaluate clinical outcomes in elderly trauma patients with rib fractures by utilizing the frailty index.

**Methods:** Between 2019 and 2023, a retrospective review of the medical records was performed on 128 patients aged 65 and over who visited a Level I trauma center with multiple rib fractures. These patients were divided into two groups according to their frailty index, with those having a frailty index of 0.27 or above being classified into the frail group. We analyzed the risk factors for pulmonary complications in elderly patients with multiple rib fractures using logistic regression analysis.

**Results:** In our study, we compared retrospectively non-frail ($n = 94$) and frail ($n = 34$) groups based on the modified frailty index. Despite

similar demographic compositions and injury severity score in both groups, the frail group showed higher in-hospital mortality rates (2.1% vs. 11.8%; $p=0.023$) and longer lengths of ICU stay (2.0 ± 3.8 vs. 10.6 ± 12.6 days; $p<0.001$) and longer length of hospital stay (14.7 ± 11.1 vs. 28.3 ± 25.3 days; $p=0.004$). The frail group was more susceptible to developing pulmonary complications and required ventilator support more longer durations. Frailty was identified as a risk factor for in-hospital mortality (OR, 6.07; 95% CI 1.1–34.8; $P=0.043$) and pulmonary complications (OR, 10.8; 95% CI, 3.8–30.8; $p<0.001$).

**Table 1 (abstract 000742)** Outcomes of non-frail and frail groups in elderly patients with multiple rib fractures

| | Non-frail(n = 94) | Frail(n = 34) | P-value |
|---|---|---|---|
| In-hospital mortality, n (%) | 2 (2.1) | 4 (11.8) | 0.023* |
| Hospital LOS, days mean ± SD | 14.7 ± 11.1 | 28.3 ± 25.3 | 0.004* |
| ICU LOS, days mean ± SD | 2.0 ± 3.8 | 10.6 ± 12.6 | < 0.001* |
| MV duration, days mean ± SD | 0.5 ± 1.9 | 5.6 ± 7.9 | < 0.001* |
| Unplanned intubation, n (%) | 3 (3.2) | 6 (17.6) | 0.005* |
| Unplanned ICU re-admission, n (%) | 4 (4.3) | 7 (20.6) | 0.004* |
| Pneumonia | 9 (9.6) | 18 (52.9) | < 0.001* |
| Pulmonary thromboembolism | 1 (1.1) | 1 (2.9) | 0.449 |
| ARDS | 0 (0.0) | 6 (17.6) | < 0.001* |
| Discharge to home, n (%) | 43 (45.7) | 10 (29.4) | 0.01* |

**Table 2 (abstract 000742)** Univariate and Multivariate analyses for risk factors of pulmonary complications

| | Univariate | | | Multivariate | | |
|---|---|---|---|---|---|---|
| | OR | 95% CI | P-Value | OR | 95% CI | P-Value |
| SBP | 0.98 | 0.97–1.00 | 0.050* | 0.99 | 0.98–1.01 | 0.677 |
| GCS | 0.20 | 0.05–0.90 | 0.036* | 0.54 | 0.08–3.59 | 0.523 |
| Chest AIS | 3.70 | 1.19–9.17 | 0.005* | 1.42 | 0.42–4.76 | 0.570 |
| Injury severity score | 1.12 | 1.05–1.19 | < 0.001* | 1.12 | 1.04–1.19 | 0.002* |
| Frailty | 9.45 | 3.69–24.18 | < 0.001* | 9.07 | 3.29–24.9 | < 0.001* |

**Conclusions:** This study indicates that frailty may play a crucial role in determining the clinical outcomes of elderly patients with multiple rib fractures, underscoring the need for management strategies suitable for this vulnerable group. There is a significant need for further research into such predictive tools to establish customized management approaches for vulnerable groups like the elderly patients.

**History of diabetes mellitus**

**Functional status**

**History of chronic obstructive pulmonary disease or pneumonia**

**History of congestive heart failure**

**History of myocardial infarction**

**History of percutaneous coronary intervention, stenting, or angina**

**History of hypertension requiring medication**

**History of peripheral vascular disease or ischemic rest pain**

**History of impaired sensorium**

**History of transient ischemic attack or cerebrovascular accident**

**History of cerebrovascular accident with neurological deficit**

**Fig. 1 (abstract 000742)** Modified Frailty Index (mFI)

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**Topic:** Trauma

## 000744

## Evaluation of the relationship between blood products and mortality ratios of polytrauma patients in intensive care unit

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000744

**Introduction:** While polytrauma patients require blood products, the use of these blood products may increase mortality due to complications that may arise.
**Objectives:** Our aim in this study is to determine the relationship between the use of different blood products and mortality and to determine whether they can be used as mortality predictors.
**Methods:** Patients diagnosed with polytrauma hospitalized in the ICU between June 2020 and June 2023 were retrospectively evaluated. Patients' files, archive records, and hospital automation recording systems were examined in detail. All patients' age, gender, accompanying chronic diseases, trauma etiology, use of blood products, number of ventilator days, intensive care unit stay, hospital stay, blood lactate level, hemoglobin measurements, platelet measurements were evaluated, and their relationships with mortality were examined. Frequency and percentage were provided for categorical data, while median, minimum, and maximum were provided as descriptive values for continuous data. The normality of variables was assessed using the Kolmogorov–Smirnov test. "Mann Whitney U-Test" was used for intergroup comparisons, and "Chi-Square or Fisher's Exact Test" was used for comparing categorical variables. "Spearman's Correlation Analysis" was used to examine the relationship between continuous variables.
**Results:** A total of 4053 patients were treated in the ICU between the specified dates, and a total of 75 patients with a diagnosis of trauma were included in the study. While 62 of the 75 patients were discharged with full recovery, 13 of them died in the ICU. Considering their mortality, the use of FFP in patients who died was significantly lower than in those who were discharged, while platelet replacement was statistically significantly higher. The PaO2/FiO2 ratio of the mortal group was significantly lower. The vasopressor requirement in the nonsurvivors group was significantly higher. The 2nd to 5th-day lactate levels of nonsurvivors were significantly higher, and meanwhile, 1st to 5th-day platelet counts were significantly lower. HCO3 levels on the first and second days of hospitalization of nonsurvivors were significantly lower than survivors.
**Conclusions:** Nonsurvivor polytrauma patients were mostly thrombocytopenic and had received platelet solutions. Although there was no significant difference in erythrocyte replacement between survivors and nonsurvivors, reevaluation should be considered to examine the relationship between higher lactate levels, lower bicarbonate levels, and lower platelet counts in nonsurvivors.

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**Topic:** Trauma

## 000745

## Pilot study: a preliminary machine learning model to predict successful extubation in ICU patients with pneumonia

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000745

**Introduction:** Pneumonia, one of the most common infectious diseases worldwide, currently stands as Singapore's fifth most common cause of hospitalisation and second most common cause of death (1). Of those hospitalised, 10–20% would require admission to the Intensive Care Unit (ICU) and invasive mechanical ventilation (2).
Studies show that 10–20% of extubated patients will require re-intubation within 48 h of liberation from invasive mechanical ventilation (3–4). However, this is associated with increased mortality and length of hospitalisation (5). Currently, no single tool is able to accurately predict extubation success in mechanically ventilated patients (6). This suggests a possible limitation in clinicians' abilities to predict successful extubation and a more powerful clinical decision-making tool is needed to fill this gap.
**Objectives:** This pilot study aims to develop a preliminary machine learning (ML) model that would act as a proof of concept to subsequently develop a ML model that can be implemented as a clinician aid towards extubating patients with pneumonia.
**Methods:** A retrospective cohort study was conducted involving patients admitted to our institution's surgical ICU from 2019 to 2021. This study included patients above 21 years old, admitted for any cause of pneumonia requiring invasive mechanical ventilation. Patients who were unintentionally or terminally extubated were excluded. Three ventilator variables were extracted: end-tidal carbon dioxide levels, patient respiratory rate and patient achieved tidal volume.
These ICU admissions were then randomised and split into 2 non-overlapping cohorts: 70% for training and 30% for a validation cohort. In collaboration with a team of engineers from the National University of Singapore, two baseline models for prediction were created and four deep-learning models were examined.
**Results:** 26 patients were included in this pilot study and all relevant data were extracted. 20 patients formed the training cohort and the remaining 6 patients formed the validation cohort.
A sliding window (see Fig 0.1) was developed to capture the temporal dependencies of the data. Of the four ML models, the convolutional neural network (CNN) model showed the best performance, with improved performance the larger the sliding window size. As seen in Table 1, at a window size of 60 h, the mean absolute error (MAE) of the CNN model is 41% less than the Mean baseline model.

**Table 1 (abstract 000745)** Mean MAE for each model and window size

| Window Size | Mean | DTR | LSTM | GRU | CNN | TCN |
|---|---|---|---|---|---|---|
| 15 | 64.62 | 77.17 | **49.41** | 54.57 | 50.75 | 54.57 |
| 20 | 64.46 | 77.06 | 48.84 | 53.70 | **48.13** | 52.39 |
| 25 | 64.43 | 73.95 | 53.71 | 53.87 | **49.05** | 51.15 |
| 30 | 64.26 | 70.55 | 51.17 | 53.23 | **46.05** | 48.27 |
| 35 | 63.88 | 71.01 | **45.09** | 53.60 | 46.87 | 48.80 |
| 40 | 63.49 | 74.37 | **44.45** | 54.38 | 45.40 | 51.20 |
| 45 | 63.08 | 72.09 | 48.53 | 54.88 | **44.33** | 51.55 |
| 50 | 62.85 | 66.14 | **41.28** | 56.13 | 44.80 | 47.33 |
| 55 | 62.81 | 66.83 | 43.99 | 61.77 | **42.98** | 48.86 |
| 60 | 62.59 | 67.81 | 45.42 | 62.90 | **37.06** | 49.03 |

Additionally, despite the limited amount of data and variables used, the CNN model was able to predict the general pattern of the length of mechanical ventilation when compared to actual data (see Fig. 2).
**Conclusions:** The results of the pilot study showed the potential of applying ML models in mechanically ventilated patients with pneumonia. With further data, we aim to build on this study and create a more robust model to determine the optimal time of extubation to minimise extubation failure.

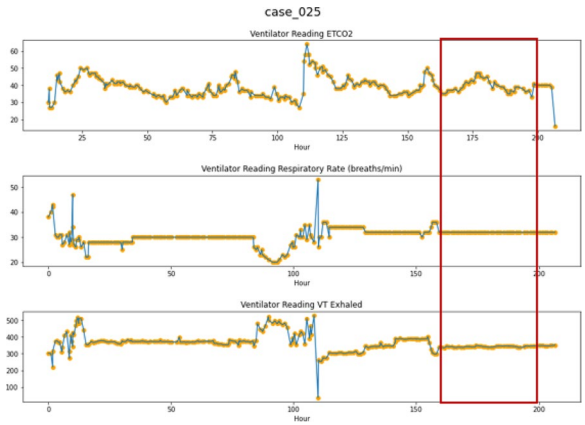


**Fig. 1 (abstract 000745)** A visual representation of a sliding window (red box). The ML model interprets all the data within the window and moves forward 1 h at a time to extract time series from all data at each step

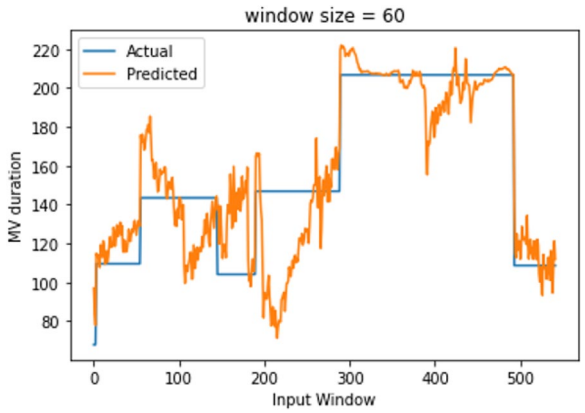


**Fig. 2 (abstract 000745)** The blue line shows the actual duration of mechanical ventilation versus the ML predicted value on the orange line of each patient in the validation cohort

**Reference(s)**


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7. This pilot study was supported by SingHealth Anaesthesiology ACP Pilot Research Grant.


**Topic:** Acute respiratory failure and mechanical ventilation

## 000747

## Exploring antibacterial consumption and pathogen surveillance over 5 years (including the COVID-19 pandemic) in a large adult general intensive care unit

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000747

**Introduction:** Antimicrobial resistance is a globally recognized health emergency. Intensive care is an area with significant antimicrobial consumption, particularly with regard to broad-spectrum antibacterials, meaning that stewardship programs are essential.
**Objectives:** The aim of our project was to explore antibacterial consumption, partnered with pathogen surveillance, over a five-year period in a tertiary referral adult general intensive care unit (ICU).
**Methods:** Patient characteristics and ICU activity data were extracted from the Intensive Care National Audit and Research Centre (ICNARC) reports and ICU daily summaries spanning April 2018 to March 2023. Cumulative antibacterial usage (excluding erythromycin for its prokinetic properties) was derived by aggregating the total doses administered from the clinical information system (MetaVision). The World Health Organisation AWaRe classification and defined daily doses were applied to standardize and interpret the data which was indexed for ICU bed occupancy. For pathogen surveillance, we obtained positive ICU blood culture details and accompanying antibacterial sensitivities from the microbiology information system (PathManager). A 14-day patient-level deduplication rule was applied.
**Results:** Total mean [SD] number of ICU admissions was 1645 [22] per annum. Of these, 60% were male and 6.3% met the Sepsis-3 definition of septic shock upon admission to the ICU (Table 1). A comparison between ICU populations admitted before and after the COVID-19 pandemic peak (2020/21) identified a number of notable differences: increased average daily unit bed occupancy (21.6 vs. 25.2 respectively) and a higher proportion of admissions with sepsis (28.4% vs. 32.5% respectively). Additionally, the post-pandemic period saw an increase in the number of patients admitted with complex diagnoses.
Over the entire five years, the overall proportion of antibacterial use by AWaRe classification[1] was access 42.6%, watch 54.7% and reserve 2.6% (Figure 1). 147 positive blood culture isolates were reported (Figure 2), with the most concerning antibacterial resistance identified in 7.5% (9 *Escherichia coli* isolates with resistance to third-generation cephalosporin; 2 *Klebsiella pneumoniae* isolates with resistance to third-generation cephalosporin, aminoglycoside and fluoroquinolone). The COVID-19 pandemic peak year was associated with increased ICU bed occupancy, a greater number of positive blood cultures but lower antibacterial consumption.
The ratio of observed risk-adjusted mortality rate for all patients (based on the ICNARC model) was consistently below the expected values: 2018/19 – 0.78; 2019/20 – 0.85; 2020/21 – 0.89; 2021/22 – 0.88; 2022/23 – 0.79.
**Conclusions:** Despite an increasingly complex workload, a large proportion of overall antibacterial consumption remained within the access category (according to the AWaRe classification). The prevalence of most concerning antimicrobial resistance, with respect to pathogens, and mortality rate remained satisfyingly consistent. These findings underscore the ongoing value of daily collaboration between senior pharmacists, consultant microbiologists, and ICU ward staff at the ward round, allowing for early escalation/ de-escalation strategies.

This has resulted in a robust antimicrobial stewardship program that promotes the careful use of antibiotics to combat the threat of antimicrobial resistance.

**Table 1 (abstract 000747)** Patient characteristics and unit activity

| Characteristic | | 2018/19* | 2019/20* | 2020/21* | 2021/22* | 2022/23* |
|---|---|---|---|---|---|---|
| Total admissions | | 1676 | 1651 | 1645 | 1614 | 1647 |
| High-risk sepsis admissions from ward† | | 12.7% | 7.3% | 4.5% | 2.9% | 8.1% |
| Unit-acquired infections in blood — per 1000 bed days‡ | | 1.8 | 2.3 | 6.4 | 5.3 | 3.3 |
| Mean [SD] age — years | | 59.4 [18.4] | 60.2 [18.1] | 60.4 [16.6] | 59.5 [17.3] | 60.2 [17.2] |
| Male | | 988 [58.9%] | 1006 [60.9%] | 1032 [62.7%] | 968 [60.0%] | 947 [57.5%] |
| Mean [SD] APACHE II score | | 14.5 [6.3] | 14.9 [6.5] | 14.4 [5.6] | 15.0 [6.3] | 14.9 [6.1] |
| Admissions following trauma | | 206 [12.3%] | 225 [13.6%] | 148 [9.0%] | 216 [13.4%] | 204 [12.4%] |
| Sepsis§ | | 504 [30.1%] | 441 [26.7%] | 648 [39.4%] | 511 [31.7%] | 549 [33.3%] |
| Septic shock§ | | 114 [6.8%] | 90 [5.5%] | 97 [5.9%] | 97 [6.0%] | 120 [7.3%] |
| COVID-19 as primary or secondary reason for admission | | NR | NR | NR | 156 [9.7%] | 57 [3.5%] |
| Median [IQR] length of stay (unit survivors) — days | | 2.3 [1.1, 4.9] | 2.4 [1.1, 4.7] | 2.7 [1.3, 5.9] | 2.5 [1.1, 5.5] | 2.8 [1.5, 5.7] |
| Admission specialty | Clinical haematology | 36 | 22 | 19 | 35 | 46 |
| | Colorectal surgery | 74 | 83 | 88 | 81 | 75 |
| | Upper GI surgery | 35 | 30 | 48 | 26 | 20 |
| Mean [SD] bed occupancy | | 21.8 [2.0] | 21.4 [2.4] | 29.2 [12.9] | 25.3 [3.2] | 25.0 [3.1] |

* April to March inclusive.
† Proportion of eligible admissions (unit admissions with infection from a ward in the same hospital) with four or more organ dysfunctions during the first 24 hours following admission.
‡ Positive blood culture at least 48 hours following unit admission in patients admitted to the unit for at least 48 hours.
§ According to the Sepsis-3 definitions and during the first 24 hours following admission.
Abbreviations: SD - standard deviation; NR - not reported; IQR - interquartile range; GI – gastrointestinal.

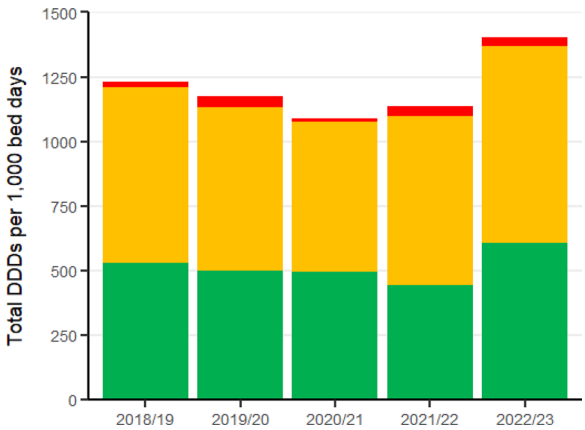


**Fig. 1 (abstract 000747)** Antimicrobial usage categorised according to the World Health Organisation AWaRe classification (access: green; watch: yellow; reserve: red)

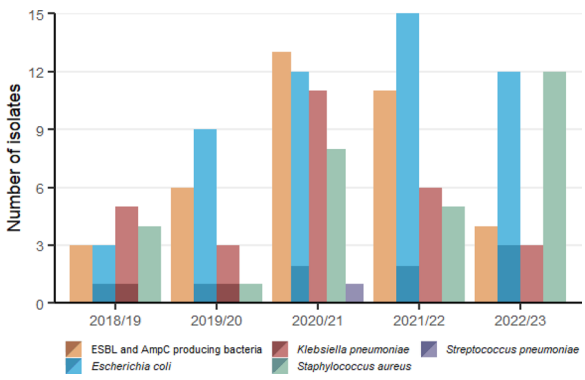


**Fig. 2 (abstract 000747)** Positive blood culture isolates (isolates with most concerning antibacterial resistance shown in a darker shade)

**Reference(s)**
1. *1. Sharland M, Pulcini C, Harbarth S, et al. Classifying antibiotics in the WHO Essential Medicines List for optimal use—be AWaRe. The Lancet Infectious Diseases. 2018;18(1):18–20. https://doi.org/10.1016/S1473-3099(17)30724-7

**Topic:** Infections and prevention

## 000748

### The efficacy of an explainable ai-driven, non-invasive monitoring system for early sepsis detection in surgical wards: the PRISM study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000748

**Introduction:** Sepsis is the third leading cause of death worldwide and the main cause of in-hospital mortality. Despite decades of research, sepsis remains a major challenge faced by patients, clinicians, and medical systems globally [1]. Early identification and prediction of patients at risk of sepsis is critical [2–4]. Annually, 15 million individuals undergo abdominal surgery, with 30% of them facing a significant risk of developing sepsis postoperatively [5,6]. In light of this, our study aims to develop an artificial intelligence (AI) algorithm designed for the early prediction of postoperative sepsis, potentially transforming patient care by enabling timely interventions.
**Objectives:** Our research aims to improve postoperative care in surgical wards by leveraging photoplethysmography (PPG) wearable devices and explainable AI (XAI) for the early prediction of sepsis. Given the high morbidity and mortality rates associated with delayed sepsis diagnosis, our objective is to establish a real-time, non-invasive monitoring system that accurately and promptly predicts the onset of sepsis.
**Methods:** An observational clinical pilot study is being conducted at the General University Hospital of Larissa [7], involving patients who have undergone abdominal surgery and were subsequently admitted to the surgical wards. Vital signs are continuously monitored using PPG wearable devices, with data integrated alongside Electronic Health Record (EHR) information, including laboratory results, for sepsis prediction. Identification of sepsis cases adhered to the Sepsis-3 criteria [8]. We employed the Extreme Gradient Boosting (XGBoost) algorithm for early sepsis prediction, prior to the manifestation of clinical symptoms (Figure 1). To address the AI "black-box" issue, we created a digital patient twin for personalized predictive insights, facilitating clinician understanding of sepsis risk etiology, especially in less monitored settings. The AI model was trained using the MIMIC IV database [9] and is currently being validated using prospectively collected data (Figure 2).
**Results:** The AI model, trained on data from approximately 20,000 patients, demonstrated a 97% accuracy, 87% sensitivity, and 98% specificity in predicting sepsis six hours before onset. This represents a significant improvement over traditional methods like qSOFA, which predicts sepsis with 89% specificity, reducing false positive rates by over fivefold. Our findings suggest that continuous vital sign monitoring through medical-grade wearable devices may enhance sepsis prediction compared to periodically collected data methods.
**Conclusions:** The integration of wearable technology and explainable AI in patient monitoring at the general surgery wards signifies a revolutionary advance in postoperative care, notably enhancing patient outcomes and reducing hospital stays. This approach not only elevates patient safety standards in surgical wards but also promotes proactive healthcare interventions for sepsis management.

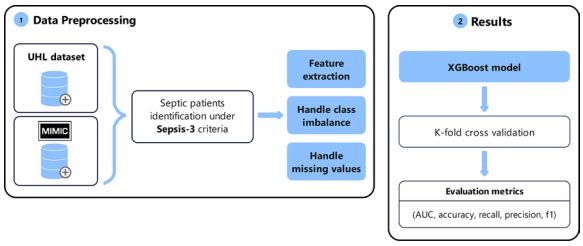


**Fig. 1 (abstract 000748)** Flowchart of the proposed sepsis prediction methodology

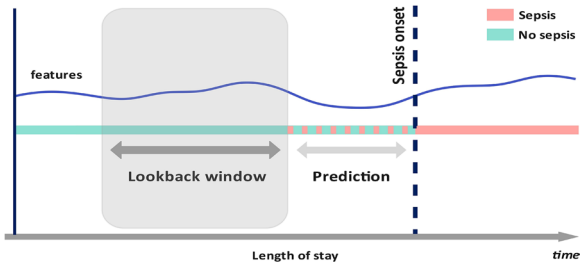


**Fig. 2 (abstract 000748)** Prediction Methodology. The "Lookback window" indicates the period used to gather features for the model, while the "Prediction" shows the horizon within the model predicts the sepsis onset, differentiated by the cyan (No sepsis) and red (Sepsis) timelines across the patient's length of stay

**Reference(s)**


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5. 7. Personalised Real-time Interoperable Sepsis Monitoring (PRISM). Identifier NCT06238180. U.S. National Library of Medicine, 2023-. https://clinicaltrials.gov/study/NCT06238180 (accessed 2024-04-10).
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7. 9. Johnson, A.E.W. et al. (2023) 'MIMIC-IV, a freely accessible electronic health record dataset', Scientific data, 10(1), p. 1.
8. 1. Buchman, T.G. et al. (2020) 'Sepsis Among Medicare Beneficiaries: 1. The Burdens of Sepsis, 2012–2018', Critical care medicine, 48(3), pp. 276–288.
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10. This work was supported by the EIT Health RIS Innovation Programme 2023 under the project "Personalised Real-time Interoperable Sepsis Monitoring (PRISM)," grant number 2022-RIS_Innovation-019.

**Topic:** Sepsis

## 000750

## Transdermal nicotine replacement therapy in critically ill patients: a systematic review and meta-analysis

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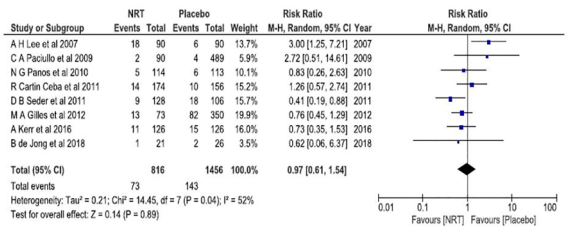
***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000750

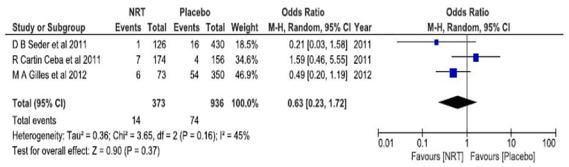
**Introduction:** The prevalence of smoking among hospitalized patients, particularly those admitted to intensive care units (ICUs), underscores the critical need for the effective management of nicotine dependence in this vulnerable population. As smokers constitute a substantial portion of ICU admissions, estimated between 22 and 45%, addressing nicotine withdrawal becomes paramount, especially considering the hemodynamic instability and multiorgan dysfunction that commonly occur in critically ill patients1. Nicotine Replacement Therapy (NRT) serves as a cornerstone in managing withdrawal symptoms; however, its efficacy and safety in the ICU setting remain under scrutiny. While NRT has demonstrated effectiveness in preventing and treating withdrawal symptoms in hospitalized patients and in improving cessation rates post-discharge, its impact on critically ill patients is not well understood2. This systematic review and meta-analysis aimed to determine the effect of a transdermal nicotine patch in critically ill patients compared with a placebo.
**Objectives:** To determine the effect of transdermal nicotine patch administration on critically ill patients in comparison to a placebo.
**Methods:** A literature search was performed using electronic databases, such as PubMed, Google Scholar, Embase, Cochrane Reviews, MEDLINE, and the US Clinical Registry. Randomized controlled trials and controlled cohort studies assessing the impact of transdermal nicotine compared to placebo on in-hospital mortality in critically ill ICU patients were included. The primary outcome was the incidence of in-hospital mortality. The secondary outcomes included the incidence of delirium, incidence of ICU mortality, length of hospital stay, length of ICU stay, and length of mechanical ventilation. Inverse variance and Mantel- Haenszel statistical analysis methods were used for continuous and dichotomous data. All results were quantitatively analyzed using a random-effects model.
**Results:** Nine studies with 2272 patients were included in both groups and showed no significant difference in in-hospital mortality between the two groups, with an RR of 0.79 (95% CI 0.61–1.54], p = 0.89; (I2 = 52%, $p = 0.04$), but showed a higher incidence of delirium in the NRT group (RR 3.25, 95% CI 2.30–1.65; $p = 0.59$), with considerable heterogeneity between the studies (I2 = 70%, $p = 0.0009$). There were no significant differences in the incidence of ICU mortality, length of hospital stay, length of ICU stay, or length of mechanical ventilation between the two groups.
**Conclusions:** Transdermal nicotine therapy in critically ill patients did not demonstrate a reduction in in-hospital mortality. Instead, it resulted in an increased incidence of delirium, without any discernible difference in the incidence of ICU mortality, length of hospital stay, length of ICU stay, or length of mechanical ventilation consequently; there is currently no compelling reason to employ nicotine in this particular context (and warrants further large- scale randomized controlled trials to assess the safety and efficacy of nicotine replacement therapy due to the predominantly observational nature of the included studies).

**Fig. (abstract 000750).**

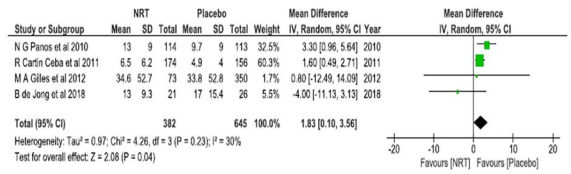



**(A) In-hospital mortality.**

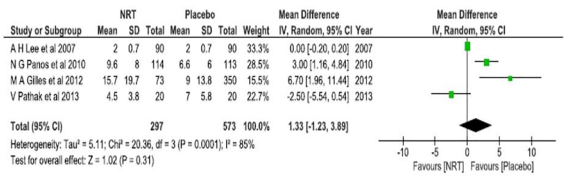

**(B) Incidence of Delerium.**



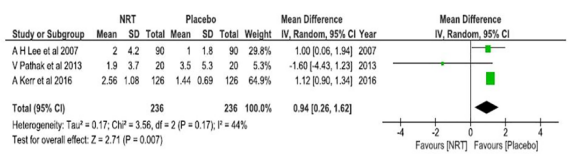

**(C) ICU mortality.**




**(A) Length of hospital stay.**




**(B) Length of ICU stay.**




**(C) Length of mechanical ventilation.**

**Reference(s)**

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2. 2. Ebbert J, Montori VM, Erwin PJ, Stead LF (2011) Interventions for smokeless tobacco use cessation. Cochrane Database Syst Rev CD004306
3. We extend our gratitude to all authors for their invaluable contributions to this study

**Topic:** Sedation, analgesia and delirium

## 000751

## Temporal harmonisation of individual patient trajectories in the MIMIC-IV dataset using pair programming with a custom GPT

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000751

**Introduction:** Intensive care units (ICUs) present with tremendous physiological and pathological challenges. Most ICU disorders present with an inherent heterogeneity which often remains undetected due to a lack of objective and specific biomarkers [1], [2], [3]. Efficiently leveraging medical data could be effective in understanding this heterogeneity, consequently advancing precision medicine. In line, ICUs, being widely tech-enabled, allow for the digitisation of medically relevant data. This could optimise clinical research, provide relevant context for translational biology and enhance evidence-based medicine in the electronic medical records (EMR) era [4].
In our study, we utilised a customised LLM to process the MIMIC-IV dataset. While multiple pre-processing pipelines have been reported [5], [6], we wanted to develop individualised patient trajectories without data loss which can retain the hierarchical structure of the dataset. This would allow for temporal harmonisation and application of multimodal clustering algorithms which provide maximum information extraction. These can be then used for further downstream analysis to identify disease heterogeneity.
**Objectives:** 1. Creation of anonymised individual patient files maintaining hierarchical data structure and minimising data loss.
2. Creating temporally harmonised data trajectories with uncertainty awareness to allow for clustering and comparative analysis
**Methods:** The dataset was processed using a custom GPT—CodeR built on the GPT-4 platform. The GPT was optimised using instructions to validate the code before output, minimise errors, and give detailed explanation. The primary language for the GPT was Python.
Strict precautions were maintained and no data was uploaded to the ChatGPT online platform complying with the Credentialed Data Use Agreement signed during data access. No attempt at reidentification was made during the creation of the patient trajectories.
**Results:** Using pair programming with CodeR, the MIMIC-IV dataset could be pre-processed to create individual JSON files for each patient. All relevant fields linked to common fields were arranged in a hierarchical fashion to allow for easier comparison (Fig. 1A). No fields were omitted, and original datatypes and missing values were retained. Validation was done by random manual screening. Temporal harmonisation was done by converting all time stamps to an ISO format. For each JSON, the first time stamp recorded was converted to '0' and all others were adjusted accordingly (Figure 1B). This allowed for creation of a bound time space which could be used for comparison of different patients.
**Conclusions:** The work creates a framework for handling EMR data, retaining its relational structure for easy harmonisation, comparisons, and processing without data loss or imputation. Using LLM-based python programming allows the retention of scalability which may be lost with relational databases [7]. In addition, it enables physicians to perform exploratory analysis, which reduces data hesitancy and fosters interdisciplinary collaboration with data scientists through development of a common vocabulary [8]. Currently our ongoing work plans on:

1. Creating uncertainty-aware multivariate trajectories for irregularly sampled data combining neural networks and statistical models
2. Using graph networks and longitudinal clustering to identify patient clusters while considering heterogeneity of treatment effects.
3. Validating with external datasets and prospective experimental biomarkers for biological validation

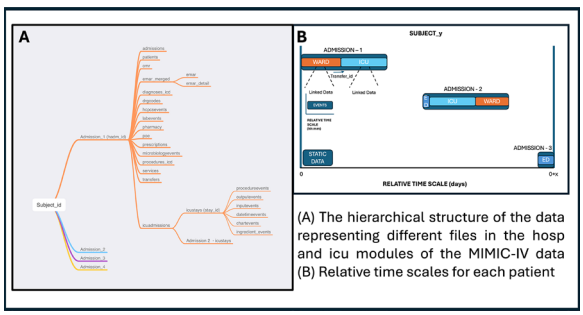


**Fig. 1 (abstract 000751)** (A) LLM-based pair programming was used to create a separate JSON files for each patient which retained the missingness and data types for each field while arranging the data into a hierarchical structure using common anchor fields. Each end field is a collapsed representation. (B) The bound time space is created for each patient by plotting date and time stamps on a relative time scale. This allows for temporal harmonisation and comparison between different patient trajectories**Reference(s)**


1. [3] S. Ridley et al., 'Heterogeneity in intensive care units: fact or fiction?', Anaesthesia, vol. 52, no. 6, pp. 531–537, Jun. 1997, https://doi.org/10.1111/j.1365-2222.1997.109-az0109.x.
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**Topic:** Information systems and Data Science

## 000752

### Exploring combined physical and nutritional rehabilitation across the critical illness continuum: a systematic review and narrative synthesis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000752

**Introduction:** Each day spent in the ICU contributes to decreased physical function and reduced quality of life. This is secondary to the physical, psychological, and cognitive impairments that survivors face following an extended stay in the ICU. In other diverse populations, nutritional and physical interventions are combined to promote muscle gain and improve physical function. However, this concept has only been explored in the context of critical illness in the last 10 years. Thus, a systematic review was performed to explore this concept and provide recommendations for future research and practice.
**Objectives:** This review aims to explore the effect of combined physical and nutritional interventions, on physical function and health-related quality of life, across the critical illness continuum. A narrative synthesis of the eligible studies will provide the basis for future recommendations.
**Methods:** A systematic review was conducted across 5 databases. Inclusion criteria were RCTs published between 2000 and 2023, with participants aged ≥ 18 years, with an ICU stay ≥ 4 days. Interventions included any combination of physical and nutritional rehabilitation. In addition, only studies with outcomes that encompassed physical function or health-related quality of life were included. The Risk of Bias 2 (ROB2) tool was implemented to determine the risk of bias in each eligible study. Due to the wide heterogeneity in included studies, a 4-stage narrative synthesis process was conducted to formulate the recommendations from this review.
**Results:** A total of 9153 articles were screened although only 6 studies met the inclusion criteria. The included studies spanned the critical illness continuum, from ICU through to the community setting.
A theoretical model was developed in the initial stage of the narrative synthesis, outlining the hypothesised pathways in which a combination of physical therapy and nutrition may impact physical function and health-related quality of life. This was developed using only the included studies and informed the reasoning behind combined interventions in the context of critical illness.
The relationships within and between each study were examined using a variety of narrative techniques to form 5 recommendations for clinical practice and future trials. Specifically, the use of Electrical Muscle Stimulation in acute critical illness, the need to define 'high protein' in the context of critical illness, nutritional supplementation further along the recovery continuum, the importance of qualified healthcare professionals in the delivery of specialised interventions to complex populations, and finally considerations for a core outcome set for future research in this area.
**Conclusions:** There may be some physical benefits to combining physical and nutritional interventions in survivors of critical illness. However, further research is needed to identify which combinations may be the most beneficial at each stage in the continuum. Recommendations from this study aim to inform this process.

**Topic:** Nursing care and physiotherapy

## 000753

### Association between serum acylcarnitine profile after ICU discharge and mid-term muscle outcomes: an observational study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000753

**Introduction:** In our previous studies, we observed an altered serum acylcarnitine (AC) profile in survivors of an intensive care unit (ICU) during the 3 months after discharge. This profile was associated with markers of protein catabolism.
**Objectives:** The aim of this observational study was to investigate the association between serum AC profile measured at ICU discharge and muscle outcomes assessed 3 months later in survivors of a prolonged ICU stay.

**Methods:** Adults enrolled in our post-ICU follow-up program and who attended the consultation 3 months (M3) after discharge were included. Serum AC concentrations were assessed using liquid chromatography with tandem mass spectrometry within 7 days following ICU discharge (T0). Exclusion criteria were known primary carnitine deficiency and ongoing treatment with zidovudine, valproate, cyclosporine or cisplatin at T0. Muscle outcomes included urea/creatinine ratio, sarcopenia index, quadriceps, and handgrip strengths measured using dynamometry and frailty (i.e.: difference in Clinical Frailty Score (CFS) between M3 and the pre-ICU status).
**Results:** A total of 127 patients (86 men (67,7%), 63(55–70) years, SAPS II 36 (26–56)) who survived an ICU stay of 13 (8–33) days were analyzed. Free carnitine (C0) concentration was 44.4 (33–52.2) µmol/L. C0 deficiency was observed in 2/127 (1.6%). The total AC/C0 ratio (normal $\leq 0.4$) was 0.37 (0.28–0.47) at T0. An AC/C0 ratio > 0.4 was observed in 55/127 (43.3%). The short-chain and long-chain ACs reached respectively 1.2 (0.9–1.7) µmol/L and 0.9 (0.6–1.2) µmol/L. At M3, the urea/creatinine ratio and the sarcopenia index were respectively 38.3 (28.3–50.3) and 0.7 (0.6–0.9). Quadriceps strength was 2.9 (2.1–3.7) N/kg and the handgrip strength was 25 (19–34) kg. CFS increased by 1 (0–1) point at M3 compared to pre-ICU level. In univariate analysis, none of the AC profile markers were associated with any of the muscle outcomes. Multivariate analyses are ongoing.
**Conclusions:** In patients surviving a prolonged ICU stay, there was no association between serum AC profile markers at ICU discharge and muscle outcomes at M3. The interest of AC profile as a predictive marker of post-ICU muscle outcomes, as assessed in daily practice and considered individually, is questionable. Further analysis should investigate if the AC profile could predict a composite muscle outcome, reflecting the interconnection between muscle mass, strength, and function.

**Topic:** Health Services Research and Outcome

### 000754

## Association between VTE and 28-day mortality in patients of critical care medicine: secondary data mining from the large-scale clinical database MIMIC-IV

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000754

**Introduction:** Venous thromboembolism (VTE) is a common complication in intensive care unit (ICU) patients and can lead to poor prognosis in critically ill patients. However, the factors affecting the prognosis of ICU patients with combined VTE remain unclear, and there is a lack of models to predict prognosis based on risk factor combinations.
**Objectives:** This study aimed to screen for independent risk factors for 28-day mortality in critically ill VTE patients and to develop a predictive model for clinical assessment of survival.
**Methods:** We identified patients with VTE using the MIMIC-IV database, data were split into two groups based on death or survival within 28 days. Variables were selected for display and comparison between groups based on the significance and availability of stepwise analysis. Multivariate Cox proportional regression model predictions were constructed by R software. The performances of the models was tested and compared by AUCs of the receiver operating characteristic curves and decision curve analysis. A nomogram model was used to assess the survival prognosis of critically ill VTE patients.
**Results:** We included a total of 1162 critically ill VTE patients, including 1002 in the 28-day survival group and 160 in the 28-day death group. In multivariate Cox regression analysis, age (OR: 1.03, 95% CI 1.02–1.05, $P < 0.001$), partial thromboplastin time(PTT)_max (OR: 1.01, 95% CI 1.00–1.01, $P < 0.001$), sepsis (OR: 2.15, 95% CI: 1.22–3.80, $P = 0.008$), malignancy (OR: 2.10, 95% CI 1.48–2.98, $P < 0.001$), severe liver disease (OR: 2.19, 95% CI 1.26–3.81, $P = 0.005$), and respiratory failure (OR: 1.48, 95% CI 1.02–2.15, $P = 0.039$) were independent risk factors for 28-day death in critically ill VTE patients. The area under the curve (AUC) was 0.76, which was used to build the nomogram model with a C-index of 0.795, indicating that the nomogram had good differentiation. Furthermore, Decision Curve Analysis (DCA) showed that the nomogram was clinically useful and had better discriminative ability to identify critically ill VTE patients at high risk.
**Conclusions:** Age, sepsis, malignancy, severe liver disease, and respiratory failure were independent risk factors for 28-day death in patients with critical VTE. Among them, severe liver disease, sepsis, and malignancy ranked in the top three, respectively. We developed and validated a prognostic nomogram model to assist clinicians in assessing the survival prognosis of critically ill VTE patients.

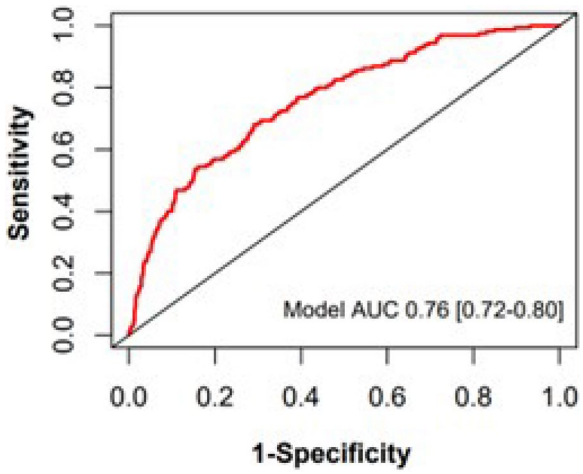


**Fig. 2 (abstract 000754)** ROC curve analysis of combined age, GCS, temperature, spo2, ptt, urine, sepsis, malignant cancer, severe liver disease and respiratory failure in critical VTE patients

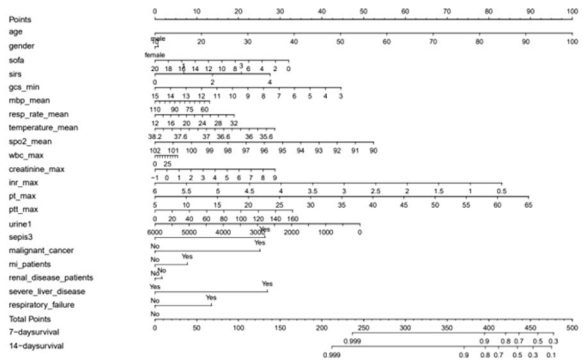


**Fig. 3 (abstract 000754)** Prediction model nomogram

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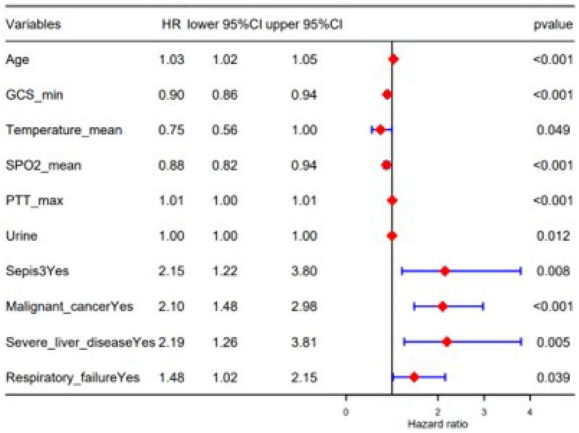


**Fig. 1 (abstract 000754)** Multi-Cox analyses of risk factors for 28-day death in critically ill patients with VTE

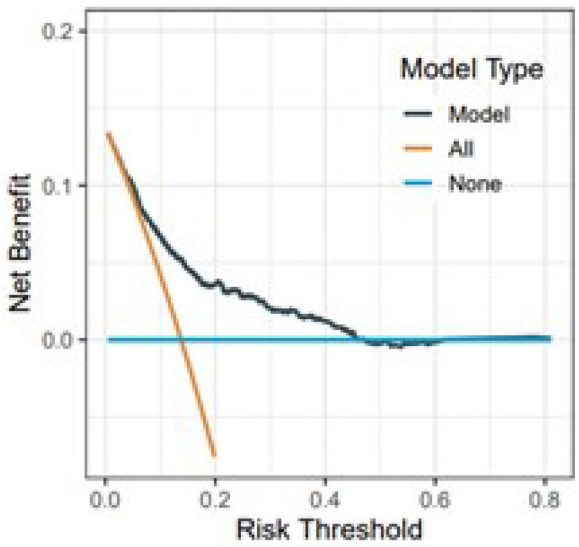


**Fig. 4 (abstract 000754)** Decision curve analysis (DCA) for the prediction of 7-day and 14-day survival based on multivariate Cox regression model (including age, sex, and comorbidities)

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6. 1.3.5 project for disciplines of excellence, West China Hospital, Sichuan University(ZYGD23012/ZYJC18006)
7. The National Key R&D Program of China (2022YFC2504500)

**Topic:** Systemic diseases

## 000755

## Net albumin leakage in patients in the icu with suspected sepsis. a prospective analysis using mass balance calculations

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000755

**Introduction:** Albumin kinetics in septic shock have been extensively studied, yet recommendations for its clinical use remain weak (1). Fleck et al. demonstrated an increased transcapillary escape rate (TER) of albumin from the vascular system; however, TER does not provide insight into lymphatic return from the interstitium to the circulation (2). Mass balance calculations takes the lymphatic return in account and have been used to assess net albumin leakage (NAL) from the circulation in surgical patients (3).
**Objectives:** The primary objective of this study was to evaluate NAL in ten patients with suspected sepsis admitted to the ICU, with the hypothesis that it would manifest as a net positive leakage. The secondary aim was to investigate associations between NAL and fluid overload, glycocalyx shedding products, and potential causes of increased NAL.
**Methods:** This prospective, observational analysis included ten patients within the first twelve hours of ICU admission due to suspected sepsis at Karolinska University Hospital Huddinge in 2017. Albumin, hematocrit, and hemoglobin levels were sampled at hours 0, 1, 2, 4, 8, and 24. NAL was estimated using mass balance calculations, which in short compare proportional changes in albumin and hemoglobin concentrations over time, adjusting for infusions and losses. If albumin concentration is decreased proportionally more or raised proportionally less than hemoglobin, this is interpreted as a net albumin leakage, NAL. That is, the amount of grams leaving the circulation to the interstitium minus the return to the circulation via the lymphatic system. The t-test was used to assess changes from baseline. ANOVA was used to measure the change of NAL and syndecan-1 from zero at hour 0, 4, and 24. Simple linear regression was used to quantify the relationship between NAL and albumin infusions. Data are presented as mean ± SD or median and range.
**Results:** Baseline characteristics are summarized in Table 1. At 24 h, NAL was 8 ± 10 g ($p = 0.029$). There was no correlation between the NAL and the fluid balance ($r2 = 0.003$, $p = 0.87$), and similarly, no correlation was observed with syndecan-1 levels ($r^2 = 0.003$, $p = 0.64$). The temporal pattern of NAL, syndecan-1, and the association of NAL with albumin administration is illustrated in Fig. 1. NAL was significantly raised over time (Fig 1a), syndecan-1 levels were high but did not change over time (Fig. 1b) and albumin administration was positively correlated to NAL (Fig 1c).
**Conclusions:**

1. During a time period of 24 h, there was a net positive albumin leakage from the circulation supposedly to the interstitium in 10 patients with suspected sepsis of 8 ± 10 g.
2. There was no correlation between the net albumin leakage and the fluid balance nor syndecan-1 levels.
3. Administration of albumin infusion seemed to increase the net albumin leakage.

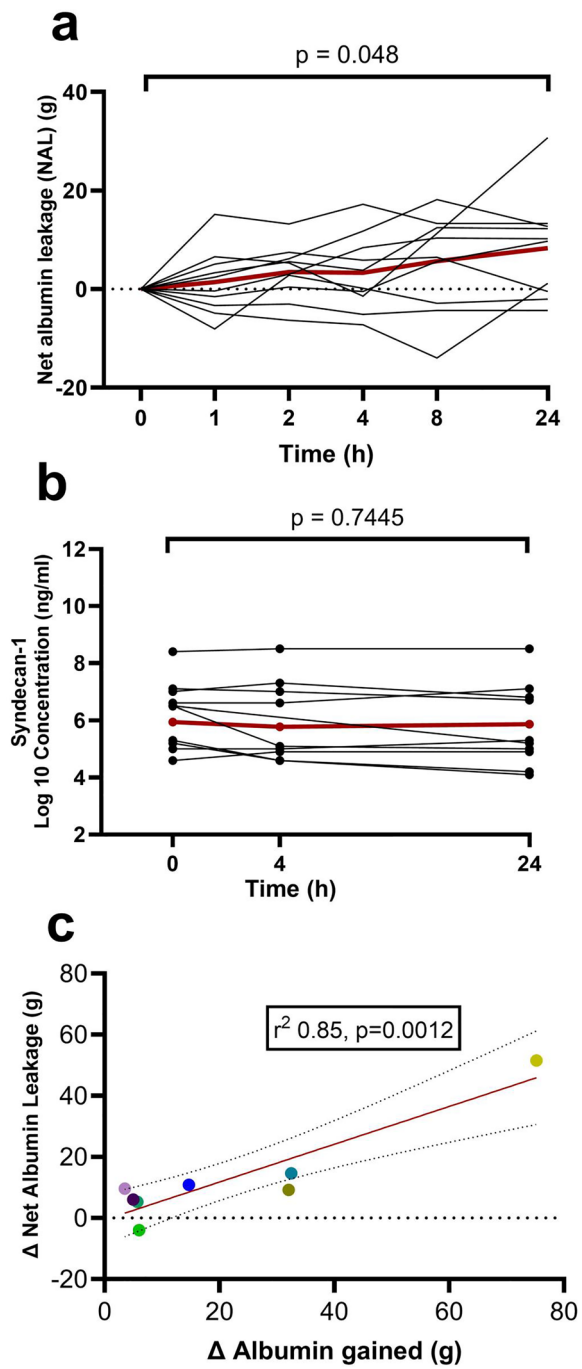


**Fig. 1 (abstract 000755)** Temporal pattern of (**a**), net albumin leakage (NAL) (**b**), syndecan-1. Red line represents the mean of ten patients. Changes over time are assessed by ANOVA. (**c**), the mean change in albumin gained (ΔAlb) versus mean change in NAL (ΔNAL) in 8 patients at 33 different timepoints in the ICU. Each dot represents the mean amount of albumin gained by a patient (x-axis) and the subsequent corresponding change in NAL (ΔNAL) between 1–16 h later (Y = 0.6180*X—0.5863, r2 = 0.85, p = 0.0012)

**Table 1 (abstract 000755)** Values are presented as median (range), fraction (%), or mean (95% confidence interval). BMI = body mass index, CRP = C-reactive protein. Septic shock was defined as a suspected infection in a patient receiving antibiotic therapy, resuscitated with IV crystalloid 30ml/kg, and on vasopressors with a lactate level > 2

| | Patients n = 10 |
|---|---|
| Length (m) (mean ± SD) | 1.79 ± 0.1 |
| BMI (kg/m$^2$) (median, range) | 23 (17, 33) |
| Sex (male) (%) | 100 |
| Age (years) (median, range) | 60 (53, 85) |
| Noradrenaline dose (µg/kg/min) (median, range) | 0.015 (0 - 0.30) |
| Lactate (mmol/L) (median, range) | 2 (1, 12) |
| Plasma Albumin (g/L) (mean ± SD) | 20 ± 5 |
| Hemoglobin (g/L) (median, range) | 72 (88 - 149) |
| CRP (mg/L) (mean ± SD) | 213 ± 114 |
| Sofa score (mean ± SD) | 9 ± 5 |
| SAPS III (mean ± SD) | 75 ± 18 |
| Septic shock (%)* | 80 |
| Fluid balance (L) (mean ± SD) | 3.7 ± 3.3 |

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**Topic:** Sepsis

## 000756

## Efficacy and safety of HA 280 immunoadsorption column in Guillain Barré syndrome patients

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000756

**Introduction:** Immunoadsorption is increasingly recognized as an alternative to therapeutic plasma exchange (PEX) and used for the supportive treatment of neurological disorders such as Guillain–Barré syndrome, chronic inflammatory demyelinating polyneuropathy, myasthenia gravis, neuromyelitis optica spectrum disorders, multiple sclerosis, and autoimmune encephalitis. Immunoadsorption can solve some drawbacks of PEX such as anaphylactic reaction from fresh frozen plasma (FFP), transmission of blood-borne organisms, and the time-consuming preparation of FFP.
**Objectives:** To evaluate the short-term clinical efficacy and safety of treatment of HA280 immunoadsorption (IA) column in Guillain Barré syndrome.
**Methods:** A prospective, interventional study on Guillain Barré patients who were under immunoadsorption therapy by HA 280 column at the Center for Critical Care Medicine, Bach Mai Hospital from

August 2022 to March 2023. Data including age, gender, mechanical ventilation, the change of muscle strength according to Medical Research Council (MRC) score after IA cycles, Disability of patients according to Hughes score after IA cycles, catheter site infection, anaphylaxis, clinical bleeding, coagulation disorders: PLT < 150 T/l, PT < 70% or APTTb/c > 1,2, fibrinogen < 2 g/l were collected. T- Tests were used for statistical analysis.

**Results:** 23 patients were included in the study with an average age of 55.4 ± 13.90 years (min 30, max 76). In the cohort, males accounted for 60.9%. IA was performed 101 times in 23 patients. 17 out of 23 patients did not require invasive mechanical ventilation, the six remaining patients were supported with invasive mechanical ventilation. The median frequency of IA in the two groups was 4 and 5 respectively. In the non-invasive mechanical ventilation group, the median MRC scale for muscle strength in the upper limb muscle groups before and after IA procedures were 2 and 5 respectively. In the mechanical ventilation group, the upper limb muscle strength also recovered, but slower (2 and 3 respectively). The results of lower limb muscle groups showed a similar pattern.

After the IA procedures, significant improvement in GBS Hughes disability scores was seen compared to prior treatment (6 vs 5, respectively). The number of patients having Hughes score 4 before IA procedures were 17 and after IA were 2.

Adverse events only occurred in 6 of 101 procedures (5.9%) in which four episodes of catheter site bleeding, once of femoral vein thrombosis and once of column clotting. Thrombocytopenia was not noted.

**Conclusions:** HA 280 column helped improve muscle strength according to the MRC score and Disability with Hughes score in Guillain Barré syndrome patients. It may be considered as a potential alternative treatment for PEX.

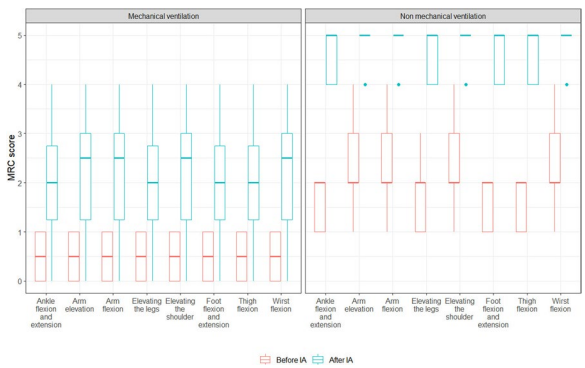


**Fig. (abstract 000756)** The changes in MRC score before and after IA

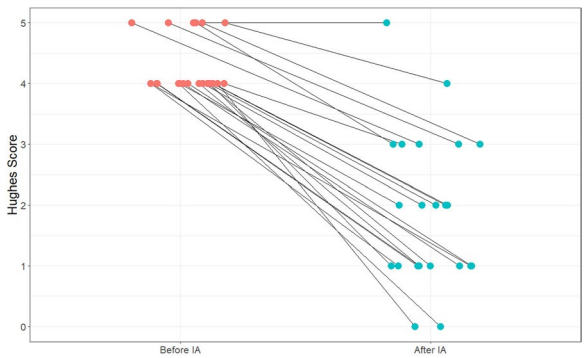


**Fig. (abstract 000756)** TThe changes of Hughes Score before and after I

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5. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

**Topic:** Neurointensive care

## 000757

### Circulating nucleosomes as a novel biomarker for sepsis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000757

**Introduction:** Circulating nucleosome levels are commonly elevated across both physiological and pathological conditions. Within sepsis, activated neutrophils release granule proteins and chromatin, resulting in the formation of neutrophil extracellular traps (NETs) which entrap and kill bacteria through a process known as NETosis. Elevated levels of NETosis and nucleosomes appear to correlate with the severity and mortality of sepsis. Furthermore, the utility of circulating nucleosome levels as biomarkers for NETosis, organ dysfunction, and sepsis diagnosis or prognosis or guide sepsis therapy remains uncertain. Technical limitations in nucleosome detection preclude definitive answers through systematic review/meta-analysis.

**Objectives:** To explore the origins, immunostimulatory functions, and potential toxicity of nucleosomes in sepsis.

**Methods:** We conducted a comprehensive search on Cochrane and Medline libraries from 1996 to February 1, 2024, to identify articles examining the involvement of circulating nucleosomes in NETosis and their potential to distinguish between septic patients from those with uncomplicated sepsis to septic shock- and individuals with Systemic Inflammatory Response Syndrome (SIRS), unrelated to infection. Studies involving animals, patients lacking probable infection, and neonates were excluded from consideration. Patient and study characteristics were independently extracted by two investigators, with any discrepancies resolved through consensus.

**Results:** Our search yielded 110 potential studies, of which 18 met the inclusion criteria, encompassing a total of 39 SIRS, 873 sepsis patients, 280 septic shock, 117 other ICU control patients, and 340 healthy volunteers. The predominant methods utilized for analyzing plasma/serum samples for nucleosome measurements were enzyme-linked immunosorbent assay (ELISA), employing both homemade and commercially available kits. Among the 7 studies exploring the relationship between nucleosome levels and other NETs biomarkers, all reported a significant correlation. Notably, in 6 out of 9 studies, admission nucleosome levels were significantly elevated in septic patients compared to healthy volunteers. Furthermore, nucleosome levels were also associated with sepsis severity scores, such as Sequential Organ Failure Assessment (SOFA) and/or Acute Physiology, Age and Chronic Health Evaluation (APACHE II) scores. Of the 13 studies reporting on mortality,

8 indicated significantly higher nucleosome levels in non-survivors compared to survivors.
**Conclusions:** Circulating nucleosome levels emerge as a promising marker of NETosis in the early stages of sepsis, exhibiting moderate diagnostic performance for sepsis and strong correlations with both severity and prognosis. However, these observations primarily stem from single-center, observational studies, often employing home-made ELISA kits and small sample sizes.

**Topic:** Sepsis

## 000758

### Theranostics approach to NETosis in sepsis and experimental human endotoxemia: impact of NETosis and potential Anti-NETs-therapeutics

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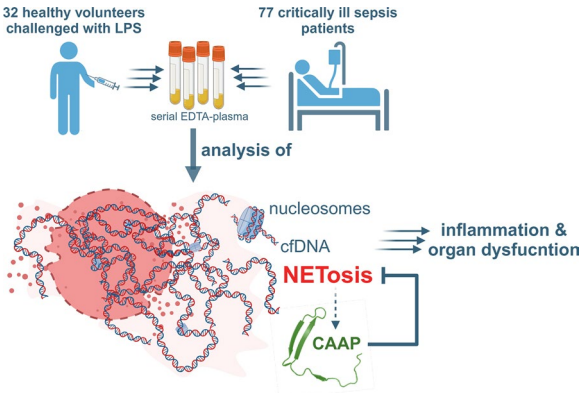
***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000758

**Introduction:** Neutrophils are innate immune cells recruited early to sites of inflammation, releasing pro-inflammatory cytokines and mesh-like structures comprised of DNA, histones, and various granular proteins known as neutrophil extracellular traps (NETs) [1]. NETs are potentially toxic and may play a key role in mediating tissue injury, inducing a prothrombotic state associated with vascular impairment, thereby contributing to organ damage. Evidence from multiple studies suggests that the imbalance between production and clearance of NETs is detrimental to organ health in various diseases [2]. NETosis could, therefore, be considered a biomarker of organ dysfunction. Hence, strategies aimed at modulating NET-associated processes could have a therapeutic impact on various inflammatory diseases. Recently, endogenous C-terminal peptides of alpha-1-antitrypsin (CAAPs), generated by inhibition of proteolysis and found to be upregulated in severe pro-inflammatory conditions [3], are postulated as novel antagonists of NETosis that may improve organ function and survival [4, 5].
**Objectives:** We aimed to determine whether circulating nucleosomes and cell-free DNA, both markers for NETosis, are associated with inflammation and organ dysfunction in a cohort of healthy volunteers subjected to experimental endotoxemia (intravenous administration of lipopolysaccharide [LPS]) and in patients with sepsis. Furthermore, we explored whether CAAPs could serve as a theranostic inhibitor to reduce NET release and disease burden.
**Methods:** Thirty-two healthy volunteers who were challenged with 1 ng/kg LPS at Radboud University Medical Center and 77 critically ill sepsis patients from the MS ICU trial at the Jena University Hospital were included in this study. EDTA plasma was obtained before and frequently after the LPS challenge in volunteers and within the first 24 h after sepsis onset in patients. Cell-free DNA and nucleosomes were quantified using Sytox Green and ELISA, respectively. Additionally, cytokine profiles and clinical severity markers were determined. CAAPs were quantified by UPLC-MS/MS in a subset of the experimental endotoxemia cohort displaying high plasma cytokine concentrations (LPS high responders). Finally, the therapeutic potential of CAAPs was assayed by performing in vitro experiments in primary human leukocytes stimulated with phorbol ester or LPS, and NET release was assayed using the same methods as outlined above.
**Results:** Quantification of cell-free DNA and nucleosomes in the plasma of LPS-challenged volunteers indicated increased NETosis during the acute phase of systemic inflammation (maximum NET release at 4–6-h post-LPS). In septic patients, significant correlations between NET-related nucleosomes and cardiovascular SOFA ($r = 0.39$, $p = 0.002$) and CRP concentrations ($r = 0.41$, $p = 0.0009$) were found. Furthermore, nucleosomes also tended to correlate with respiratory and renal SOFA, further strengthening the possible contribution of NETosis to organ dysfunction by inducing an inflammatory prothrombotic state and/or vascular impairment. In LPS high responders the generation of sepsis-related CAAPs C36 and C42 paralleled with the increase of NETosis markers, and in vitro investigations confirmed inhibition of NETosis by incubation with CAAPs.
**Conclusions:** Systemic inflammation induces NETosis, which is related to organ dysfunction in sepsis. As such, inhibition of an excessive NETosis may hold promise for attenuating organ damage in pro-inflammatory conditions and potentially improving the survival of critically ill patients. However, a deeper understanding of individual NET burden is crucial for tailoring therapeutics to mitigate NETosis, such as applying NET-inhibiting CAAPs. Therefore, further research is warranted to develop a theragnostic approach aimed at preventing or reducing NETosis, which could be achieved through quantifying NET markers and controlling endogenous NETosis inhibitors, potentially establishing CAAPs concentration as a novel therapeutic target.




**Graphical Abstract (abstract 000758)** created With Biorender.com.

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**Topic:** Sepsis

## 000759

### Serum neuron-specific enolase, glial fibrillary acidic protein and neurofilament light in critically ill patients with severe acute brain injury: a pilot study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000759

**Introduction:** Prognostication in patients with severe acute brain injury (SABI) admitted to the ICU can be challenging. Biomarkers released into the blood have shown promising results in predicting neurological outcomes in patients with traumatic brain injury (TBI). (1, 2) However, for patients with SABI of various other etiologies, literature remains scarce.
**Objectives:** In this pilot study we aimed to explore the optimal sampling point for Glial Fibrillary Acidic Protein (GFAP), Neurofilament Light (NFL), and Neuron Specific Enolase (NSE) in patients with SABI admitted to the ICU. Furthermore, we studied trends between survivors and non-survivors.
**Methods:** This prospective cohort study conducted between January 3, 2023, and July 27, 2023, included all patients with SABI defined as subarachnoid or intracerebral hemorrhage, intracranial infection, traumatic brain injury, or acute ischemic stroke and a GCS score $\leq 8$ prior to inclusion. Inclusion was within 24 h after brain injury. Data on demographic and baselines characteristics were collected from the electronic patient records. Blood samples were collected using gel-separator tubes (STG-5) for serum at 24 h, 72 h, 7 days and 14 days. Single Molecule Array (SIMOA HD-X) was used to determine biomarker concentrations of GFAP and NFL. NSE concentrations were assessed with electrohemiluminescence immunoassay (ECLIA).
**Results:** A total of 39 patients with SABI were included. TBI was diagnosed in 17 patients (43%) and subarachnoid hemorrhage in 8 patients (20.3%). Patients had severely impaired consciousness at hospital admission, the median GCS score was 4 (IQR 3–6). In 13 patients (33.3%) pupillary reactivity was absent in either one or both pupils. The median ICU length of stay was 5 days (IQR 3–8). At hospital discharge 16 patients (41%) were alive, of which 4 (10.3%) were discharged to their homes, the remaining to rehabilitation facilities. Serum biomarker concentrations over time are illustrated in Figure 1. No significant differences in serum biomarker concentrations on days 1 and 7 were found between survivors and non-survivors at hospital discharge. However, a threefold increase was found for GFAP on day 3 median 14,656 pg/ml (IQR 2932–23,788.5) in survivors versus a median 47,674.5 pg/ml (IQR 13700.5–110,561) in non-survivors ($p = 0.014$). In Figure 2, the biomarker trends between survivors and non-survivors are visualized.
**Conclusions:** This pilot study suggests sampling should be performed in the first few days for NSE and GFAP. For NFL a time point later should be considered, as it increases over time. Further research in larger cohorts of patients with SABI is needed to validate these findings and explore the potential utility of biomarkers in neuroprognostication in the ICU.

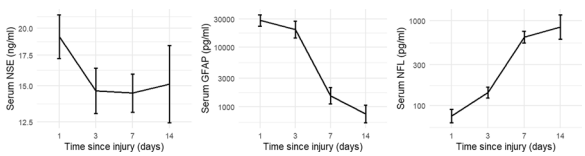


**Fig. 1 (abstract 000759)** Timecourse of mean serum concentrations of neuron-specific enolase (NSE), glial fibrillary acidic protein (GFAP), and neurofilament light (NFL). The y-axis is log-transformed (log10). The x-axis depicts the sampling time since brain injury. Error bars indicate SEM. GFAP = Glial Fibrillary Acidic Protein, NFL = Neurofilament Light, NSE = Neuron Specific Enolase

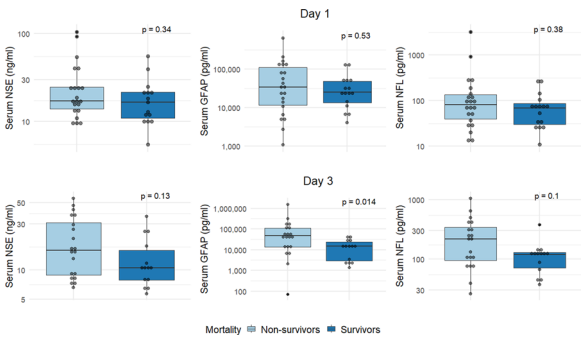


**Fig. 2 (abstract 000759)** Serum concentrations measured at days 1 and 3 after brain injury of neuron-specific enolase (NSE), glial fibrillary acidic protein (GFAP), and neurofilament light (NFL) between survivors and non-survivors at hospital discharge. Boxplots show the median and interquartile range. GFAP = Glial Fibrillary Acidic Protein, NFL = Neurofilament Light, NSE = Neuron Specific Enolase

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3. Stichting Remmert Adriaan Laan Fonds

**Topic:** Neurointensive care

## 000760

### Measurement of circulating nucleosomes and their post translational modification in septic shock receiving anti-histone therapy

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000760

**Introduction:** In sepsis, circulating nucleosome levels are commonly increased in proportion to the disease severity and mortality.
**Objectives:** The objective of the present study was to measure circulating nucleosome levels and histone post-translational modification (including acetylation, citrullination, and methylation) in a clinically relevant ewe model of septic shock, particularly in the context of anti-histone therapy.
**Methods:** in 24 mechanically ventilated, hemodynamically monitored female sheep, sepsis was induced through fecal peritonitis. Following surgical preparation and stabilization, the animals were randomly assigned to one of three groups: control, concurrent treatment (CuT, immediate intervention), and post-treatment (PT, 4 h later) groups ($n = 8$ each). Anti-histone therapy involving sodium-B-O-methyl cellobioside sulfate (Grand Pharma, Wuhan, China)was administered as a bolus (1 mg/kg) followed by continuous infusion (1 mg/kg/h). The experimental period spanned 24 h, during which the experimenters remained blinded to group allocation. Plasma nucleosome levels and their post-translational modifications (acetylation, citrullination, and

methylation) were measured at baseline and every 4 h thereafter, by ELISA (Belgian Volition SRL, Isnes, Belgium).
**Results:** The control group showed increased circulating nucleosomes, while decreased in the treatment groups ($p = 0.24$). Citrullination levels were peaking at 8 h after sepsis, while methylation levels reached peak levels 12 h after sepsis. Acetylation was rarely detected in samples. Additionally, histone neutralization appeared to reduce methylation ($p = 0.08$) and citrullination ($p = 0.12$) in this model.
**Conclusions:** These findings underscore the complex dynamics of nucleosome modifications in response to sepsis and suggest a potential therapeutic measure through histone neutralization. Further investigation is warranted to fully elucidate the underlying mechanisms and evaluate the potential clinical implications.

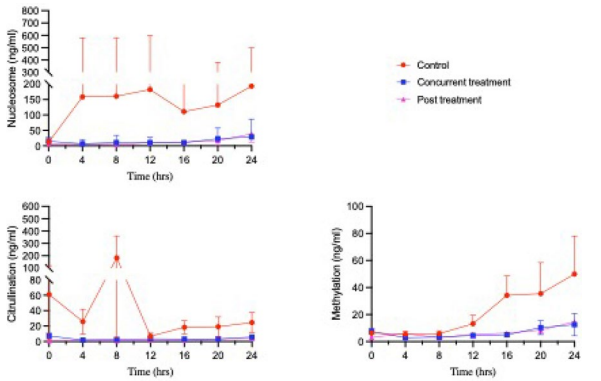


**Fig. (abstract 000760)** Circulating nucleosome levels, citrullination, methylation in different groups

**Topic:** Sepsis

## 000762

### Circulating nucleosomes and histone post tranlational modification in septic vs cardiogenic shock

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000762

**Introduction:** Nucleosomes are released during cellular damage and cell death, and histone post-translational modifications (PTM) (such as methylation often with on/off gene expression) significantly impact disease progression.
**Objectives:** We explored the temporal dynamics of nucleosomes and their post-translational modifications (PTM) (including acetylation, citrullination, and methylation) in septic vs cardiogenic shock.
**Methods:** In one model, septic shock was induced in eight female sheep via fecal peritonitis. The animals received fluid resuscitation, antibiotics, vasopressors, and peritoneal lavage. The experimental period spanned 24 h, during which plasma samples were collected at baseline and every 4 h for nucleosome measurements. In another model, cardiogenic shock was induced in 8 mixed-sex pigs by subocculding the anterior interventricular and circumflex arteries using an angioplasty balloon to reduce coronary blood flow for 120 min, followed by resuscitation. The experiment lasted for 8 h, with serum samples collected at baseline, post-ischemia, and every 4 h thereafter. All animals were mechanically ventilated and hemodynamically monitored throughout the experiment. Nucleosomes and their post-translational modifications (acetylation, citrullination, and methylation) were measured using ELISA (Belgian Volition SRL, Isnes, Belgium).
**Results:** circulation nucleosome levels e increased more in the septic shock than in the cardiogenic shock model. Acetylation and citrullination reached peak levels rapidly following the onset of sepsis, whereas methylation increased more gradually during the later phases of septic shock. Conversely, the changes in acetylation, citrullination, and methylation were less evident in cardiogenic than in septic shock.
**Conclusions:** These two studies indicate different patterns of circulating nucleosomes and their post-translational modifications (PTMs) in septic and cardiogenic shock, suggesting distinct underlying mechanisms being at play. Further studies are warranted to elucidate these mechanisms and explore the potential implications in the pathophysiology and clinical management of these conditions.

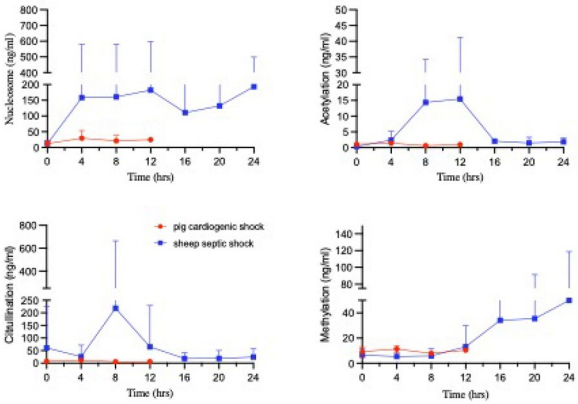


**Fig. (abstract 000762)** Nucleosome, acetylation, citrullination and methylation in septic vs cardiogenic shock

**Topic:** Sepsis

## 00076

### 3 Duration of mechanical ventilation is not associated with an increase in estimated mean pulmonary artery pressures

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**Introduction:** The right ventricle (RV) in health serves to conduct venous return from the right atrium to the pulmonary circulation while avoiding increases in right atrial pressure (RAP) to minimise venous excess. Elevated pulmonary artery systolic pressure (PASP) represents the pressure generated by the RV to push blood through the pulmonary circulation, which can be determined by factors including pulmonary vascular resistance, left ventricular systolic/diastolic function and ventilator driving pressures [1].
PASP can be raised acutely (e.g. pulmonary embolism) or chronically (pulmonary arterial hypertension) and can result in RV dysfunction. Impaired RV stroke volume can translate to increased RAP which impairs preload and therefore cardiac output, and by ventricular interdependence can also limit LV end-diastolic volume [2]. These factors could contribute to slow weaning from mechanical ventilation in the critically ill.
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pulmonary artery systolic pressure (PASP) represents the pressure generated by the RV to push blood through the pulmonary circulation, which can be determined by factors including pulmonary vascular resistance, left ventricular systolic/diastolic function and ventilator driving pressures [1].
PASP can be raised acutely (e.g. pulmonary embolism) or chronically (pulmonary arterial hypertension) and can result in RV dysfunction. Impaired RV stroke volume can translate to increased RAP which impairs preload and therefore cardiac output, and ventricular interdependence can also limit LV end-diastolic volume [2]. These factors could contribute to slow weaning from mechanical ventilation in the critically ill.
**Objectives:** To determine whether increased estimated pulmonary artery systolic pressures correlate with increased duration of mechanical ventilation.
**Methods:** We examined 97 patients that had been mechanically ventilated over a 3 month period (12/23–02/24). The clinical record for each patient was examined for echocardiography reports performed during admission. The pressure gradient (PG) data were calculated directly from the echocardiography reports based on the simplified Bernoulli equation applied to the peak velocity (Vmax) of the tricuspid regurgitant jet, PASP estimated from PG + median estimated RAP. Correlation between 'advanced respiratory days' and estimated PASP was performed using Pearson's product-moment coefficient. All analyses were performed using R (version 4.3.2).
**Results:** 8 patients had a transthoracic echocardiogram performed during their admission which was sufficient to estimate pulmonary arterial systolic pressure (PASP). There appears to be no correlation between mean estimated PASP and number of days of mechanical ventilation ($r^2 = 0.076$; see Figure 1).
**Conclusions:** In this small study of 8 patients, there was no detected correlation between estimated PASP and number of days of mechanical ventilation. However, this is based on a small sample size of 8 patients so the influence of other factors in individual cases could obscure a true relationship. 11 mechanically ventilated patients could not be included because they did not have a sufficient TR jet to estimate PASP, however, other echo parameters could have been used to assess for pulmonary hypertension. Pressure gradient from TRVmax can also fail to represent PASP in situations of pressure equalisation from severe tricuspid regurgitation e.g. due to annular dilatation. Future work will involve examining a prospective larger data set to further investigate whether a correlation exists.

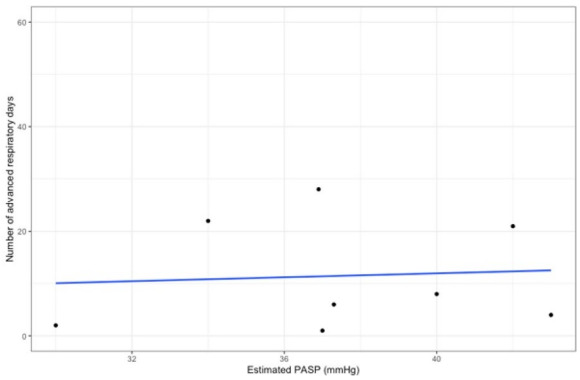


**Fig. 1 (abstract 000763)** Number of advanced respiratory days vs estimated PASP

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3. No grants to acknowledge for this project

**Topic:** Cardiovascular issues in ICU

## 000764

## High PEEP/low $FiO_2$ ventilation is associated with lower mortality in COVID–19, an observational study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000764

**Introduction:** Titration of positive end-expiratory pressure (PEEP) in patients with acute respiratory distress syndrome (ARDS) with and without coronavirus 2019 (COVID-19), remains a challenge, with guidelines being unable to make a strong recommendation for one strategy in particular [1, 2]. Several COVID-19 studies have suggested harm from ventilation using high PEEP [3–5]. These studies, however, originated from the initial waves of the pandemic, where high PEEP ventilation was frequently administered, and with some patients potentially receiving it without a justified need.
**Objectives:** Since we know practice and patient characteristics changed during the course of the first year of the pandemic [6], we aimed to assess the impact of high PEEP/low fraction of inspired oxygen (FiO2) ventilation on outcomes during the second wave of the national outbreak in the Netherlands.
**Methods:** Retrospective observational study of invasively ventilated COVID-19 patients during the second wave. Patients were categorized based on whether they received high PEEP/low FiO2 or low PEEP/high FiO2 ventilation according to the ARDS Network tables, based on the strategy most frequently employed in the initial 3 calendar days of ventilation. The primary outcome, intensive care unit (ICU) mortality, and secondary outcomes hospital, 28-day, and 90-day mortality, were compared between groups using a (shared-frailty) Cox proportional hazard model. Additional secondary outcomes included duration of ventilation and length of stay, both analyzed through a competing risk model, ventilator-free days (VFD–28) and occurrence of kidney injury. Propensity matching was performed to correct for factors with a known relationship to ICU mortality.
**Results:** This analysis included 790 COVID–ARDS patients. Of the included patients, 142 were classified as high PEEP/low FiO2 patients and 648 as low PEEP/high FiO2 patients. At ICU discharge, 32 (22.5%) of high PEEP patients and 254 (39.2%) of low PEEP patients had died (HR 0.66 [0.46–0.96]; P = 0.03; see Figure). High PEEP patients had overall lower mortality rates, a shorter duration of ventilation and length of stay, more VFD–28, and a lower incidence of kidney injury. In matched analysis, 23 (22.3%) out of 103 high PEEP patients and 152 (41.3%) out of 368 low PEEP patients met the primary endpoint (HR 0.59 [0.38–0.92]; P = 0.02).
**Conclusions:** High PEEP/low FiO2 ventilation was associated with improved ICU survival and improved secondary outcomes in patients with COVID–ARDS.

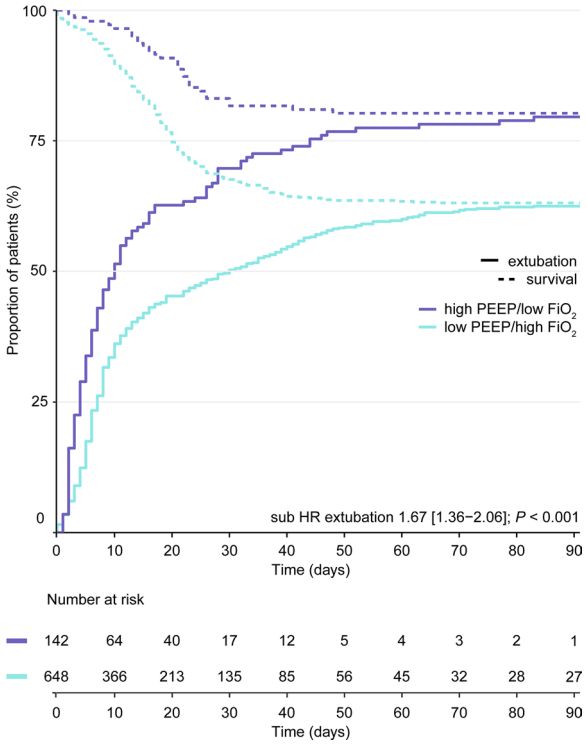


**Fig. (abstract 000764)** Mortality and pattern of extubation in the two PEEP groups. Abbreviations: PEEP, Positive end-expiratory pressure ; FiO2, Fraction of inspired oxygen ; Sub HR, Subdistribution hazard ratio

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7. This research was supported by 'ZorgOnderzoek Medische Wetenschappen' (ZonMw) (grant number 10430102110008).


**Topic:** Acute respiratory failure and mechanical ventilation

## 000766

### Extracorporeal membrane carbon dioxide removal in patients with acute respiratory distress syndrome: a prospective, observational study from Vietnam

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000766

**Introduction:** Acute respiratory distress syndrome (ARDS) results in severe hypoxemia refractory to oxygen therapy and can cause a high mortality rate. A lung ultraprotective ventilation strategy with low tidal volume (Vt < 6 ml/kg predicted body weight) and high positive end-expiratory pressure (PEEP) may prevent ventilator-induced lung injury (VILI) by reducing the driving pressure (Plateau–PEEP) that was demonstrated reducing mortality. Extracorporeal carbon dioxide removal (ECCO2R) is a form of extracorporeal gas exchange that allows substantial CO2 removal from blood across a gas exchange membrane at low blood flow rates. ECCO2R has been shown to be an effective way to reduce airway pressures and lung volumes in ARDS patients.
**Objectives:** To assess the feasibility and technical aspects of ECCO2R to facilitate lung ultraprotective ventilation strategy in patients with ARDS.
**Methods:** A prospective, intervention study was conducted in severe and moderate ARDS patients supported with ECCO2R in the Center for Critical Care Medicine, Bach Mai Hospital from August 2023 to March 2024. We used the Prismax machine and PrismaLung + with an area of 0.8 $m^2$. Data including age, gender, mechanical ventilation parameters, arterial blood gas, blood flow, catheter size, and circuit thrombosis during ECCO2R were collected. T- Test was used during statistical analysis.
**Results:** 10 patients were included in our study with an average age 54.4 ± 12.22 years (min 34, max 70), males accounted for 80. P/F ratio was 122.7 ± 47.14 and compliance was 16.6 ± 4.85 (ml/cmH20). Catheter 13.5 F size was applied on 7/10 (70%) of patients reaching a blood flow of 350–380 ml/min and 3/10 patients used catheter 14.5 F with a maximum blood flow of 450 ml/min. Before ECCO2R, in patients having severe respiratory acidosis, pH was 7.20 ± 0.09 and PaCO2 was 63.1 ± 14.25 (mmHg) ($p < 0.05$). Respiratory acidosis improved significantly during ECCO2R: after 72 h, pH was 7.38 ± 0.08 and PaCO2 was 47.0 ± 8.21 (mmHg) ($p < 0.05$). Mechanical ventilation parameters after 2 h of ECCO2R were improved. After 72 h, tidal volume (Vt) decreased from 6.5 (IQR: 5.5–7.0) to 5.0 (IQR: 4.0–5.7) (ml/kg) ($p < 0.05$), driving pressure dropped from 20.5 (IQR: 18.0–24.5) to 19 (IQR: 17–23) (cmH2O) ($p > 0.05$) and the respiratory rate declined from 30 (IQR: 27.2–31.2) to 22 (IQR: 20–27.5) (bpm) ($p < 0.05$).
**Conclusions:** Use of ECCO2R to facilitate lung prospective ventilation strategy was feasible. Catheter 14.5F size should be used for patients supported with ECCO2R with Prismax machine and PrismaLung + to achieve maximum blood flow to promote enhanced elimination of carbon dioxide.

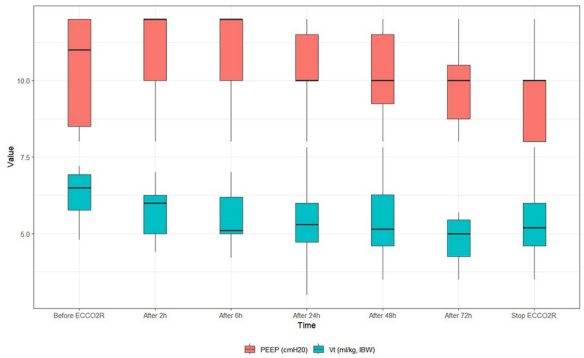


**Fig. (abstract 000766)** The changes of PEEP and Vt during ECCO2R

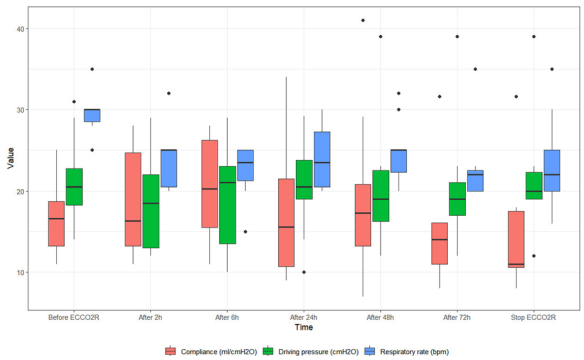


**Fig. (abstract 000766)** The changes of compliance, driving pressure and respiratory rate during ECCO2R

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4. 1.Raphaël Giraud, Carlo Banfi, The use of extracorporeal CO2 removal in acute respiratory failure, Ann. Intensive Care, 2021, 11:43

**Topic:** Acute respiratory failure and mechanical ventilation

## 000767

### PEEP calculation: comparison of the best compliance method vs the pulmonary elastic recoil formula in patients with ARDS secondary to SARS-CoV-2 infection. A retrospective study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000767

**Introduction:** In patients with moderate-severe ARDS secondary to SARS-COV-2 infection who were under mechanical ventilation, it is necessary to carry out adequate titration of PEEP within the management. Currently, various methods are available, we focus the study on two useful methods that can be carried out in any center. The use of the best compliance method has been described previously and it is an effective approach to obtain adequate PEEP that will maintain lung protective goals. It is proposed that the simplified formula below for pulmonary elastic recoil pressure will serve as a new proposal within therapeutic measures.
PEEPel = P. Plateau -13.5 ± 2.
**Objectives:** Demonstrate that the calculation of PEEP through the pulmonary elastic recoil formula presents similar results compared to the best compliance method.
**Methods:** A Retrospective analysis was carried out with patients who presented moderate-severe ARDS secondary to SARS-CoV-2 infection who were under mechanical ventilation. As a process study where PEEP was obtained by better compliance, the calculation was compared with the initial plateau pressure with statistical test, frequencies, percentages, and interquartile range. For the comparison between both methods, Rho of Spearman was used.
**Results:** One hundred eighty-four ARDS patients under mechanical ventilation were included; to whom PEEP titration was performed by both methods described, the correlation performed by Rho Spearman's method of 0.426 with statistical significance < 0.001, with lower confidence intervals of 0.296 and upper confidence interval of 0.541. Demographic values: mean age 60 ± 12.7, male predominance 143 (77.7%), a mean SOFA score 6 (2, 8), APACHE II 12 (8,19), SAPS II 27.5 (22, 43).
**Conclusions:** With the previous results, there is a correlation between both methods for the titration of the appropriate PEEP, however, the use of the formula in this study was carried out with the plateau pressure established for a better compliance method. It would be recommended to carry out a prospective study in the same patient population, with a basal plateau pressure to evaluate as a new easily accessible PEEP titration method option for the future.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000768

### Rehabilitation integrated in ICU patient care – A Scandinavian survey study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000768

**Introduction:** ICU survivors often suffer long-lasting physical, psychological, and cognitive impairments termed PICS as a consequence of their critical illness (Inoue et al., 2019; Needham et al., 2012). Rehabilitation to prevent and/or reduce the negative effects of critical illness starts in the hospital and continues post-discharge from the hospital (Hodgson et al., 2021). While active mobilization in the ICU is well investigated (Hodgson et al., 2022; Schweickert et al., 2009), less is known about the rehabilitating effects of cognitive, sensory and socially stimulating activities (Collet et al., 2023).
**Objectives:** To explore and describe current early rehabilitation practices among Scandinavian ICU healthcare professionals.
**Methods:** From September 2022 to June 2023, we conducted a multicenter, electronic survey among healthcare professionals working full- or part-time in Danish, Swedish or Norwegian ICUs. Participants were asked to describe what they perceived as rehabilitation during and after the patient's ICU stay, and asked to quantify the importance and time used within six a priori defined domains: Cognitive, physical, sensory and social stimulation, participation in personal care and other rehabilitation interventions. Quantitative data were summarized in absolute numbers and percentages using STATA (StataCorp, 2021), and qualitative data were analyzed using the framework method (Gale et al., 2013). Assessment by an ethical committee followed national legislation. The study was registered at VIA University College, Aarhus, Denmark.
**Results:** A total of 518 participants responded to the questionnaire, 78% were nurses, and the remaining were physiotherapists, physicians, occupational therapists, and others. Rehabilitation began at ICU admission (70%) when the patient was ABC stable (19%) or at least circulatory stable (7%). Participants reported spending approximately 40% of their working time on rehabilitating activities and estimated that about 90% of all patients would benefit from rehabilitation.
Cognitive stimulation was considered highly important and involved communication activities, activities of daily living, television and radio, and delirium prophylaxis. Physical stimulation consisted of physiotherapy, mobilization (sitting on the bed, standing), training and activities of daily living, and visiting outdoors in a wheelchair or hospital bed. Rehabilitation activities progressed from passive to active, balancing rest and activities and aimed at strengthening the patient's autonomy, self-management, and will to recover. Family members were seen as important to the patient's rehabilitation.
**Conclusions:** In Scandinavia, ICU rehabilitation starts at ICU admission and progresses as the patient regains strength, with attention to balancing rest and activity. Involvement in cognitive and socially stimulating activities and activities of daily living are seen as important for helping the patient towards rehabilitation and independence.

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9. No grant was obtained for this project


**Topic:** Nursing care and physiotherapy

## 000773

### Rocking motion therapy for delirious patients in the intensive care unit: a multicentre randomized clinical trial


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000773


**Introduction:** Rocking motion therapy has been shown to calm people with dementia but has never been investigated in delirious patients in the intensive care unit (ICU).
**Objectives:** The aim of the RockingICU trial was to investigate the efficacy and safety of a rocking motion versus non-rocking motion chair on the duration of delirium and intensity of agitation in ICU patients with delirium. We hypothesised that rocking motion therapy would increase the number of days alive without coma or delirium at 14 days of follow-up.
**Methods:** In this multicentre, investigator-initiated, parallel-group trial we randomly assigned delirium-positive adult ICU patients to a minimum of 20 min rocking motion therapy or a minimum of 20 min in the same chair without rocking motion daily. The primary outcome was days alive without coma or delirium two weeks after randomisation. Secondary outcomes were the number of days alive and without life support, ICU length of stay, and the number of participants that received antipsychotics, sedatives, or benzodiazepines during the intervention, and the number of times the intervention was discontinued.
**Results:** We enrolled 149 patients; 73 were randomly assigned to rocking motion therapy and 76 to non-rocking motion therapy. Primary outcome data were available in 141 patients. The median number of days alive without coma or delirium after 14 days was 8.8 days (interquartile range, 1.0–13.0) in the rocking motion group and 9.4 days (1.0–13.0) in the non-rocking motion group, with a mean difference of −0.73 days (95% confidence interval: −2.05 to 0.58; $p=0.28$). At day 14, 8 of the 70 participants (11.4%) in the rocking motion group had died and 10 of the 70 participants (14.2%) in the non-rocking motion group (risk difference −2.28%-points, 95% CI −13.63 to 8.85, $p=0.69$).

The mean difference in the number of days with coma and delirium between the rocking motion group and the non-rocking motion group was 0.40 days (95% CI −0.67 to 1.68, $p = 0.42$). There were no statistically significant differences between groups in the number of days alive and without life support, ICU length of stay, and the number of participants that received antipsychotics, sedatives, or benzodiazepines during the intervention. In total, 11/70 (15.7%, 99% CI 6.4–29.9) in the rocking therapy group and 7/71 (9.9%, 99% CI 3.0–22.5) in the non-rocking group had the intervention stopped earlier than the protocolised 20 min at least once (risk difference 5.82%-points, 99% CI −7.73 to 19.42, $p = 0.27$).

**Conclusions:** Among patients with delirium in the ICU, the use of rocking motion therapy did not lead to a statistically significantly greater number of days alive without coma or delirium at 14 days than non-rocking motion therapy. More patients aborted the intervention in the rocking motion therapy group than in the non-rocking motion therapy group. The reasons for discontinuation appeared to be unrelated to the intervention.

**Reference(s)**

1. Trykfonden

**Topic:** Sedation, analgesia and delirium

## 000774

## Relevant predictors of HFNO failure and the effect of flow rate—a machine learning-based approach

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000774

**Introduction:** Due to the risk of complications involved in the process of endotracheal intubation (ETI) and the subsequent positive pressure ventilation [1, 2], clinicians typically strive to mitigate the need for invasive ventilation by considering non-invasive respiratory support modalities, such as non-invasive ventilation (NIV) or high-flow nasal oxygen (HFNO) [3]. Given the unclear effects of intubation timing on clinical outcomes, gaining a deeper understanding of the risk factors that drive the need for escalation to intubation could help the clinician ascertain whether prolonged non-invasive treatment will lead to a desirable outcome.

Therefore, the present study aims to identify and validate the most important predictors for intubation risk in critically ill patients who receive HFNO, and to evaluate the effect of flow rate on relevant clinical outcomes and HFNO failure.

**Methods:** In this study, we employed several machine learning-based approaches to predict the risk of HFNO failure, which we defined as the need for escalation of respiratory support treatment or patient mortality, within 4 h after discontinuation of HFNO treatment. The primary dataset in this study was extracted from the MIMIC-IV database, which contains high-resolution, deidentified medical data from approximately 300,000 patients. Additionally, we extracted a secondary validation dataset from the Dutch Data Warehouse (DDW), a large multicenter data warehouse containing data from 3464 critically ill COVID-19 patients in the Netherlands.

For our machine learning models, we used logistic regression, random forest, decision trees, and XGBoost. After training the models, we performed evaluation using sensitivity, specificity, accuracy, and AUROC scores and visualised the most relevant predictors using SHapley Additive exPlanations (SHAP).

To evaluate the effect of flow rate on the risk of HFNO failure, we used propensity score matching and a Cox Proportional Hazards analysis.

**Results:** In our experiments, 779 patients from the MIMIC-IV database and 239 patients from the DDW dataset were included for subsequent analysis. Using the primary MIMIC-IV dataset, the XGBoost model yielded the highest performance with an AUROC score of 0.72 (0.67–0.77), outperforming logistic regression (AUROC 0.69 (0.63–0.74)), random forest (AUROC 0.69 (0.62–0.76)), and the decision tree (AUROC 0.61 (0.51–0.71)). The SHAP visualisation revealed that the most important predictors of HFNO failure were APS-III score, sepsis, urine output, weight, and mean SpO2 (Fig. 1).

When using the DDW validation dataset to both train and evaluate an XGBoost prediction model, the model achieved an AUROC of 0.64 (0.52–0.75). In contrast, when the best-performing model from the primary MIMIC-IV dataset is evaluated on the DDW validation dataset, the model yielded an AUROC score of 0.61.

Furthermore, our analysis shown in Figure 2 revealed a significantly higher risk of HFNO failure (Hazard ratio 4.99 (2.30–10.84), $p < 0.005$) among patients who received a relatively high flow rate ($\geq$ 40L/min). This effect persisted even after compensating for potential confounding effects through propensity score matching.

**Conclusions:** This study underscores the predictive value of sepsis diagnosis, APS-III score, urine output, admission weight, and average $SpO_2$ in anticipating the risk of HFNO failure, even before treatment initiation. In addition, our findings suggest that, in propensity score-matched cohorts, patients requiring higher flow rates are at a significantly elevated risk of HFNO failure. These results may aid critical care professionals in making better-informed decisions regarding the potential gain of providing HFNO therapy for critically ill patients and regarding the appropriate timing of respiratory support escalation to invasive ventilation.

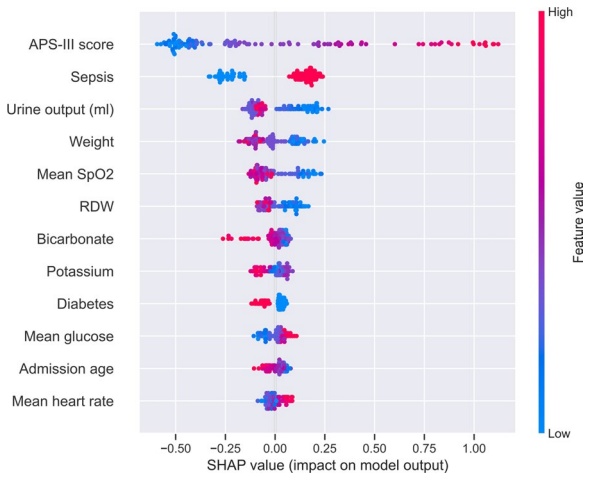


**Fig. 1 (abstract 000774)** A visualisation of SHAP values for the most relevant predictors of HFNO failure, using a trained XGBoost prediction model. A higher SHAP value corresponds to a higher likelihood of the model predicting that HFNO failure will occur. APS-III: Acute Physiology Score III, RDW: red blood cell distribution width, $SpO_2$: oxygen saturation

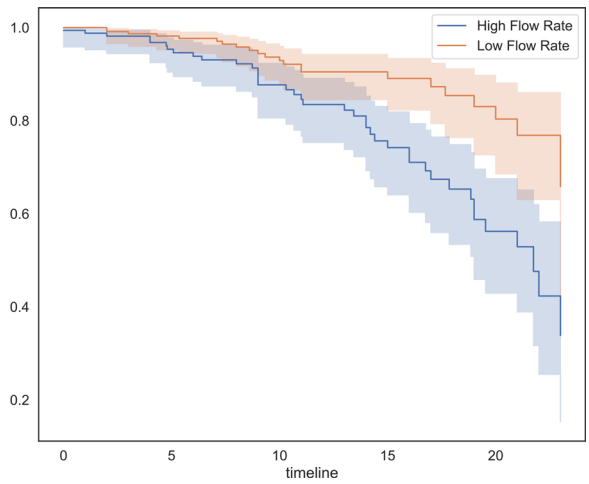


**Fig. 2 (abstract 000774)** The effect of flow rate on the risk of HFNO failure, represented by Kaplan–Meier (KM) survival curves in terms of HFNO failure risk between the high and low flow rate groups

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000775

### Outcomes of patients admitted to Critical Care who have recently transitioned from paediatric services

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000775

**Introduction:** More children are surviving to adulthood with life-limiting conditions or complex health needs. They may require admission to adult critical care units either during the transition phase or soon afterwards. A recent UK national report (1) highlighted how the process of transition is often fragmented and challenging for patients, relatives, and healthcare teams. Despite national guidelines defining a process to help patients transition between paediatric and adult critical care services (2), established pathways do not currently exist in our area. Critical Care input into the transition process is vital to ensure patient-centered care plans can be agreed, and to prepare the patient and their family for the different environments of the adult unit.
**Objectives:** To identify patients aged 16–19 years old admitted to our Critical Care service who transitioned from paediatric care with complex medical needs or a life-limiting condition. To help define the patient cohort that may benefit from a bespoke Critical Care transition pathway.
**Methods:** We retrospectively identified patients aged 16 to 19 years old who were admitted to the 3 Critical Care units within our Trust from March 2018 to October 2023. We sourced our data from the national ICNARC audit database. We interrogated electronic and paper notes to identify patients with complex, multispecialty or life-limiting conditions, and assessed the level of organ support required and outcomes.
**Results:** 560 patients meeting our age and timeframe criteria were admitted. Of these, 492 were excluded as their admissions were due to trauma or elective admissions unrelated to an underlying complex health condition.
Of the 68 patients that we identified as having complex multisystem disease, the mean age of the cohort was 17.87 years, with an equal split of males and females. 48 patients were emergency admissions, and 20 elective surgical admissions were related to their complex health condition. For example, one patient was admitted for elective cardiac surgery and had underlying Loeys-Dietz syndrome causing cardiac pathology.
The median ITU length of stay (LOS) was 3.5 days (range 0.1 to 404.3 days) and median hospital LOS was 9.5 days (range 1 to 409 days). 33 patients required advanced respiratory support, 18 required advanced cardiovascular support and 8 patients required renal support.
84.0% of the patients survived to discharge from ITU, with 83% surviving to hospital discharge. 85% of the emergency patients survived to ITU discharge, with 83% surviving to hospital discharge, and 81% alive 1 year after ITU discharge.
**Conclusions:** Young patients with complex medical conditions may require ITU support as they survive into adulthood. Most of this cohort has good outcomes in terms of survival and relatively short-term ITU requirements. We can now look at how we can adapt our services to better predict and prepare for paediatric patients with complex medical conditions requiring adult critical care services.

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2. 2) Guidance for Paediatric to Adult Critical Care Transition, Intensive Care Society, March 2022.
3. No grants were used in this work

**Topic:** Systemic diseases

## 000776

### Skill Mix in the Intensive Care Unit

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000776

**Introduction:** The shortage of nursing staff in intensive care units (ICUs) is a well-documented worldwide challenge [1]. Contributing factors include excessive workload, moral distress, and perceived failings in providing quality patient care. Innovative approaches are needed to sustain nursing care, especially in high-stress environments such as ICUs [2]. New care models, involving skill mix among specialized nurses and carers, could reduce workload and offer opportunities to grow in clinical leadership for ICU nurses and potentially improve quality of care.
**Objectives:** This study aims to explore the experiences of ICU nurses in a pilot project with the start of carers in an integrated team, with a focus on skill mix, quality of care, and job satisfaction.
**Methods:** The design of the study was a quantitative cross-sectional survey at two-time points in a tertiary hospital. The self-developed questionnaires were sent digitally at a three-month interval to all ICU nurses and nurse trainees of two pilot ICUs. Questionnaire 1 primarily focused on assessing opinions and attitudes regarding skill mix in the ICUs, as well as the involvement of carers. Questionnaire 2 evaluated the implementation of a skill mix and the integration of carers into

the nursing team. The study population comprised a total of 119 ICU nurses. Data were analyzed using descriptive statistics.
**Results:** A total of 95 (80%) participants completed questionnaire 1 prior to the pilot project. The majority (72%) was positive about the involvement of carers within the team and 81% reported that various care tasks in the ICU were suitable to differentiate in a skill mix. However, 54% expressed concerns about maintaining the quality of care, and 52% expected that patient safety might be compromised. Almost all (96%) were satisfied with their work as ICU nurses.
After the start of carers in the ICU team, 58 participants completed questionnaire 2 (49%). Collaboration with carers was perceived positively (83%), and 52% reported that carers were clear about their skills and tasks related to ICU care. However, 83% did not experience a reduction of workload, nor additional time to grow in clinical leadership due to the integration of carers. The majority (59%) expressed concerns about maintaining quality of care. Job satisfaction remained high (97%).
**Conclusions:** ICU nurses initially report a positive attitude towards interprofessional collaboration and a skill mix within the ICU teams. However, this enthusiasm is tempered by practical challenges, including concerns about the maintenance of care quality and potential mismatches between the competencies of carers and the demands of an ICU environment. These challenges may hinder ICU nurses' professional advancement and, thus, threaten the sustainability of the nursing workforce.

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**Topic:** Nursing care and physiotherapy

## 000777

### Effects of high-protein, arginine and glutamine supplementation of enteral nutrition on pressure ulcers in critically ill patients: A primary report of a randomised trial

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**Introduction:** Pressure ulcers (PUs), especially in critically ill elderly patients, are recognised as a significant problem. Due to the increased metabolic demands of repairing tissue damage, the presence of PUs in the critically ill has implications for nutritional management.
**Objectives:** This study aimed to evaluate the effect of nutrition supplemented with high protein, arginine, and glutamine on PUs in critically ill patients.
**Methods:** We prospectively collected data from patients with PUs in the ICU who were fed enterally with high protein, arginine, and glutamine (Impact Glutamin®) or standard formula. Patients were included in the study if they were haemodynamically stable, not in shock, and had received a target dose of standard formula feeding. Patients were randomly assigned to the study or control group. Unfortunately, we did not have indirect calorimetry. Therefore, the caloric requirements of all patients were calculated and given according to the formula (30 kcal/kg/day). After admission to the study we checked and noted PUs' sizes weekly (1st,2nd,3rd).
**Results:** Ten patients were included in the study. The mean age was 81.7 and 6 (60%) were female. The mean Charlson Comorbidity Index was 6.9, APACHE II score was 31.6 and the admission SOFA score was 7.9. The most common admission diagnosis was sepsis in 6(60%) patients. Except for one patient, all had a high risk for malnutrition (mean mNUTRIC score was 7.3). The mean body mass index was 23.62. According to randomization, 4 patients were in the study group. In the study group, all PUs had a reduction of at least 2 cm (min 2 cm-max 8 cm) in each diameter after 3 weeks. In contrast, only 2 PU in the control group showed a decrease in diameter over the study period. In addition, two others increased in diameter and the remaining two were stable. ICU mortality was 40% and hospital mortality was 60%.
**Conclusions:** We have observed that the healing of PUs in critically ill patients is improved by a diet supplemented with protein, arginine, and glutamine. While standard care of PUs with the use of appropriate wound care products and regular repositioning is the mainstay of treatment, special nutritional formulas may be effective in the management of PUs.

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3. *We thank Nestle® company for their support of the study.

**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000778

### Comparing cipepofol and propofol for sedation in ICU patients with hypotension: a single center prospective cohort study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000778

**Introduction:** ICU physicians often use sedative medications to manage agitation and minimize its negative consequences. Multiple clinical studies have demonstrated that the novel sedative drug cipepofol has sedative effects that are not inferior to propofol and can reduce the incidence of cardiovascular adverse events. Currently, there is limited research on the use of cipepofol for sedation in ICU patients, and its application in ICU patients with hypotension has not been reported.
**Objectives:** This study aims to investigate the effectiveness of cipepofol in sedating ICU hypotensive patients, and further explore its impact on the dosage of vasopressor drugs.
**Methods:** Clinical data were prospectively collected from patients requiring sedation and concomitant use of vasoactive drugs to maintain MAP $\geq$ 65 mmHg in the ICU ward of the Department of Intensive Care Medicine at Southern Hospital. The primary endpoint was the success rate of sedation in both groups, and the corresponding between-group rate differences and 95% confidence intervals were estimated according to the Newcombe-Wilson method. Propensity score matching (PSM) analysis was used to match patients receiving cipepofol to propofol. The Cox proportional hazards, logistic regression, and linear regression models were used to assess the association between cipepofol and outcomes.
**Results:** In both the cipepofol group and the Propofol group, 295 patients (97.0%) and 148 patients (97.4%) successfully achieved the required level of sedation during over 70% of the study period without any rescue therapy. The difference between the two groups was -0.33%, and the 95% CI for the rate difference was (-3.51%, 2.85%), falling within the equivalence margin of (-10%, 10%), indicating that the sedative effect of Cipepofol is equivalent to that of Propofol. Additionally, the dose of norepinephrine used in the Cipepofol group was significantly lower than that in the Propofol group (5.75 vs 9.62 μg/kg/h, $P < 0.001$). A total of 214 patients in the Cipepofol group and 128 patients in the Propofol group completed the propensity score matching. Despite a statistically significant difference in norepinephrine dosage reduction associated with the use of cipepofol (6.67 vs 10.01 μg/kg/h; $P = 0.02$), but it did not improve patients' duration of mechanical

ventilation (5.25 days vs 6.7 days,HR 0.94, $P=0.3$) or ICU mortality rate (11.2% vs 13.2%,HR 0.67, $P=0.24$).

**Table 1 (abstract 000778)** Association between sedation administration and clinical outcomes in critically ill patients with hypotension

| | Unmatched Patients | | | | Propersity-scores-matched Patients | | | |
|---|---|---|---|---|---|---|---|---|
| | Cipepofol (n = 304) | Propofol (n = 152) | HR (95 %CI) | *P* value | Cipepofol (n = 214) | Propofol (n = 128) | HR (95% CI) | *P* value |
| Dosage of sedation drugs, mg/kg/h | 2.24[1.81, 2.73] | 1.98 [1.64, 2.48] | 1.26 [1.10, 1.44] | 0.001 | 2.26 [1.84, 2.77] | 2.00 [1.67, 2.50] | 1.25 [1.08, 1.45] | 0.004 |
| Dosage of analgesic drugs, μg/kg/h | 1.82 [1.35, 2.51] | 1.72 [1.39, 2.68] | 1.39[0.81, 1.51] | 0.58 | 1.84 [1.32, 2.55] | 1.72 [1.43, 2.48] | 1.35 [0.871, 1.46] | 0.52 |
| Dosage of norepinephrine, μg/kg/hc | 5.75[1.81, 17.52] | 10.01[4.96, 24.38] | 0.59 [0.43, 0.79] | 0.03 | 6.67[2.33, 20.35] | 10.01[4.44, 23.74] | 0.68 [0.44, 0.87] | 0.02 |
| Duration of MV, day | 4.50[1.60, 10.72] | 5.80 [3.42, 10.75] | 0.90[0.66, 1.51] | 0.37 | 5.25[1.83, 12.38] | 6.70 [3.58, 10.93] | 0.94 [0.76, 1.26] | 0.30 |
| ICU mortality, n(%) | 29 (9.7) | 22 (14.7) | 0.63[0.35, 1.14] | 0.13 | 24 (11.2) | 17 (13.2) | 0.67[0.34 −1.29] | 0.24 |

The dosage of analgesic drugs were presented and compared using MED10(10mg Morphine equivalent dosing), including remifentanil, morphine, esketamine, hydromorphone.

Cox regression was used for estimating the impact of Ciprofol use on mortality outcomes adjusting for confounding variables, including age, gender, BMI, APACHE II scores, SOFA scores, baseline creatinine and ALT.

Linear regression was used to evaluate the association between Ciprofol use and sedation drugs, analgesic drugs, norepinephrine or duration of MV. HR was calculated using the formula HR = eβ.

**Conclusions:** In hypotensive patients in the ICU who received sedation within 24 h, the sedative effect of Cipepofol is equivalent to propofol, and it can reduce the dosage of norepinephrine used.

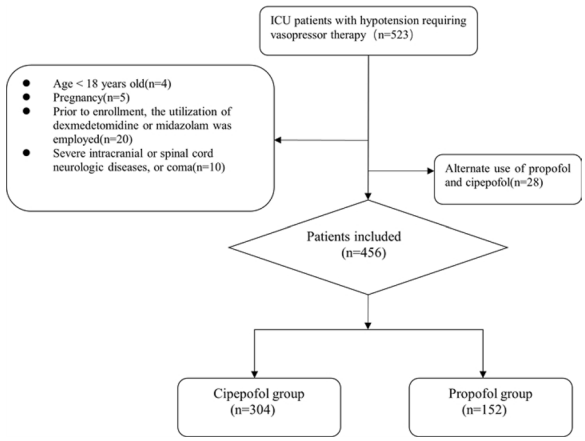


**Fig. 1 (abstract 000778)** Enrollment flowchart

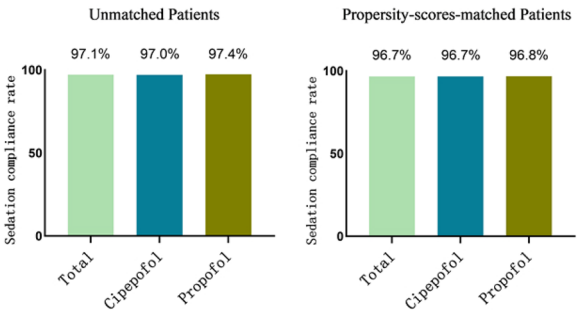


**Fig. (abstract 000778)** Sedation compliance rate

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**Topic:** Sedation, analgesia and delirium

## 000779 Comparison of extracorporeal blood purification therapies between COVID-19 versus non-COVID-19 patients with sepsis

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**Introduction:** In recent years, extracorporeal blood purification (EBP) therapies have emerged as a promising treatment modality aimed at modulating the inflammatory response in sepsis (1–3).

**Objectives:** We aimed to retrospectively compare the clinical, laboratory values and mortality of patients with COVID-19 and non-COVID-19 who received EBP therapies for sepsis.

**Methods:** Patients admitted to the intensive care unit (ICU) with a diagnosis of sepsis and undergoing EBP therapy between March 2020 and May 2022 were retrospectively evaluated through hospital data with the approval of the local Ethics Committee. Septic patients were categorized into two groups based on etiology: those admitted

with COVID-19 etiology (EBP COV) and those admitted with etiologies other than COVID-19 (EBP Non-COV). The groups were compared in terms of clinical and laboratory results before and after EBP therapy.
**Results:** In the EBP COV group, 193 patients were included, whereas the EBP Non-COV group comprised 108 patients. Demographic and clinical characteristics of the cases in the groups are shown in Table 1. Before EBP therapy, neutrophil–lymphocyte ratio (N/L), lactate dehydrogenase (LDH) and D-dimer levels were higher, C-reactive protein (CRP), lymphocyte, and procalcitonin (PCT) levels were lower in the EBP COV group compared to the other group ( $p < 0.05$). Evaluation of post-EBP therapy laboratory changes revealed a significant decrease in ferritin and interleukin-6 levels in the EBP COV group, and a significant decrease in procalcitonin and white blood cell levels in the EBP Non-COV group ($p < 0.05$). Changes in LDH, D-dimer, lymphocyte, N/L, and lactate levels were not significant in both groups ($p > 0.05$), whereas CRP and platelet changes were significant in both groups ($p < 0.05$).

**Table 1 (abstract 000779)** Comparisons of Characteristics of the Patients

| | | EBP COV (n = 193) | EBP Non-COV (n = 108) | P |
|---|---|---|---|---|
| Gender | Female | 41 (%21.2) | 30 (%27.8) | 0.200 a |
| | Male | 152 (%78.8) | 78 (%72.2) | |
| Age (years) | | 61.1 ± 11.8 | 54.6 ± 16.4 | **< 0.001** b |
| LOS in ICU (days) | | 15.8 ± 8.8 | 22.1 ± 16.8 | **< 0.001** b |
| Prognosis | Death | 124 (%64.2) | 69 (%63.9) | 0.950 a |
| | Discharge | 69 (%35.8) | 39 (%36.1) | |
| Days in Ventilator | | 7.7 ± 8.7 | 14.6 ± 15.0 | **< 0.001** b |
| Respiratory Therapy | Mask | 1 (%0.5) | 11 (%10.2) | **< 0.001** a |
| | HFNO | 67 (%34.7) | 8 (%7.4) | |
| | IMV | 125 (%64.8) | 89 (%82.4) | |
| Time between admission- EBP (days) | | 5.3 ± 3.2 | 10.2 ± 10.4 | **< 0.001** b |
| APACHE II | | 27.4 ± 10.5 | 27.1 ± 8.5 | 0.831 b |
| SOFA | | 5.8 ± 2.0 | 6.9 ± 2.1 | **< 0.001** b |

EBP COV: Extracorporeal Blood Purification COVID, EBP Non-COV: Non COVID, LOS: Length of Stay, ICU: Intensive Care Unit, HFNO: High Flow Nasal Oxygen, IMV: Invasive Mechanical Ventilation, APACHE: Acute Physiology and Chronic Health Evaluation, SOFA: Sequential Organ Failure Assessment, a: Chi-square Test (n/%), b: Independent Samples t Test (Mean ± SD).
**Conclusions:** In non-COVID patients, despite the later EBP therapy, higher pre-treatment CRP, PCT levels and SOFA scores, and longer duration of stay in the ventilator and ICU, the mortality rates of septic Covid and non-Covid patients who received EBP therapy were similar.

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**Topic:** Sepsis

## 000780 Incidence and risk factors of Delirium in Intensive Care Unit: a prospective observational study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000780

**Introduction:** Delirium is a neurobehavioral syndrome characterized by alterations in cognitive functions, attention, and consciousness, along with increased or decreased psychomotor activity and irregularities in the sleep–wake cycle. It has a high incidence in the intensive care units. The use of the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) is recommended for delirium Screening in intensive care units.
**Objectives:** The primary aim of this study is to determine the incidence and risk factors of delirium in patients admitted to the intensive care unit using the CAM-ICU scale. The secondary aim is to record the clinical and epidemiological characteristics of patients, assess the outcome of delirious patients in the intensive care unit and establish the impact of delirium on morbidity and mortality.
**Methods:** A total of 128 patients aged 18 and older, with a Richmond Agitation- Sedation Scale (RAAS) score ≥ -3 and Glasgow Coma Scale (GCS) score > 7 who responded to verbal stimuli, were included in the study. The CAM-ICU scale was applied daily to patients until a positive result was obtained or until they were discharged from the intensive care unit. Clinical follow-up continued until the patients were discharged from the intensive care unit.
**Results:** The study involved the application of the CAM-ICU scale to patients an average of 3 times (IQR 2–5) with delirium detected in 27 (%21,1) out of 128 patients on the 2nd day (IQR 1–4) of their hospitalization. The median age of patients was 66 years (IQR 53–75) and 58.6% (n = 75) were male. Advanced age, the implementation of restraints, low GCS at admission, high APACHE II and SOFA scores at admission, lack of visits, sleep deprivation, elevated levels of troponin and pro-BNP, and a history of malignancy or lung disease were identified as risk factors. Delirious patients were observed to have longer stays in the intensive care unit and a higher mortality rate.
**Conclusions:** The findings of this study identified risk factors involved in the incidence and development of delirium in the intensive care unit. Delirium prolongs the length of stay in the intensive care unit and increases mortality. To reduce the incidence of delirium, these identified risk factors, shown to be effective by routine screening with CAM-ICU, should be recognized and preventive measures should be taken in intensive care units**.**

**Topic:** Sedation, analgesia and delirium

## 000781 Acute kidney injury in patients with out-of-hospital cardiac arrest receiving extracorporeal cardiopulmonary resuscitation: a retrospective multicenter study in Japan

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000781

**Introduction:** Acute kidney injury (AKI) is frequently found in intensive care unit (ICU) and is associated with unfavorable outcomes. However, little is known about AKI in patients with out-of-hospital cardiac arrest (OHCA) receiving extracorporeal cardiopulmonary resuscitation (ECPR).
**Objectives:** This study aimed to examine the incidence of AKI and the association between AKI and mortality in patients with OHCA receiving ECPR.
**Methods:** We performed a secondary analysis of the SAVE-J II study, a retrospective multicenter study of OHCA patients ≥ 18 years treated with ECPR between 2013 and 2018. Adult patients with OHCA of presumed cardiac etiology who were admitted to ICU were included. AKI was defined as the patients' serum creatinine level within 4 days after ICU admission according to Kidney Disease Improving Global Outcomes (KDIGO) stages. The primary outcome was in-hospital mortality.
**Results:** Of 2,157 patients registered in the SAVE-J II study, 943 patients were ultimately included for analyses. The median age was 60 years (interquartile range: 48–68), 83.5% of patients were men, and in-hospital mortality was 56.1%. AKI was observed in 631 patients (66.9%) within 4 days after ICU admission. Multivariable analysis showed that AKI was significantly associated with in-hospital mortality (odds ratio [OR], 4.15; 95% confidence interval [CI], 3.05–5.66; $p < 0.001$). Furthermore, compared with KDIGO 1 stage, KDIGO 2 and 3 stage was associated with a higher in-hospital mortality rate (KDIGO 2 OR, 2.64; 95% CI, 1.67–4.17; $p < 0.001$, KDIGO 3 OR, 3.72; 95% CI 2.42–5.71; $p < 0.001$).
**Conclusions:** AKI was commonly recognized in the acute phase and associated with in-hospital mortality in patients with OHCA receiving ECPR.

**Topic:** Acute Kidney Injury and haemofiltration.

## 000782 History of cancer diagnosis in critically ill sepsis patients: a nationwide register-based cohort study in Sweden

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000782

**Introduction:** Frequently co-occurring sepsis and cancer share common risk factors and pathophysiological features (1). Moreover, the immunosuppression effect of cancer therapy increases the risk of infection and sepsis (2). Cancer patients are at an increased risk of sepsis especially within the first year after cancer diagnosis (3). On the other hand, a recent study reported an increased incidence of cancer among sepsis survivors (4). However, little is known on the prevalence of cancer among sepsis patients compared to the general population.
**Objectives:** To assess the overall and site-specific prevalence of cancer in sepsis patients relative to the general population.
**Methods:** Sepsis patients treated in the intensive care units between 2005 and 2017 (N = 36 824) were identified from the Swedish Intensive care registry using ICD-10 code for sepsis. The study cohort included those aged ≥ 20 years and was linked with cancer data (2001–2017). We compared the 1- and 5-year observed prevalence of cancer in the sepsis cohort to that expected according to the NORDCAN statistics (5) for the general Swedish population using standardized (age and calendar year) prevalence ratios (SPR).
**Results:** Median age at sepsis was 69 years (IQR 60–78), 57.5% were men, 7890 (21.4%) had at least one cancer diagnosis within the preceding five years and 3210 (8.7%) had ongoing cancer treatment. The proportion of those with a history of cancer remained the same over time (Fig. 1). Overall, 9696 cancer diagnoses were set within five years before sepsis, of which 5234 were within one year before sepsis. Colorectal (21%), hematological (19%), nonmelanoma skin (15%), prostate (8%), and breast (5%) cancers were the most common. The overall 1- and 5-year SPRs were 5.73 (95% CI 5.53–5.94) and 2.78 (2.70–2.85) in men; 5.38 (5.14–6.63) and 2.55 (2.46–2.64) in women. A higher prevalence was seen for a wide range of cancer sites; the 1-year SPRs tended to be higher than 5-year SPRs (Figs. 2, 3). The former varied in men from 1.16 (1.03–1.31) for prostate cancer to 20.14 (15.22–26.65) for gallbladder cancer; in women from 1.27 (1.07–1.50) for breast cancer to 18.23 (12.50–26.59) for cancer of esophagus. A lower 5-year prevalence was seen for prostate (0.81, 0.76–0.87) and breast (0.77, 0.69–0.85) cancers.
**Conclusions:** Those with a history of cancer are highly overrepresented among critically ill sepsis patients compared to the general population. Almost all cancer forms contribute to the increased prevalence. Slightly over half of cancer diagnoses are set within one year before sepsis.

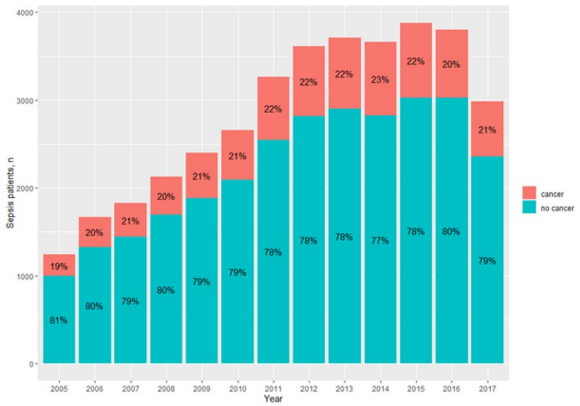


**Fig. 1 (abstract 000782)** Number of sepsis patients by calendar time and proportion with/without history of cancer before sepsis

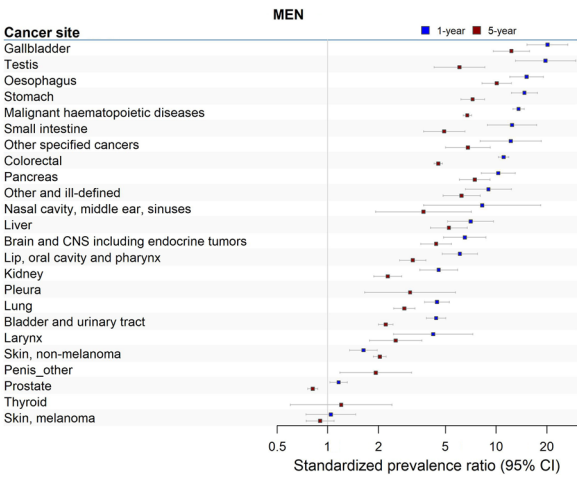


**Fig. 2 (abstract 000782)** SPRs by cancer site in men for cancers diagnosed within one and five years before sepsis

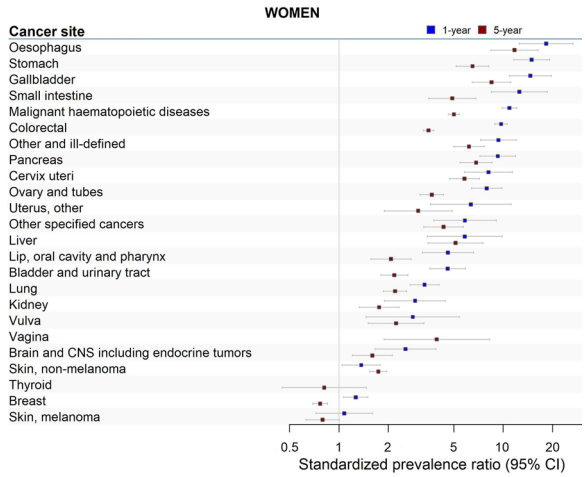


**Fig. 3 (abstract 000782)** SPRs by cancer site in women for cancers diagnosed within one and five years before sepsis

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2. Uppsala University Hospital Research Fund (ML)
3. Kirsti och Tor Johanssons Hjärt- och Cancerstiftelse (JH)

**Topic:** Sepsis

## 000786 The effects of advanced waveform analysis and PEEP on non-invasive respiratory effort assessment from diaphragm surface EMG in critically ill ICU patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000786

**Introduction:** Respiratory effort should be closely monitored in mechanically ventilated ICU patients to avoid both overassistance and underassistance. Surface electromyography of the diaphragm (sEMGdi) offers a continuous and non-invasive modality to assess respiratory effort based on neuromuscular coupling (NMCdi) [1, 2]. The sEMGdi-derived electrical activity of the diaphragm (sEAdi) has potential as a non-invasive alternative for respiratory effort monitoring, as compared to invasive modalities based on oesophageal pressure and invasive diaphragm EMG. Widespread use in clinical practice is currently limited, as the sEMGdi signal is prone to distortion by crosstalk, from the heart and other muscles [3].
**Objectives:** We developed an advanced analysis as well as quality criteria for sEAdi waveforms and investigated the effects of clinically relevant levels of PEEP on non-invasive NMCdi.
**Methods:** NMCdi was derived by dividing end-expiratory occlusion pressure (Pocc) by sEAdi, based on three consecutive Pocc manoeuvres at four incremental (+2 cmH2O/step) PEEP levels in stable ICU patients on pressure support ventilation. Measurements were repeated every other day until successful extubation. Pocc and sEAdi quality was assessed by applying a novel, automated advanced signal analysis, based on tolerant and strict cut-off criteria, and excluding inadequate waveforms. The coefficient of variations (CoV) of NMCdi was evaluated after basic manual and automated advanced quality assessment. The effect of an incremental PEEP trial on NMCdi was examined using Generalised Estimating Equations (GEE).
**Results:** 593 manoeuvres were obtained from 42 PEEP trials in 17 ICU patients. Waveform exclusion was primarily based on low sEAdi signal-to-noise ratio (Ntolerant = 155, 37%, Nstrict = 241, 51% waveforms excluded), irregular or abrupt cessation of Pocc (Ntolerant = 145, 35%, Nstrict = 145, 31%), and high sEAdi area under the baseline (Ntolerant = 94, 23%, Nstrict = 79, 17%). Strict automated assessment allowed to reduce CoV of NMCdi to 15% from 37% for basic quality assessment (Fig 1). As PEEP was increased, NMCdi decreased significantly by 4.9 percentage point per $cmH_2O$ (Fig 1).
**Conclusions:** Advanced signal analysis of both Pocc and sEAdi greatly facilitates automated and well-defined identification of high-quality waveforms. In the critically ill, this approach allowed to demonstrate a dynamic NMCdi (Pocc/sEAdi) decrease upon PEEP increments, emphasising that sEAdi-based assessment of respiratory effort should be related to PEEP-dependent diaphragm function. This novel, non-invasive methodology forms an important methodological foundation for a more robust, continuous, and comprehensive assessment of respiratory effort at the bedside.

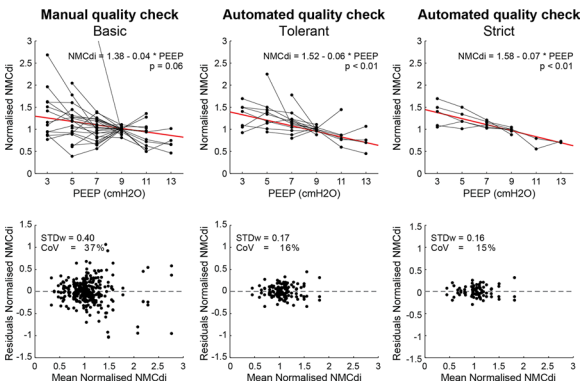


**Fig. 1 (abstract 000786)** Effect of PEEP and quality criteria on NMCdi – Top: PEEP effect on NMCdi. Black lines show the median NMCdi per PEEP level within a measurement session (one patient, one day). In red the GEE model is shown. Bottom: Residuals in NMCdi after subtraction of the mean NMCdi at that PEEP level for that patient at that day. NMCdi components PTPocc and ETPdi are unitless after normalisation to their median value at PEEP = 9 cmH2O

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000787 Long-term cognitive and pulmonary function after lower or higher oxygenation targets for acute hypoxaemic respiratory failure

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**Introduction:** Long-term cognitive and pulmonary impairments are frequent in intensive care unit (ICU) survivors admitted with severe hypoxaemic respiratory failure. However, there is still considerable uncertainty regarding the long-term effects of oxygen therapy in these patients[1]. A low partial pressure of arterial oxygen (PaO2) has been associated with reduced cognitive performance[2], while concerns exist about the potential harm to pulmonary function when pursuing higher oxygenation targets[3].
**Objectives:** To assess the effects of a PaO2 target of 8 kPa (lower target) versus a PaO2 target of 12 kPa (higher target) in ICU patients with acute hypoxaemic respiratory failure on one-year cognitive and pulmonary functions. We hypothesised that targeting a PaO2 of 8 kPa would aggravate cognitive impairment and reduce pulmonary impairment compared to targeting a PaO2 of 12 kPa.
**Methods:** In the present study we analysed two pre-specified one-year outcomes of the *Handling Oxygenation Targets in the ICU* (HOT-ICU) [4] trial and its amendment trial, *Handling Oxygenation Targets in COVID-19* (HOT-COVID)[5]. In the HOT-ICU trial 2928 adult ICU patients with acute severe hypoxaemia were randomised 1:1 to a lower versus a higher PaO2 target during the ICU stay up to 90 days, including re-admissions. The HOT-COVID trial tested the same interventions in 726 patients with confirmed COVID-19. One-year survivors, randomised at selected Danish sites, were eligible to participate in the present follow-up study. The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) and full-body plethysmography, including diffusion capacity for carbon monoxide (DLCO), were performed by blinded and trained research personnel. Primary outcome measures were the age-adjusted global cognitive score from the RBANS and the DLCO, presented as the percentage of the predicted value according to age, height, and sex. Analyses were conducted using a linear mixed model, accounting for the clustering of patients within the trials and sites.
**Results:** A total of 417 patients participated in one-year follow-up. The RBANS was performed in 189 patients in the lower-target group and 190 in the higher-target group; DLCO was obtained in 196 patients in the lower-target group and 198 in the higher-target group. The median RBANS global cognitive score was 79 (interquartile range (IQR), 66 to 99) in the lower-target group and 79 (IQR, 58 to 90) in the higher-target group (adjusted mean difference (MD): 2, 95% confidence interval (CI): -2 to 6, p = 0.41). Fig. 1 presents the RBANS performance in each intervention group stratified by the background age-adjusted mean. The median DLCO was 68% (IQR, 55 to 83%) in the lower-target group and 74% (IQR, 55 to 87%) in the higher-target group (adjusted MD: -5%, 95% CI: -9 to -1%, p = 0.007). Figure 2 presents DLCO by intervention group, categorised by severity.
**Conclusions:** In ICU patients with acute hypoxaemic respiratory failure, a lower oxygenation target of 8 kPa did not aggravate cognitive impairment but did worsen pulmonary impairment after one year compared to a higher oxygenation target of 12 kPa PaO2. Results should be considered exploratory only.

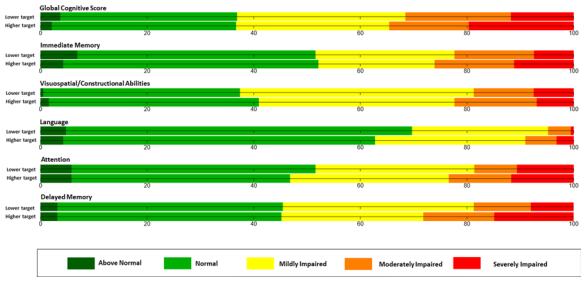


**Fig. 1 (abstract 000787)** Cognitive function
Distribution of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) global cognitive scores and the index scores from the five domains (i.e. immediate memory; visuospatial/constructional abilities; language; attention; delayed memory). Scores are stratified into 5 categories according to the background age-adjusted cognitive performance: Above normal (> 115 points); Normal (85–115 points); Mildly impaired (70–84 points); Moderately impaired (55–69 points); Severely impaired (below ≤ 54 points). Presented by the oxygenation target group. Data from survivors participating in the RBANS test: n = 189 in the lower-target group; n = 190 in the higher-target group.

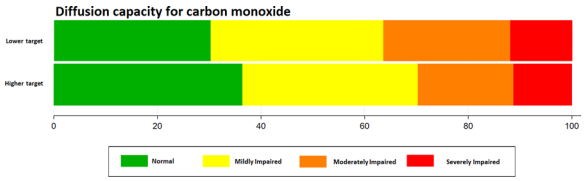


**Fig. 2 (abstract 000787)** DLCO
Distribution of diffusion capacity for carbon monoxide (DLCO) measurements according to the percentage of predicted value based on the Global Lung Function Initiative network equations: Normal (> 80%); Mildly impaired (60%–80%); Moderately impaired (40%–59%); Severely impaired (< 40%). Presented by the oxygenation target group. Data from survivors participating in lung function testing: n = 196 in the lower-target group; n = 198 in the higher-target group.

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1. This study is funded by the Novo Nordisk Foundation (NNF18OC0034614) and Danish Ministry of Higher Education and Science (0238-00004B), who had no influence on study design, scientific content of the protocol, trial conduct, data collection or analysis, interpretation of the results, or on the final publication.
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**Topic:** Acute respiratory failure and mechanical ventilation

## 000788 Urgent intubation in intensive care unit: direct laryngoscopy versus Video-laryngoscopy

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**Introduction:** Direct laryngoscopy (DL) is the classical reference method used in urgent orotracheal intubation (OTI). Nowadays, the use of the Video-laryngoscopy (VL) is increasing over time. It's used to approve the visibility of the upper airways especially in difficult expected intubation.
**Objectives:** To compare the VL to VD in terms of the first-time success in the intensive care unit (ICU) and according to the operator's experience.
**Methods:** It was a prospective comparative study conducted in the ICU of Zaghouan's regional hospital between January and December 2023. We included all patients who needed an urgent OTI with an age superior to 18 years old. We excluded pregnant women, obese patients with a BMI superior to 30 kg/m$^2$, those who were intubated for a cardiac arrest, and those with an indication for a better visualization of the upper airway. Two groups were individualized by randomization by applying a ratio 1:1 as following: Group 1 (27 patients): Intubated by Video laryngoscopy—Group 2 (27 patients): Intubated by Direct laryngoscopy.
First and second-year interns were classified as novice operators, while third and fourth-year interns were considered trained operators.
**Results:** During the study period, 54 patients were included. Median age was 61 [42–70] years and gender ratio was 1.2. Median IGSII and APACHII scores were respectively 42 [28–53] and 16 [13–22]. The main reasons for OTI were neurological and respiratory distress in 20 patients (37%). Median ICU Length of stay was 6 [2–20] days. Mortality rate was 61%.
According to the Cormack and Lehane scale, 47 patients (87%) were classified as grade 1–2, while seven patients (13%) were classified as grade 3–4. Twenty-six patients (48%) were intubated by novice operators, whereas 28 (52%) patients were intubated by trained operators.
First-attempt success was achieved in 26 patients (96%) of Group 1 compared to 18 patients (67%) in Group 2 ($p = 0.005$).
Median time to successful intubation was 60 [30–120] seconds for Group 1 versus 120 [60–120] seconds for Group 2.
The proportion of patients with successful first-pass intubation did not differ significantly between both groups performed by novice operators (92% vs 77%, $p = 0.59$).
However, the proportion of successful first-pass intubation performed by trained operators was 57% with DL versus 100% with VL ($p = 0.02$).
**Conclusions:** Video-laryngoscopy improved first-attempt success during urgent orotracheal intubation compared to direct laryngoscopy for trained operators, but it did not differ significantly in novice operators.

**Topic:** Acute respiratory failure and mechanical ventilation

## 000789 Early diagnosis of sepsis in emergency room

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000789

**Introduction:** It is challenging to detect sepsis early in patients who are admitted to the Emergency Room (ER). Organ dysfunction usually does not become evident until the damage has already been done. Sepsis can cause immunoparalysis, Septiloop is a challenge test that has been developed to diagnose sepsis and monitor immune response during stages of immunosuppression.
**Objectives:** To evaluate the characteristics of patients who came to the ER with suspicion of infection and high risk of developing sepsis (NEWS scale > = 3) and to assess the performance of Septiloop in diagnosing sepsis.
**Methods:** We conducted a preliminary prospective observational cohort study of patients with suspected infections with a high risk of developing sepsis (measured by a NEWS scale > = 3). We drew blood and performed severity scores at baseline, 4 h, and 24 h. Sepsis was defined according to the Sepsis 3(2) definition by two blinded researchers.
**Results:** We included 104 patients, out of which 72 (69%) developed sepsis within the first 24 h. The baseline characteristics are summarized in Table 1, no differences in age or comorbidities were found. The Septiloop test has shown significant differences between patients with or without sepsis at baseline.
**Conclusions:** SeptiLoop is a new tool that can aid in the early detection of sepsis and the identification of immunosuppression in high-risk patients. However, larger multicenter studies are necessary to confirm and even extend these findings.

**Table (abstract 000789)** Baseline characteristics

| Variable | Sepsis-3 (N=72) | No Sepsis-3 (N=32) | P-value |
|---|---|---|---|
| Age Median [IQR] | 75.5 [63-82] | 73.5 [64.5-81.5] | 0.732 |
| Gender Male, N (%) | 43 (60%) | 23 (72%) | 0.333 |
| Body Mass Index, Median [IQR] | 26.75 [23.5-30.05] | 24.7 [22.55-28.65] | 0.314 |
| Heart Failure, N (%) | 14 (19%) | 3 (9%) | 0.32 |
| Chronic Pulmonary Disease, N (%) | 20 (28%) | 11 (34%) | 0.655 |
| Diabetes mellitus, N (%) | 28 (39%) | 8 (25%) | 0.25 |
| Chronic kidney disease, N (%) | 19 (26%) | 11 (34%) | 0.552 |
| Infectious Focus, N (%) | | | 0.193 |
| Respiratory | 28 (39%) | 15 (47%) | |
| Urinary | 22 (31%) | 9 (28%) | |
| Abdominal | 11 (15%) | 2 (6%) | |
| CNS | 1 (1%) | 0 (0%) | |
| Endocarditis | 1 (1%) | 0 (0%) | |
| Osteoarticular | 2 (3%) | 0 (0%) | |
| Soft Tissues | 5 (7%) | 1 (3%) | |
| Unknown | 1 (1%) | 4 (12%) | |
| SOFA scale at admission, Median [IQR] | 3 [2-4.5] | 1 [1-2] | <0.001 |
| NEWS scale at admission, Median [IQR] | 6 [4-8.5] | 5 [4-7] | 0.146 |
| qSOFA at admission, Median [IQR] | 1 [1-1] | 1 [0-1] | 0.002 |
| C-reactive Protein at admission, Median [IQR] | 12.7 [2.62-27.35] | 5.6 [2.3-15.5] | 0,06 |
| In-hospital mortality, N (%) | 12 (17%) | 2 (6%) | 0.202 |
| Septiloop results at baseline, N (%) | | | 0.009 |
| Positive | 47 (70%) | 12 (42%) | |
| Negative | 20 (30%) | 18 (58%) | |

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3. This study was funded by the Science Minister of Spain CPP2021-008394

**Topic:** Sepsis

## 000790

### Prognostic evaluation of chloremia's impact on neurological outcome after a subarachnoid hemorrhage episode

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**Introduction:** Subarachnoid hemorrhage (SAH) is a life-threatening emergency with significant mortality and long-term disability. Chloride is the most abundant strong anion in the body, playing a major role in cell volume regulation by impacting the transmembrane osmotic gradient (1), as well as the arterial vasomotor tone and neuromuscular excitability (2).
**Objectives:** To investigate the relationship between chloremia and neurological outcomes after an SAH.
**Methods:** We conducted a single-center observational study including adult patients admitted to the Intensive Care Unit for non-traumatic SAH from November 2015 to December 2022. Chloremia was measured daily during the first 3 days after admission as standard care. Hyperchloremia was defined as a chloride level above 105 mmol/L. The clinical course of hospitalized patients was followed, and neurological outcome was determined according to the Glasgow Outcome Scale (GOS) 3 months after admission.
**Results:** Among the 262 patients included, 110 (42%) had a World Federation of Neurological Society (WFNS) score on admission 4 or 5. A total of 131 (50%) patients had favorable neurological outcome (GOS 4–5). Median chloride levels were 110 (IQR 106–113) mmol/L on day 1, 110 (IQR 107–113) mmol/L on day 2, and 107 (IQR 104–111) mmol/L on day 3. Hyperchloremia was present in 213 (82%), 199 (84%) and 154 (71%) patients on days 1, 2 and 3 respectively. Chloride levels were significantly lower on the first 3 days of ICU stay in patients with favorable outcomes (GOS 4–5) when compared to those with unfavorable outcomes (GOS 1–3, $N=131$ (50%), $p<0.001$ – Figure 1, panel A). Hospital survivors ($N=184$, 70%) also had lower chloride levels in the first 3 days compared to non-survivors ($N=78$ (30%), $p=0.01$ – fig*ure 1, panel B). In a multivariate analysis including age, WFNS score on admission, occurrence of rebleeding or delayed cerebral ischemia, chloremia on day 3 was independently associated with unfavorable neurological outcome (OR 1.141; 95% confidence intervals [1.051; 1.250]) and mortality (OR 1.100; 95% confidence intervals [1.017; 1.195]).
**Conclusions:** High chloride level was significantly associated with an increased risk of unfavorable neurological outcome and mortality after SAH.

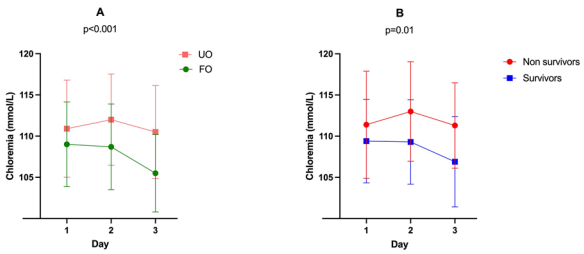


**Fig. 1 (abstract 000790)** Chloremia in the first 3 days of ICU stay according to neurological outcome 3 months after admission (panel A) and hospital mortality (panel B). FO: favorable outcome; UO: unfavorable outcome

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3. None

**Topic:** Neurointensive care

## 000791

### Diagnostic performance of the recruitment-to-inflation ratio to identify lung recruitability by PEEP in ARDS. A computed tomography study

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**Introduction:** The recruitment-to-inflation (R/I) ratio is a promising technique to individualize positive end-expiratory pressure (PEEP) level in patients with acute respiratory distress syndrome (ARDS) [1]. However, this technique has only been validated using the pressure–volume curve technique, and the optimal threshold differentiating low and high recruiters remains unknown.
**Objectives:** The aim of this study was to evaluate the diagnostic performance of the R/I ratio to identify patients with high recruitability by PEEP, using computed tomography (CT) as a gold standard.
**Methods:** We conducted a prospective single-center study on adult ARDS patients under invasive mechanical ventilation. The R/I ratio was measured on the ICU ventilator between PEEP 5 and 15 cmH2O as previously described [1] before the transfer of the patient to the imaging facility, where 4 low-dose CT scans were performed: at-end-expiration and at-end-inspiration at the PEEP level chosen by the clinician, and at end-expiration at both PEEP 15 and 5 cmH2O. Alveolar recruitment between PEEP 5 and 15 cmH2O was computed as the weight of the non-aerated compartment at PEEP 5 cmH2O minus its weight at PEEP 15 cmH2O, standardized to total lung weight. Patients were classified as high-recruiters if the recruited lung weight induced by a PEEP decrease from 15 to 5 cmH2O corresponded to at least 5% of total lung weight [2]. The primary endpoint was the area under ROC curve (AUROC) to predict low or high recruitability on CT. We estimated that with a sample size of at least 17 patients with high lung recruitability

on CT, the study would provide at worst a ± 0.15 precision for the 95% confidence interval (CI95%) of the AUROC, assuming an AUROC of at least 0.8 and with a two-tailed hypothesis.
**Results:** 44 patients were included, and 6 [14%] were subsequently excluded for suspected air leaks on the respiratory circuit, as the difference between set VT on the ventilator and measured VT on CT scan exceeded 60 ml. Most patients presented with severe ARDS (27/38 [71%]), and 8/38 [21%] were classified as high-recruiters on CT. Median non-aerated lung weight at PEEP 5 cmH2O amounted to 51% [IQR:39%-58%] of total lung weight. Median R/I ratio amounted to 0.48 [IQR:0.28–0.73], and was non-significantly lower in the low-recruiters as compared to high-recruiters on CT (0.43 [IQR:0.25–0.66] vs. 0.70 [IQR:0.51–1.00], $p = 0.07$). The correlation between the R/I ratio and lung recruitability on CT was not statistically significant ($R^2 = 0.07$; $p = 0.11$). The AUROC of the R/I ratio to predict high recruitability on CT amounted to 0.74 (CI95%: [0.49–0.93]). The optimal R/I ratio differentiating low- and high-recruiters amounted to 0.57. Median sensitivity and specificity at this threshold were 25% [CI95%:0%-63%] and 93% [CI95%:83%-100%], respectively.
**Conclusions:** With the limit that the study is ongoing and underpowered, the R/I ratio may have an acceptable diagnostic performance to identify high-recruiters by PEEP on CT, with excellent specificity.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000794

### Prediction algorithms in coronary hearts disease

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000794

**Introduction:** The cardiovascular disease is the principal cause of mortality in Europe and in Spain in 2022, 29,068 patients died because of ischemic heart disease. The machine learning (ML) improves the early detection and treatment of these pathologies.
**Objectives:** The objective of this study was to develop prediction algorithms in Python, that can predict coronary disease in patients who consults at the emergency department with thoracic pain.
**Methods:** This is a retrospective and analytic study, that includes patients over 15 years of age who consulted in the emergency room due to chest pain and who underwent cardiac catheterization. The variables were analyzed and those that had the greatest correlation with positive cardiac catheterization were selected. Three supervised learning models were carried out.
**Results:**

**Table 1 (abstract 000794)** Characteristics of the sample

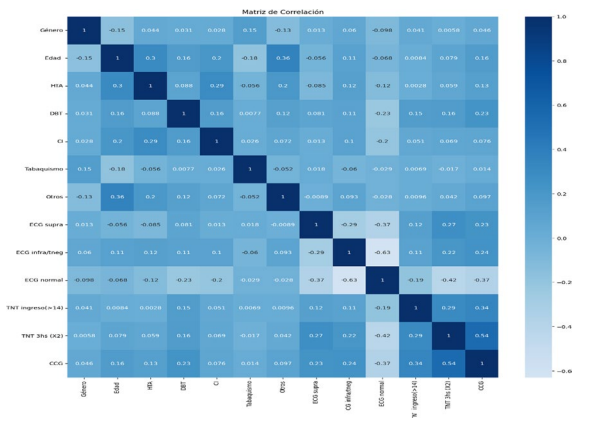
| | Sample (281) | Coronary disease (171) | No coronary diesease (110) |
|---|---|---|---|
| Man | 69 | 70 | 66 |
| Age mean (SD) | 65.8(12) | 67(10) | 63(14) |
| Arterial Hypertension | 64 | 69 | 56 |
| Diabetes | 24 | 31 | 12 |
| Ischemic heart disease | 26 | 28 | 22 |
| Smoker | 19 | 19 | 18 |
| Others | 49 | 52 | 43 |
| ECG ST elevation | 16 | 22 | 5 |
| ECG non-ST elevation/ negative T | 34 | 43 | 20 |
| ECG normal/ no changes | 44 | 29 | 67 |
| TNT admission | 61 | 74 | 40 |
| TNT 3 h | 39 | 60 | 6 |

281 patients who were admitted to the emergency room from 2022 to 2024 were included. There were no null values. The characteristics of the sample are described in Table 1. A correlation matrix was made (Graph 1). The variables with p value ($p < 0.05$) were age, ST segment elevation, ST depression/ T negative in electrocardiogram (ECG), positive troponin (TNT) at admission and positive curve at 3 h. The selection of the variables was carried out with the featurewiz library.
For the internal validation of the models, the sample was divided into training (80%) and test (20%) and a cross-validation with K folders with 50 splits was made.
The first model was logistic regression, Table 2 resumes the performance of the algorithms. Then a decision tree model was created, obtaining a tree with 5 nodes, 14 terminal nodes, entropy criterion (Graph 2). Finally, a k-nearest neighbors model was developed and Graph 3 combines the confidence map with the scatter plot of the test and training groups.

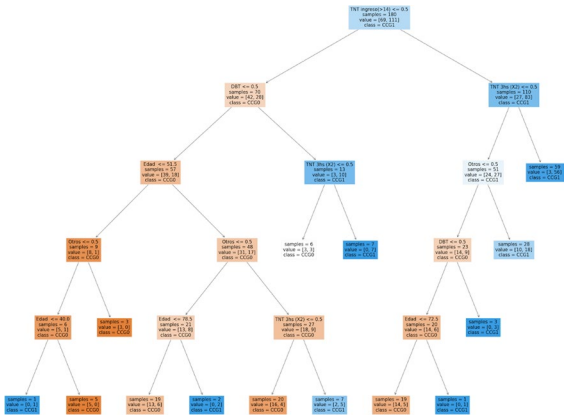
**Table 2 (abstract 000794)** Performance comparison of different ML models in the test group

| Models | Sensitivity (%) | Specificity (%) | Accuracy | AUC | MSE |
|---|---|---|---|---|---|
| Logistic Regression | 74 | 79 | 75 | 0.76 | 0.24 |
| Tree Decision | 74 | 63 | 75 | 0.67 | 0.6 |
| k-NN | 82 | 89 | 84 | 0.71 | 0.56 |

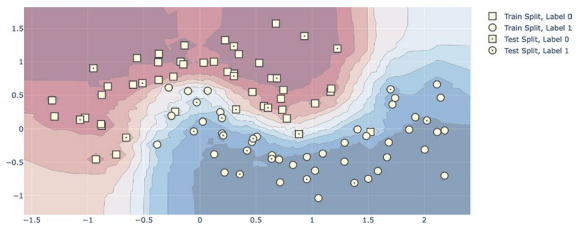
**Conclusions:** The use of ML can help to predict different pathologies. The algorithms develop in this study can predict de coronary disease however have less accuracy compared with other studies.




**Graph 1 (abstract 000794).**



**Graph 2 (abstract 000794).**




**Graph 3 (abstract 000794).**

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**Topic:** Cardiovascular issues in ICU

## 000795 C

## onservative or liberal oxygen targets in patients on venoarterial extracorporeal membrane oxygenation

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**Introduction:** Patients receiving venoarterial extracorporeal membrane oxygenation (VA-ECMO) frequently develop arterial hyperoxaemia, which may be harmful. However, lower oxygen saturation targets may also lead to harmful episodes of hypoxaemia.
**Methods:** In this registry-embedded, multicentre trial, we randomly assigned adult patients receiving VA-ECMO in an Intensive Care Unit (ICU) to either a conservative (target $SaO_2$ 92–96%) or to a liberal oxygen strategy (target SaO2 97–100%) through controlled oxygen administration via the ventilator and ECMO gas blender. The primary outcome was the number of ICU-free days to day 28. Secondary outcomes included ICU-free days to day 60, mortality, ECMO and ventilation duration, ICU and hospital lengths of stay, and functional outcomes at six months.
**Results:** From September 2019 through June 2023, 934 patients who received VA-ECMO were reported to the EXCEL registry, of whom 300 (192 cardiogenic shock, 108 refractory cardiac arrest) were recruited. We randomised 149 to a conservative and 151 to a liberal oxygen strategy. The median number of ICU-free days to day 28 was similar in both groups (conservative: 0 days [IQR 0 to 13.7] versus liberal: 0 days [IQR 0 to 13.7], median treatment effect: 0 days [95% CI -3.1 to 3.1]). All secondary outcomes and adverse events were similar in both groups. The conservative group experienced 44 (29.5%) major protocol deviations compared to 2 (1.3%) in the liberal oxygen group ($P < 0.001$).
**Conclusions:** In adults receiving VA-ECMO in ICU, a conservative compared to a liberal oxygen strategy, did not affect the number of ICU-free days to day 28.

**Reference(s)**

1. MRFF, Australia (APP1152270)

**Topic:** Cardiovascular issues in ICU

## 000796

## Reduction in human albumin usage in a UK general critical care unit, an MDT quality improvement project

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000796

**Introduction:** Use of Human Albumin Solution (HAS) in Critical Care units is a controversial topic, with limited or uncertain evidence supporting usage in certain conditions. As a human blood product, there is a significant risk of side effects, such as disease transmission, transfusion reactions, and circulatory overload. It is an expensive medication, with recent UK shortages.

Our NHS trust has two general intensive care units on 2 sites. The critical care team noted high usage rates and expenditure on HAS in recent years (~ £50k/yr 2020–21 or ~ €58,000).

Over the last few years, the team adopted a multimodal quality improvement project featuring a safety update, new guidelines highlighting the evidence base, and an updated e-prescribing system—adding an albumin protocol that requires an indication to be selected. Looking at prescribing over the last 4 years, usage has decreased. However, the rationale for and appropriateness of albumin prescription has not been formally audited in this time.

**Objectives:** To audit the prescription of albumin against our guidelines setting the following standard:

- 100% of patients will have documented indication for prescription of HAS in keeping with Critical Care guidelines

To obtain descriptive data for comparison of HAS prescription in critical care according to guidelines and any subsequent improvement after intervention.

**Methods:** Details of all patients prescribed 20% HAS in both critical care units from July-Nov 2023 were obtained via a report of electronic prescriptions. Prescriptions were reviewed and data gathered for age, site, volume prescribed, and indication. Electronic notes, prescriptions and fluid-balance charts were reviewed to determine if it was in keeping with guidelines (Fig 0.1).

If the indication was sepsis, this was deemed 'appropriate' if the patient received > 2L IV fluid resuscitation prior and was on vasopressors—as a surrogate for haemodynamic instability/shock. Albumin expenditure was compared using pharmacy cost reports (Fig 0.2).

**Results:** Spending and usage of albumin at both sites has decreased significantly over the last 4 years (Fig 0.2) as per expenditure analysis, decreasing by around ~ £35,000 (~ €40,000).

There were 30 prescriptions of 20% HAS in 22 patients. 100% had an indication on the prescription (mandatory on e-prescribing), with majority receiving 20g or 40g of 20% HAS.

The majority of prescriptions stated 'sepsis' as the indication, with the second largest indication being 'other' (Fig 0.3). Of the 8 'other' prescriptions there were 5 different patients: 2 given for specialist indications (dialysis, poisons advice to aid venlafaxine binding), 2 for shock (tumour lysis syndrome, multi-organ failure/shock on anaesthetic induction)—both deemed 'appropriate'. The other 4 prescriptions were for the same patient, essentially for hypoalbuminaemia and open abdominal wound (indication of 'sepsis/shock', inappropriately).

When looking at indications, 63% (19 prescriptions) were 'appropriate'. Of 11 prescriptions deemed 'inappropriate', all were 'other' or 'sepsis' categories. However, 7 of these were the same patient, which given the small sample size, skewed results. One of the 'other' indications was 'shock, alcoholic', the rest were sepsis/shock and hypoalbuminaemia. There were 17 HAS prescriptions for 'sepsis': 11 '(65%) 'appropriate', 6 'inappropriate' (4 patients). None of the 4 had > 2L crystalloid resuscitation prior, although 3 were on vasopressors.

**Conclusions:** In a UK general intensive care unit a multi-modal approach using education, guidelines and alterations to e-prescribing showed a reduction HAS prescribing costs over a 4 year period.

HAS is prescribed in keeping with guidelines the majority of the time in our critical care units. However, 1/3 of prescriptions are probably inappropriate and unlikely to provide benefit to the patient, with increased cost and risk of side effects. Analysis was limited by small numbers and lack of definite data from prior to the guidelines for direct comparison.

Having presented the data and analysis at our cross-site governance meeting, we have re-circulated the guidelines and provided further evidence-based education on albumin usage to our critical care teams. As 'sepsis' was the majority of 'inappropriate' indications, we have focused our learning on the need for adequate crystalloid resuscitation prior, and are looking at adding additional guidance on the e-prescribing system. We are re-auditing in the near future, aiming to cement the improvement in appropriate HAS prescriptions in our units.

| **EVIDENCE SUPPORTS USE** | |
|---|---|
| INDICATION | ALBUMIN PRODUCT/DOSE |
| Large volume paracentesis (drainage of ascites) in patient with chronic liver disease | HAS 20% 100ml 1 bottle per every 3L ascites drained (increased to 1 bottle every per every 2L if renal function impaired) |
| Spontaneous bacterial peritonitis (SBP) | HAS 20% 100ml 1.5g/kg on day 1 (usually 4-8 bottles), then 1g/kg on day 3 (usually 2-5 bottles) |
| Hepatorenal syndrome | HAS 20% 100ml 1g/kg on day 1 (usually 2-5 bottles)<br>**Then**<br>HAS 20% 100ml 1-2 bottles daily for 2-16 days. |
| **AREA OF UNCERTAIN BENEFIT** | |
| INDICATION | NOTES |
| Large volume paracentesis (drainage of ascites) in patient with ascites not due to chronic liver disease | May be indicated dependent on individual patient circumstances |
| Sepsis - resuscitation as per surviving sepsis guidelines, with continued cardiovascular instability after 40mL/kg crystalloid | Ensure resuscitation with crystalloid prior to considering albumin. Consider involving a Critical Care Consultant as determined by patient clinical condition. |
| **NO EVIDENCE OF BENEFIT – NOT TO BE PRESCRIBED** | |
| INDICATION | EVIDENCE BASE |
| Volume resuscitation for hypovolaemia | No difference in length of stay / ventilated days and RRT. In trauma reveals an increase in mortality. |
| Mild acute lung injury and ARDS | May improve oxygenation but no effect on mortality |
| Hypoalbuminemia – in the absence of ascites, SBP or hepatorenal syndrome | No difference in survival or sustained improvement in organ dysfunction. Using albumin offers no additional benefit, with additional adverse effects. |
| Low serum albumin in haemodynamically unstable patient in critical care | Lack of evidence to support use |
| **EVIDENCE OF HARM – NOT TO BE PRESCRIBED** | |
| INDICATION | EVIDENCE BASE |
| Volume resuscitation in brain injury | Significantly higher mortality & fewer favourable neurological outcomes. |

**Fig. 1 (abstract 000796)** Critical Care Trust Guidelines

| | Total Cost incl VAT | Quantity |
|---|---|---|
| **Albumin 20% 100ml** | | |
| 2020 | 31298.4 | 752 |
| 2021 | 27949.4 | 805 |
| 2022 | 14573 | 387 |
| 2023 | 8245.6 | 215 |
| **Albumin 5% 500ml** | | |
| 2020 | 15831 | 292 |
| 2021 | 7441 | 172 |
| 2022 | 2561 | 52 |
| 2023 | 1731.5 | 37 |

**Fig. 2 (abstract 000796)** Combined Unit Albumin Expenditure

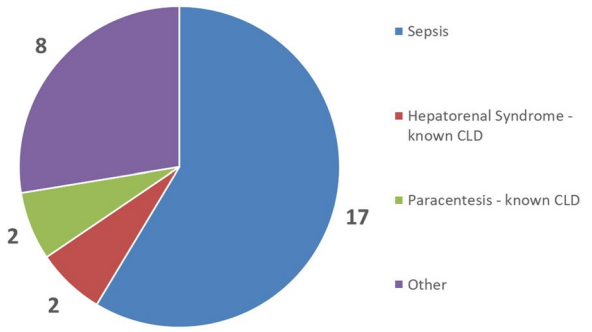


**Fig. 3 (abstract 000796)** Indications for HAS Prescription

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4. None received

**Topic:** Transfusion and haemostasis disorders

## 000798

### Electronic neuromuscular stimulation versus intermittent pneumAtic compression devices for the pRevention of venous thromboembolic disease in critically Ill Adults: a randomised feasibility study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000798

**Introduction:** Venous Thromboembolism (VTE) is common in critical illness, affecting as many as 1 in 3 patients admitted to critical care (1). VTE prevention strategies typically include intermittent pneumatic compression devices, graduated compression stockings or a combination of these. Both methods have several limitations: including contraindications, poor compliance, mechanical upkeep, and risk of falls (2). Although well-established, international guidelines on VTE prophylaxis in critical care are variable and based on low-quality evidence (3,4,5). This study tested the feasibility of an alternative, novel, neuromuscular stimulation device to prevent VTE in critically ill adults.
**Objectives:** The primary objective of this trial was to show the feasibility of comparing application of the gekoTM device to intermittent pneumatic compression stockings in new patients admitted to critical care. Secondary objectives included the collection of pilot data for relevant outcomes, which may inform the design of a future efficacy trial.
**Methods:** This single-centred, open-label, parallel-group, randomised feasibility trial recruited patients admitted to critical care at risk of VTE. Patients were randomised to the intervention group (Geko) or control group (intermittent pneumatic compression devices) for up to ten days. Pre-specified measures of feasibility and associated thresholds included: adherence to assigned intervention, recruitment rate, and data completeness.
**Results:** 40 patients were randomised, 20 to each group. Data were available from 38 patients for analysis. The recruitment rate was 3.3 patients per month (93.3% of the target rate). Adherence to the Geko was 84.2% in the intervention group, versus 86.1% in the control arm. Common reasons for non-adherence included: inability to sleep with devices on, discomfort when devices programmed at higher levels, refusal due to delirium/confusion. There were 4 mild adverse events of skin irritation seen in the intervention group.
**Conclusions:** The application of the Geko device was feasible, safe, and well-tolerated by patients admitted to critical care who were at high risk of VTE. Larger, well-designed randomised controlled trials would be required to investigate Geko's efficacy and cost-effectiveness compared to existing alternatives.
Trial registration: URL: www.clinicaltrials.gov. Unique identifier: NCT05208216. Registered 26 January 2022.

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**Topic:** Nursing care and physiotherapy

## 000800

### Goal-directed vasopressor vs. fluid administration and spinal cord microcirculatory blood flow following aortic-cross-clamping induced ischemia–reperfusion: a pilot study in pigs

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000800

**Introduction:** Spinal cord injury induced by ischemia/reperfusion is a major complication of aortic repair. Despite efforts to prevent spinal cord injury, it still commonly occurs and impacts patient outcomes. The microcirculation is of paramount importance for tissue perfusion and oxygen supply and may be dissociated from macrohemodynamic variables clinically used to guide resuscitation. Fluids and vasopressors are commonly used for hemodynamic resuscitation, however their specific effects on spinal cord microperfusion are unknown.
**Objectives:** We aimed to compare the effects of vasopressor- and fluid-based hemodynamic resuscitation on spinal cord microperfusion in a translational acute pig model of aortic cross-clamping.
**Methods:** This was a randomized trial of 16 anaesthetized mechanically ventilated pigs. Ischemia/reperfusion was induced by supraceliac aortic-cross-clamping with prior ischemic preconditioning with an ascending order of 1-, 2-, 5-, 10-, and 30-min intervals to improve the survival of the animals during the study protocol. Pigs were

randomized to receive either goal-directed vasopressor therapy with norepinephrine to a target mean arterial pressure (MAP) of 80 mmHg or goal-directed fluid therapy with balanced isotonic crystalloids until no improvement of cardiac output could be achieved. Spinal cord microcirculation was measured using Laser-Speckle-Contrast- Imaging as well as fluorescent microspheres. Further cerebrospinal fluid drainage was used to maintain normalized cerebrospinal fluid pressure.
**Results:** The microcirculation of the lower spinal cord decreased significantly following the ischemia/reperfusion injury caused by aortic cross-clamping (0.103 (0.088–0.120) vs. 0.030 (0.026–0.035) ml*min-1*g-1 in fluorescence microsphere analysis, $p<0.001$; 77.16 (58.72–101.38) vs. 12.54 (9.63–16.32) p.u. in Laser-Doppler measurements, $p<0.001$). After ischemia/reperfusion injury the microcirculatory blood flow was significantly higher in pigs assigned to vasopressor therapy than in pigs assigned to fluid therapy (0.138 (0.111–0.172) ml min-1 g-1 vs. 0.099 (0.080–0.122,$p<0.001$). Microcirculatory resuscitation was not uncoupled from macrohaemodynamic variables.
**Conclusions:** The results of this trial suggest that there are beneficial effects of vasopressor-based resuscitation on lower spinal cord microcirculation compared to fluid-based resuscitation in an experimental model of aortic cross clamping.

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**Topic:** Cardiovascular issues in ICU

## 000801

### Effects of paracetamol on mean arterial pressure in critically ill patients: a systematic review and metanalysis


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000801


**Introduction:** A meta-analysis of randomized controlled trials showed that paracetamol increases significantly systolic arterial pressure (SAP). However, the effects of paracetamol infusion in intensive care unit (ICU) patients may be opposite and hypotension after paracetamol administration is not uncommon.
**Methods:** We conducted a meta-analysis of observational studies reporting hemodynamic changes in ICU patients receiving parenteral paracetamol for fever/sepsis and/or pain/analgesia. The primary outcome was a change in mean arterial pressure (MAP) using the nadir value recorded within the first 30 min. Secondary outcomes were: cumulative incidence of hypotensive events, changes in SAP, diastolic arterial pressure (DAP) and heart rate (HR). Outcomes were analyzed using a random-effect model (inverse variance approach) and reported as mean difference (MD) with 95% confidence interval.
**Results:** We included 13 studies reporting the cumulative incidence of hypotension (as defined by each study) following paracetamol administration was 54.2% ($n=186/343$). Eight studies provided values of MAP, which significantly decreased after administration of parenteral paracetamol (MD:-7.53 mmHg [-9.58;-5.49]; $p<0.0001$; $I2=10\%$; Figure 1). When evaluating the effects on MAP at longer timeframe, the analysis of nine studies yielded almost identical results (MD:-7.66 mmHg [-9.66;-5.67]; $p<0.0001$; $I2=7\%$). We found also a significant reduction after paracetamol administration in SAP (seven studies, MD:-14.23 mmHg [-19.21;-9.24]; $p<0.0001$; $I2=28\%$; Figure 2) and DAP (six studies, MD:-3.77 mmHg [-6.21;-1.32]; $p=0.003$; $I2=23\%$; Figure 3), with no significant changes in HR (four studies, MD:-1.97 mmHg [-6.52;2.58]; $p=0.40$; $I2=0\%$).
**Conclusions:** This is the first metanalysis quantifying the hemodynamic impact of paracetamol administration to ICU patients. Paracetamol produces hypotensive events in over half of the population, with a mean reduction in MAP over 7 mmHg within the first 30 min after administration, with no effects on HR.

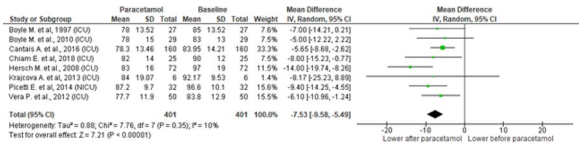


**Fig. (abstract 000801)** Mean arterial Pressure change before and after paracetamol infusion in critically ill patients. MD: mean difference; CI: COnfidence interval; IV: Inverse variance

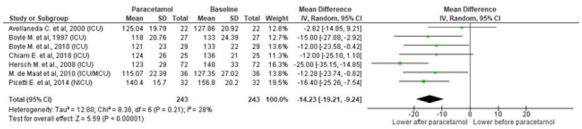


**Fig. (abstract 000801)** Systolic Arterial Pressure change before and after paracetamol infusion in critically ill patients. MD: mean difference; CI: COnfidence interval; IV: Inverse variance

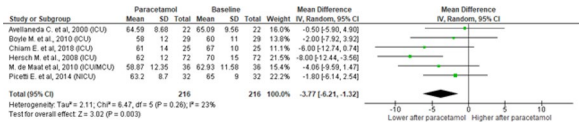


**Fig. (abstract 000801)** Diastolic arterial pressure change before and after paracetamol infusion in critically ill patients. MD: mean difference; CI: Confidence interval; IV: Inverse variance

**Topic:** Poisoning/Toxicology/Pharmacology

## 000803

### Ghrelin: inhibiting ferroptosis to protect against sepsis-induced intestinal injury


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000803


**Introduction:** Ghrelin offers benefits in sepsis therapy, but its impact on sepsis-induced intestinal injury is not well-defined. This study investigates the therapeutic efficacy of ghrelin in alleviating sepsis-induced intestinal damage, focusing on its potential to inhibit ferroptosis and protect intestinal barrier integrity.
**Objectives:** To examine the roles of ghrelin in alleviating sepsis-induced intestinal injury, especially in ferroptosis, and protect intestinal barrier integrity.
**Methods:** We evaluated ghrelin and Ferrostatin-1 (Fer-1) in C57BL/6 mice with CLP-induced sepsis, assessing bacterial load, intestinal integrity, inflammation, oxidative stress, and ferroptosis through histopathology and biochemical assays.

**Results:** Ghrelin and Fer-1 effectively reduce bacteremia, sepsis severity, and oxidative stress in intestinal cells. They decrease apoptosis, as shown by TUNEL assays, and lower DAO and FABP2 levels, markers of intestinal barrier damage, indicating barrier restoration. Furthermore, these agents normalize cytokine levels (IL-6, IL-1β, TNF-α, IL-22), disrupted in sepsis, showcasing their anti-inflammatory effects. Western blot analysis shows they reverse sepsis-induced changes in ferroptosis-related proteins (4-HNE, FTH1, GPX4, ACSL4, PTGS2, SLC7A11), underscoring their role in ferroptosis inhibition (Fig 1).
**Conclusions:** Ghrelin protects against sepsis-induced intestinal injury by inhibiting ferroptosis, highlighting its therapeutic potential for sepsis.

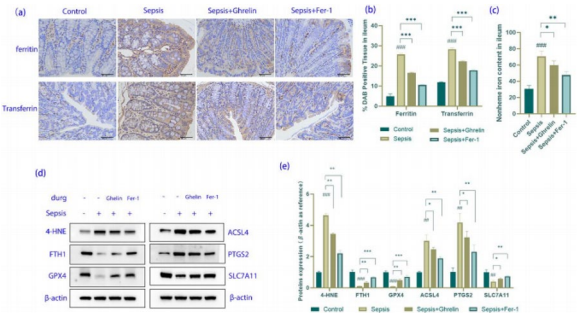


**Fig. 1 (abstract 000803)** Impact of Ghrelin and Fer-1 on Ferroptosis Markers in Intestinal Cells during Sepsis

**Reference(s)**

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**Topic:** Sepsis

## 000806

## Activation of hippocampal cGAS-STING pathway exacerbates sepsis-associated encephalopathy

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000806

**Introduction:** Sepsis is a severe infectious condition that triggers systemic inflammatory response syndrome, often leading to multiple organ dysfunctions, notably sepsis-associated encephalopathy (SAE). SAE, a severe complication of sepsis, affects central nervous system function and results in cognitive and memory impairments. Oxidative stress is an integral component of the pathogenesis of SAE, with mitochondria serving as the primary site of oxidative stress, potentially playing a significant role in the pathogenesis of SAE by activating the cGAS-STING pathway 1 2.
**Objectives:** Our study aims to investigate the activation of the cGAS-STING pathway induced by sepsis-associated mitochondrial damage and its role in cognitive dysfunction in SAE. Additionally, the study seeks to evaluate whether intervention in this pathway using the STING inhibitor H151 can ameliorate cognitive impairments in SAE, providing new insights and strategies for the treatment of SAE.
**Methods:** The SAE mice models were induced in C57BL/6 mice using cecum ligation and puncture (CLP) surgery. Subsequently, the mice were randomly divided into six groups: sham operation (Sham) group, sepsis (CLP) group, sepsis with intraperitoneal (i.p.) PBS injection (PBS + CLP) group, sepsis with H151 i.p. (CLP + H151) group, cGAS AAV overexpression (cGAS + -AAV) group, and control virus (Control-AAV) group. Hippocampal stereotactic injection of cGAS AAV virus was used to overexpress and activate the hippocampal cGAS-STING pathway. Intraperitoneal injection of H151 was used to block STING. The activation level of the hippocampal cGAS-STING pathway was evaluated by Western Blot, and the cognitive ability of mice was assessed using the Novel Object Recognition Test (NORT).
**Results:** The expression of the hippocampal cGAS-STING pathway was markedly elevated in mice from the CLP group compared to those in the Sham group. Administration of the STING inhibitor H151 via intraperitoneal injection (750 nM) significantly reduced hippocampal STING expression. Concurrently, these treated mice exhibited a notable increase in the duration of novel object exploration during NORT. Conversely, mice receiving AAV injection for hippocampal cGAS overexpression displayed a significantly decreased exploration time for novel objects in the NORT.
**Conclusions:** Our study confirmed the pivotal role of the hippocampal cGAS-STING pathway in the cognitive impairment of SAE. Suppression of this pathway activity by intraperitoneal injection of H151 effectively improved cognitive impairment in SAE mice, offering a novel strategy for the treatment of SAE. This discovery serves as a significant reference for further research on the pathomechanism of SAE and the development of therapeutic strategies.

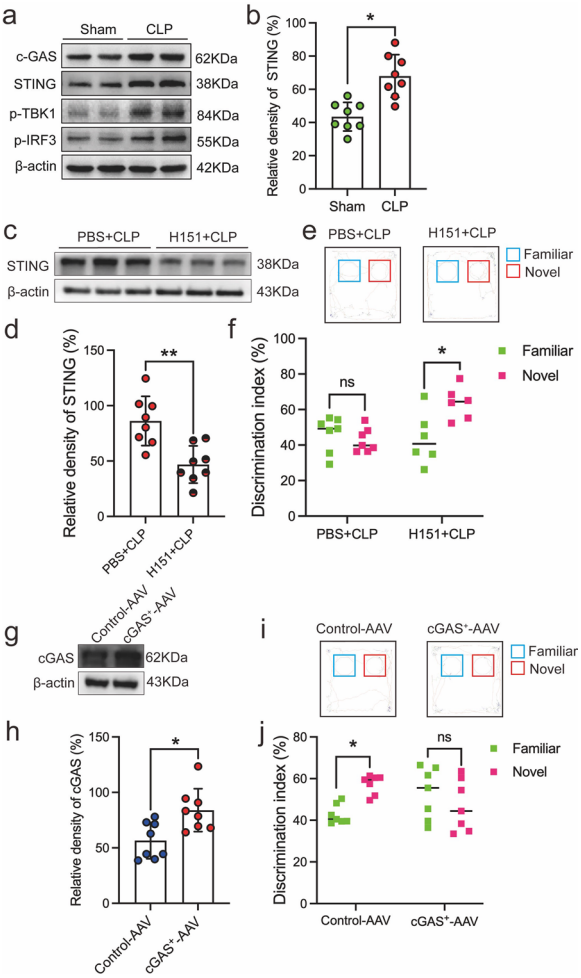


**Fig. (abstract 000806)** (a, b), hippocampal cGAS-STING pathway expression is significantly increased in mice after cecum ligation and puncture (CLP). (c, d) intraperitoneal injection of STING inhibitor H151 (750 nM/only) significantly reduced hippocampal STING expression. (e, f), H151 i.p. significantly increased time to novelty exploration in NORT in septic mice. (g, h), hippocampal injection of cGAS overexpresses AAV. (i, j), hippocampal injection of cGAS overexpressing AAV significantly reduced the time mice spent exploring novel objects in NORT. Data are expressed as mean ± variance and t-test was used for comparison between groups. $^{*}p < 0.05$, ns: not significant

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1. 2 Zhao, C. et al. GSDMD promotes neutrophil extracellular traps via mtDNA-cGAS-STING pathway during lung ischemia/reperfusion. Cell Death Discovery 9, 368, https://doi.org/10.1038/s41420-023-01663-z (2023).
2. 1 Skopelja-Gardner, S., An, J. & Elkon, K. B. Role of the cGAS–STING pathway in systemic and organ-specific diseases. Nature Reviews Nephrology 18, 558–572, https://doi.org/10.1038/s41581-022-00589-6 (2022).

**Topic:** Sepsis

## 000808

### High level of patient-ventilator asynchrony thoughout mechanical ventilation is associated with poor prognosis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000808.

**Introduction:** During mechanical ventilation (MV), the mismatch between patients' needs and machine's delivery, known as patient-ventilator asynchrony (PVA), can cause patient discomfort and dyspnea, and may contribute to poor prognosis. Monitoring PVA in critically ill patients is valuable for lung protection. Ventilator waveforms are commonly used in clinical practice as noninvasive and user-friendly parameters, and our group has devised a real-time monitoring platform (the RemoteVentilateView platform) for the identification and monitoring of PVA.
**Objectives:** To observe the level and types of PVA, and examine their associations with patients' prognosis, PVA throughout MV of patients from ICU admission up to 28 days were analyzed.
**Methods:** This retrospective, observational, multicenter study was conducted in four ICUs, including 50 patients that were on ventilators connected to the RemoteVentilateView platform and ventilated for more than 24 h. Within 2 h of initiating MV, physicians enrolled the patient, and the platform would automatically begin recording and monitoring, which were stopped manually when the patient was discharged from ICU or was removed from MV. The platform recognizes 8 types of PVA, including ineffective trigger, double trigger, reverse trigger, auto-trigger, flow insufficiency, overshoot, premature cycle, and delayed cycle. Our analysis included a total of 15,144 h of ventilation.
**Results:** The Asynchrony index (AI, the proportion of asynchronous breaths to total breaths) was applied to evaluate the frequency of PVA. Gross AI among 50 patients was 12.5% (10.1, 18.0). Non-survivors had a higher level of AI than survivors [22.1 (13.2, 25.6) % vs 11.5 (8.5, 16.3) %, p = 0.002]. We also found that using AI as a predictor, a cutoff value of 14% could be used for survival outcomes. Patients with an AI ≥ 14% had a higher 28-day mortality than those with AI < 14% (42.86% vs. 13.79%, $p = 0.021$). In the investigated patients, those who received MV due to infection demonstrated a significantly higher ineffective trigger index compared to patients without infection [4.6 (3.3, 6.9) % vs 2.0 (0.1, 4.2) %, $p = 0.010$]. Specifically, patients diagnosed with lung infection had a much higher ineffective trigger index than those undergoing cardiac surgery [4.8 (3.7, 7.1) % vs 0.1 (0, 4.1) %, $p = 0.016$].
**Conclusions:** PVA is common in patients receiving MV in the ICU. High PVA was associated with poor prognosis, such as higher 28-day mortality. Poor outcomes could be predicted by AI ≥ 14%. Among multiple asynchronies, only ineffective triggers demonstrated significantly different levels between patients with or without infection. Future studies could pay more attention to the relationship between different types of asynchrony and prognosis with the underlying mechanisms involved.

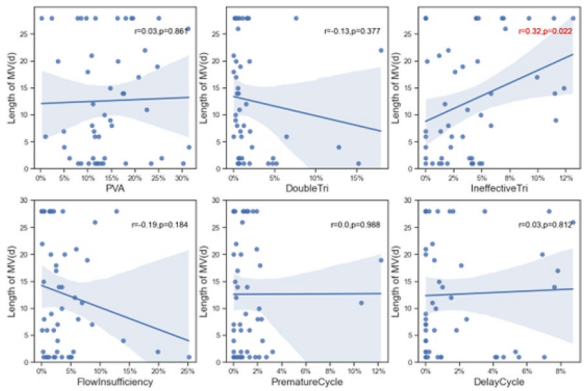


**Fig. (abstract 000808)** Association between Length of MV and asynchrony index. Among all kinds of asynchronies, only an ineffective trigger index has been associated with the duration of MV

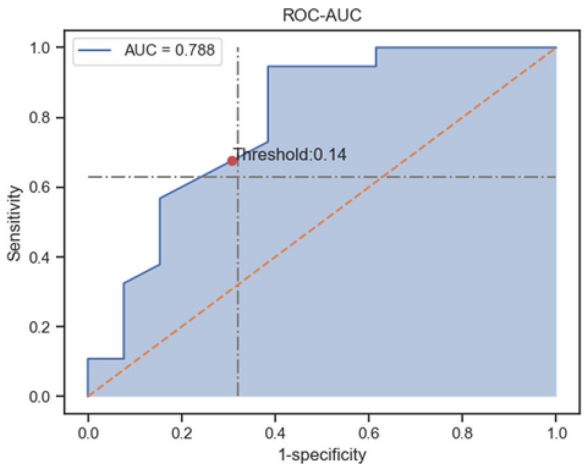


**Fig. (abstract 000808)** Receiver operating characteristic (ROC) curve of AI throughout MV for 28d mortality

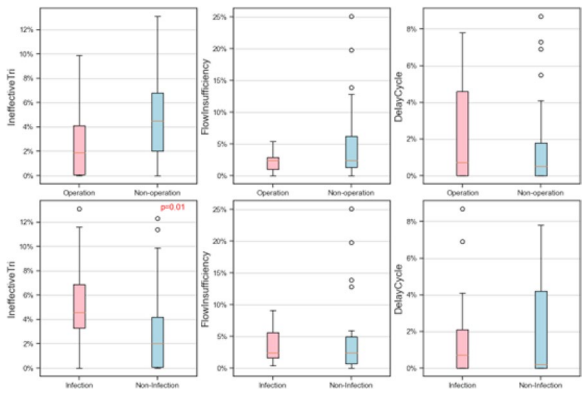


**Fig. (abstract 000808)** Levels of different types of asynchrony in patients. Those diagnosed with infection demonstrated a higher level of ineffective trigger

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000809

### Fluid boluses and infusions in the early phase of resuscitation from septic shock: a retrospective report and outcome analysis from a tertiary hospital

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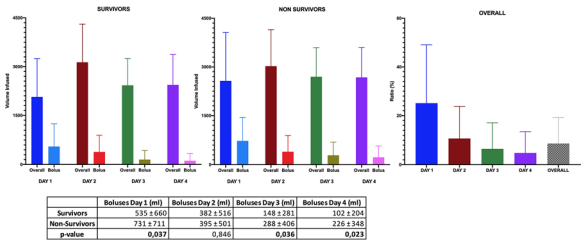
***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000809

**Introduction:** Fluid administration is the first line treatment of for critically ill patients admitted to the ICU with septic shock, aiming to increase venous return and, hence, cardiac output and tissue oxygen delivery. However, despite fluids administration being one of the most common and early interventions, the modality and the overall volume are still debated. Specifically, the amount of fluids given by boluses (FB) or by continuous infusions (including drugs and medications) in the early phases of shock treatment is often unknown. [1,2,3].
**Objectives:** We conducted a retrospective analysis on the use of fluids in septic patients, with the primary aim of analyzing the proportion of FBs over infusions in days 1–4. We secondarily described the different types of fluids given and four main pharmacological categories (i.e. vasoactive, sedative/analgesic, anti-infective, and other drugs). Finally, we assessed if fluid administration modality and fluid types may impact ICU mortality.
**Methods:** We enrolled patients admitted with a diagnosis of septic shock from 1st July 2021 to 31st December 2023, during the first 4 days of ICU stay. Data related to fluid administration were exported from the electronic health records system (ICCA®, Philips Healthcare): fluid balance, boluses, infusions by pumps, and enteral infusions. Age, severity score, overall fluid balance, and the percentage of volume of each fluid type over the 4 considered days were included in a multivariable logistic regression model, evaluating the association with ICU survival.
**Results:** We analysed 220 patients, with 66 patients (30.0%) who died. Overall, on Day 1 FB was 25.1% and was reduced to 4.8% (8.7) on Day 4 (overall, only 8.6% (10.5) of fluids given). Non-survivors received a higher amount of IV fluids as compared to survivors only on Day 1 [2,493 (1,489–2,963) vs. 1,855 (1,167–2,638); p 0.022]. Fluid infusion represented 49.3% (22.8) of the overall fluid intake, being the balanced solution the most represented [27.4% (22.0)]. All IV drugs represented 34.0% (12.9) of the total, while PO/NGT intake was 18.0 (15.7%). A positive fluid balance [OR 2.14 (1.33 – 3.43)], was the most important factor associated to ICU mortality.
**Conclusions:** This retrospective analysis based on a precise evaluation of fluids given over the early phases of septic shock, showed that the overall amount of fluid given by boluses is small (from about 25% on Day 1 to about 5% on Day 4). Our data confirm that a positive fluid balance over the first 4 days of ICU is associated to mortality.




| | Boluses Day 1 (ml) | Boluses Day 2 (ml) | Boluses Day 3 (ml) | Boluses Day 4 (ml) |
|---|---|---|---|---|
| Survivors | 535 ± 660 | 382 ± 516 | 148 ± 281 | 102 ± 204 |
| Non-Survivors | 731 ± 711 | 395 ± 501 | 288 ± 406 | 226 ± 348 |
| p-value | 0,037 | 0,846 | 0,036 | 0,023 |

**Fig. 1 (abstract 000809)** Percentage of fluids given by boluses or not over ICU days 1–4

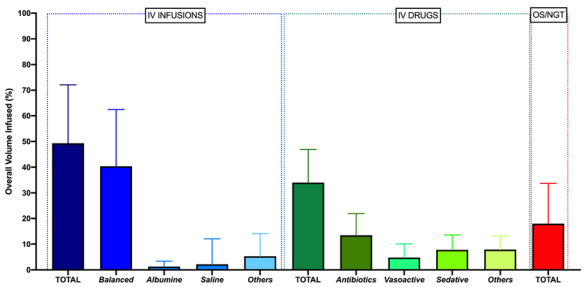



**Fig. 2 (abstract 000809)** Overall intakes during the first 4 days of ICU stay

**Reference(s)**
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**Topic:** Cardiovascular issues in ICU

## 000810

### Pulmonary aspergillosis in critically ill patients treated with isavuconazole

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000810

**Introduction:** In our ICU, we do not have voriconazole levels, so isavuconazole (ISV) has become the standard treatment for pulmonary aspergillosis (PA).
**Objectives:** To analyze PA in critically ill patients admitted to our ICU who have been treated with ISV.
**Methods:** A retrospective descriptive observational study of patients with PA treated with ISV during their admission to our ICU, from February 2019 to July 2023. It is a multipurpose ICU with 12 beds, expanded to 24 during the pandemic. The characteristics of the patients, reason for admission to the ICU, diagnosis of PA, aspergillus species identified, treatment and clinical cure are analyzed. The diagnosis of PA was made according to the 2020 ECMM/ISHAM consensus criteria (1).
**Results:** During the study period, 48 patients were diagnosed with PA and treated with ISV. The average age was 62.1 years (95% CI 58,6–65,5) and 34 (70.83%) were men. The most common personal history was high blood pressure (23, 47.9%), followed by diabetes (15, 31.2%) and obesity (11, 22.9%). They had a mean APACHE II score of 19.22 (95% CI 17,12–21,32). The reason for admission to the ICU was COVID pneumonia in 30 patients (62.5%), community pneumonia of another etiology in 6 (12.5%), abdominal sepsis origin in 4 (8.3%), polytrauma in 4 (8.3%) and other reasons in 4 (8.3%). All patients were on mechanical ventilation, 8 (16.7%) with continuous renal replacement therapy and 2 (4.2%) with ECMO therapy. The mean SOFA score at the time of ISV initiation was 7.4 (95% CI 6,6–8,2). In 27 patients (56.3%) the laboratory diagnosis of PA was made by bronchoalveolar lavage (BAL) -culture and/or PCR and/or positive galactomannan (GM)-, in 2 (4.2%) by serum GM and in the remaining cases by bronchial aspirate culture (BAS). Aspergillus species was identified in 33 (68.8%) patients: 18 (54.5%) *A. fumigatus*, 12 (36.4%) *A. terreus*, 3 (9%) *A. flavus*, 3 (9%) *A. niger* and 2 (6%) *Aspergillus sp*. In 4 (8.3%) more than one species was identified. ISV was started empirically due to suspicion of PA in 34 (70.8%) patients. During a variable amount of time, according to responsible physician criteria, 32 (66.7%) patients received another antifungal treatment associated with ISV: 16 (50%) IV and/or nebulized liposomal amphotericin B (LAB), 13 (40.6%) LAB plus echinocandin and 3 (9.4%) echinocandin. The length of treatment with ISV was 17.3 (95% CI 15,2–21) days. No side effects that would require discontinuation of the ISV were recorded. Presented clinical cure 28 (58.3%) patients.
**Conclusions:** Of the 48 critically ill patients with PA treated with ISV, this was started empirically in 70.8%. The most frequently aspergillus species isolated was *A. fumigatus* (68.8%) followed by *A. terreus* (36.4%). 32 patients (66.7%) received combined antifungal treatment at some point in course; the combination of ISV with IV and/or nebulized LAB being the most common. No side effects that would require discontinuation of ISV treatment were recorded. 28 (58.3%) patients presented clinical cure.

**Reference(s)**

1. Philipp Koehler et al. Defining and managing COVID-19-associated pulmonary aspergillosis: the 2020 ECMM/ISHAM consensus criteria for research and clinical guidance. Lancet Infect Dis 2020. Published online December 14, 2020 https://doi.org/10.1016/S1473-3099(20)30847-1

**Topic:** Sepsis

## 000811

### Neutrophil-lymphocyte ratio, serum lactate and lactate clearance in predicting mortality in patients with sepsis in the emergency department

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000811

**Introduction:** Different biomarkers are used for rapid bedside assessment of the severity of sepsis. Neutrophil to Lymphocyte ratio (NLR), serum lactate is frequently used for this purpose1. To evaluate the individual as well as combined efficacy of NLR and serum lactate clearance, measured in the emergency department (ED), in predicting 28-day mortality.
**Objectives:** To evaluate the individual as well as combined efficacy of NLR and serum lactate clearance, measured in the emergency department (ED), in predicting 28-day mortality.
**Methods:** This was a prospective observational single-center study. Conducted in the emergency department of a tertiary care centre in north India (CTRI/2018/08/015371). Adult patients between 18 to 80 years, are admitted to the emergency department with sepsis. Along with baseline demographic and hemodynamic variables, NLR, serum lactate, and lactate clearance (LC) at 6 h were collected. The primary outcome was 28-day mortality.
**Results:** Out of 50 patients, 33 survived (66%). Non-survivors had lower systolic, diastolic, mean blood pressure, lower LC, tachycardia, high SOFA score, vasopressors requirement, mechanical ventilation requirement, and high NLR. NLR ($\geq$ 11.13) was best correlated with 28-day mortality (AUROC 0.87), followed by initial lactate ($\geq$ 3.3, AUROC 0.77) and lactate clearance ($\leq$ 17.07%, AUROC 0.73). Multivariate logistic regression revealed NLR and LC were independent predictors of mortality, with weak correlation between them. However, their combination did not perform better(AUROC 0.82)than individual markers.
**Conclusions:** NLR and LC can be used with moderate certainty in predicting 28 day mortality.

**Topic:** Sepsis

## 000813

### Serum lactate at the ICU admission predicts mortality in unexpected in-hospital cardiac arrest

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000813

**Introduction:** In-hospital cardiac arrest (IHCA) is major differences from OHCA regarding not only background but also initial response. To control prompt ICU beds during ICU surges under disseminating lethal infection, it is relevant to evaluate the prognosis after IHCA immediately.
**Objectives:** To identify various biomarkers as a prognostic factor on the day of ICU admission after unexpected IHCA in the general ward.
**Methods:** This study was a retrospective single-center observation for 5 years from April 2014 to March 2019. We collected 95 adult patients who entered the ICU under sustained return of spontaneous circulation (ROSC) after IHCA in the general ward and compared various candidates as a prognostic biomarker between survivors and non-survivors at 28 days after IHCA.
**Results:** Fifty-one patients were included. Cardiovascular disease is higher in survivors (31.8% vs 9.7%, $p = 0.026$). Vasopressors use was lower in survivors (50.0% vs 83.9%, $p = 0.01$). Lactate, T-Bil, BUN, LDH, and SOFA scores were significantly lower in survivors. Platelets were significantly higher in survivors. AUC-ROC analysis for prediction of mortality demonstrated significantly by Lactate, T-Bil, BUN, Platelet, LDH, and SOFA. Cut-off values were obtained with Lactate (4.7 mmol/L), T-Bil (0.7 mg/dL), BUN (44 mg/dL), Platelet ($17.9 \times 104$ / µl), LDH (383 U/L), and SOFA score (11 points). Multivariate logistic regression analysis indicated Lactate had high correlation with mortality (OR:6.6, $p < 0.001$). Kaplan–Meier survival curve analysis demonstrated that the lower Lactate group (less than 4.7 mmol/L) had better survival ($P < 0.001$).
**Conclusions:** Lactate levels at ICU admission reflected the prognosis of unexpected IHCA patients. We established the optimal cut-off value

for a mortal prediction that contributed to make decision of the next management.

| Variable | Number (%) | 48-days neurological outcome OR (95%CI) | P-value |
|---|---|---|---|
| Age | | 1.01 (0.96 – 1.07) | 0.643 |
| Lactate | | 1.24 (1.05 – 1.46) | 0.011 * |
| Platelet | | 0.92 (0.85 – 0.99) | 0.027 * |
| SOFA | | 1.25 (1.03 - 1.52) | 0.025 * |
| Time to ROSC | | 1.10 (1.00 - 1.20) | 0.043 * |
| Lactate ≧ 4.5 (mmol/L) | 28/50 (56.0) | 4.60 (1.28 – 16.52) | 0.019 * |
| Platelet ≧ 18 x $10^4$ (/μl) | 28/51 (54.9) | 0.34 (0.89 – 3.73) | 0.096 |
| SOFA ≧ 10 | 33/51 (64.7) | 3.71 (1.07 - 12.90) | 0.019 * |
| Time to ROSC ≧ 10.0 (min) | 28/51 (54.9) | 4.22 (1.19 - 14.97) | 0.026 * |

Asterisks indicate the statistical significance at p-value ≦ 0.05 (*).

| Variable | 48-days neurological outcome OR (95%CI) | P-value |
|---|---|---|
| Age | 1.01 (0.95 – 1.07) | 0.763 |
| Lactate ≧ 4.5 (mmol/L) | 4.32 (1.04 – 17.95) | 0.044 * |
| SOFA ≧ 10 | 1.77 (0.43 – 7.22) | 0.427 |
| Time to ROSC ≧ 10.0 (min) | 3.63 (0.88 - 15.00) | 0.069 |

Asterisks indicate the statistical significance at p-value ≦ 0.05 (*) and ≦ 0.01 (**).

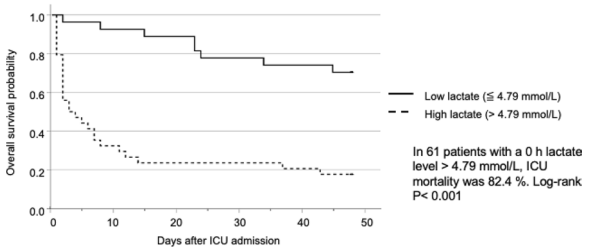


**Fig. 1 (abstract 000813)** Kaplan–Meier analysis of survival of in-hospitalized cardiac arrest patients admitted to the Intensive Care Unit

**Reference(s)**

1. Andersen LW et al., In-Hospital Cardiac Arrest A Review. JAMA. 2019;321(12):1200–1210.

**Topic:** Cardiac arrest

## 000814 Effects of adjuvant intravenous immunoglobulin (IvIg) on the outcomes in the management of adult patients with necrotising soft tissue infections (NSTI)- A systematic review and meta-analysis

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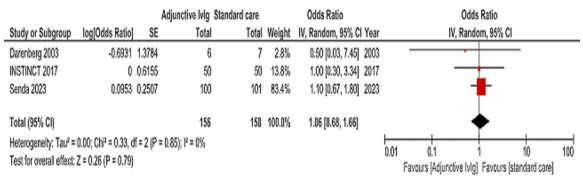
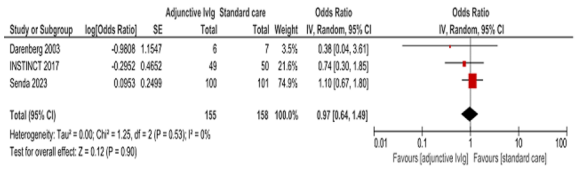
***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000814

**Introduction:** The standard care in the management of necrotising soft tissue infections (NSTI) includes broad-spectrum antibiotics, urgent surgical intervention, and supportive care. The efficacy of adjunctive intravenous immunoglobulin (IvIg) in relative to standard care in the management of these patients is not well established.
**Objectives:** We aimed to perform a systematic review and meta-analysis to evaluate the effects of adjunctive IvIg in compared with standard care in the outcomes of patients with NSTI.
**Methods:** We searched Pubmed, Cochrane and Embase databases for the randomised and non-randomised controlled trials published in the English language up to 17 January 2024 comparing adjunctive IvIg with standard care in patients with NSTI. Statistical analysis was performed using Review Manager 5.4.1. Odds ratio with a 95% confidence interval were pooled with random effects model. Heterogeneity was assessed with $I^2$ statistics. Quality assessment and risk of bias were performed according to Cochrane recommendations.
**Results:** We included a total of 655 patients from 5 studies of whom adjunctive intravenous immunoglobulin (IvIg) was used in 330 patients (50.38%). In the pooled data, there was no difference in the overall mortality (combined 28 and 30 days mortality) between the two groups. (OR:1.06; 95% CI:0.69–1.66; $p = 0.79$; $I^2 = 0$). There was also no difference in the overall mortality (combined 30 and 180 days) between the two groups (OR:0.97; 95% CI:0.64–1.49; $p = 0.90$; $I^2 = 0$). We found that the in-hospital mortality was not different when adjunctive intravenous immunoglobulin was compared with standard care in these patients.(OR:0.98; 95% CI:0.67–1.46; $I^2 = 0$).
**Conclusions:** In this meta-analysis, with 655 patients receiving atleast single dose (0.5–2.0 g/kg) of adjunctive intravenous immunoglobulin (IvIg) in patients with NSTI followed for a period up to 180 days, the overall mortality and in-hospital mortality were not different when compared with standard care.




A: There is no difference in the overall mortality (combined 28 and 30 days mortality) in patients with NSTI receiving adjunctive IvIg compared with standard care.




B: There is no difference in the overall mortality (combined 30 and 180 days mortality) in patients with NSTI receiving adjunctive IvIg compared with standard care.

**Fig. 1 (abstract 000814)** FOREST PLOT- OVERALL MORTALITY

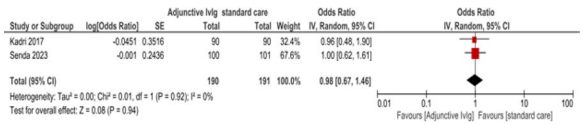



**Fig. 2 (abstract 000814)** FOREST PLOT IN-HOSPITAL MORTALITY

**Reference(s)**

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2. 2)Clinical Efficacy of polyspecific intravenous immunoglobulin therapy in patients with streptococcal toxic shock syndrome: a comparative observational study. Linner A et al.; Clin. Infect. Dis. 2014; https://doi.org/10.1093/cid/ciu449
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4. 4)Immunoglobulin G for patients with necrotising soft tissue infection (INSTINCT): a randomised blinded, placebo-controlled trial. Madsen et al.; Intensive Care Med. 2017; https://doi.org/10.1007/s00134-017-4786-0
5. 5)Effectiveness of intravenous immunoglobulin therapy for invasive group A streptococcus infection: A Japanese nationwide observational study. Senda et al.; Int.J.Infect Dis. 2023; https://doi.org/10.1016/j.ijid.2023.08.011
6. None

**Topic:** Sepsis

## 000815

### Sepsis-induced coagulopathy in critically ill patients (partial results from single-center observational study)

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000815

**Introduction:** Sepsis-induced coagulopathy (SIC) is an important complication in critically ill patients with sepsis, contributing to increased morbidity and mortality. A hallmark of SIC is profound fibrinolysis inhibition triggered by elevated levels of plasminogen activator inhibitor-1, leading to prothrombotic effects and heightened susceptibility to thrombosis and organ dysfunction.
**Objectives:** The incidence of SIC and its implications have been mainly studied in the East Asian population. We planned this prospective observational study to find out the incidence of SIC and its effect on clinical outcomes in critically ill patients admitted to the medical ICU of a tertiary care academic hospital in North India.
**Methods:** Consecutive consenting patients admitted to the ICU were screened over a period of nine months (June, 2023 to March, 2024). Patients with pre-existing coagulopathy, acute liver failure, patients on anti-haemostatic drugs, thrombotic thrombocytopenic purpura, hemolytic uremic syndrome, and idiopathic thrombocytopenic purpura were excluded. The baseline parameters were recorded along with APACHE II and daily SOFA scores. Patients were screened daily for sepsis using Sepsis-3 criteria, and a SOFA score of $\geq 2$ indicated the presence of sepsis. Screening for SIC was performed using the SIC score, with a score of 4 or higher defining SIC. All SIC patients were assessed for disseminated intravascular coagulation (DIC) using the International Society on Thrombosis and Haemostasis (ISTH) DIC score, with a score $\geq 5$ indicating DIC. The clinical outcomes were assessed in terms of days of mechanical ventilation, vasopressor use, length of stay, and ICU mortality.
**Results:** A total of 50 adult patients who developed sepsis were enrolled and their baseline characteristics were analyzed. (Fig. 1, Table 1) Amongst these, 36% (18/50) of patients were diagnosed with SIC. Patients with SIC had significantly higher requirements of vasopressor support, renal replacement therapy and mortality compared to those without SIC (Table 2).
**Conclusions:** This prospective study showed a 36% incidence of SIC with a higher requirement for vasopressor support, renal replacement therapy, and mortality in these patients.

**Table (abstract 000815)** Tables of results

| Characteristic | Overall, N=50 | SIC<4, N=32 (64%) | SIC≥4, N=18 (36%) | Difference | p-value |
|---|---|---|---|---|---|
| ICU Mortality | 13(26%) | 1 (3.13%) | 12 (66.67%) | 64% | <0.001 |
| Vasopressor support (Yes/No) | 26(52.00%) | 10 (31.25%) | 16 (88.89%) | 58% [32% - 84%] | <0.001 |
| Mechanical ventilation duration (days) | 5(2 -10) | 5 (2.00, 8.50) [4.5, 8.5] | 6 (4.00, 10.75) [5.0, 12] | 1 [-2.81, 4.81] | 0.2 |
| RRT (Yes/No) | 12(24.00%) | 1 (3.13%) [0.16%, 18%] | 11 (61.11%) [36%, 82%] | 58% [30%, 86%] | <0.001 |

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**Table (abstract 000815)** Table of baseline charecterestics

| Characteristic | Overall, N=50 | SIC<4, N=32 (64%) | SIC≥4, N=18 (36%) | Standardized Difference [95% CI] |
|---|---|---|---|---|
| **Age** Median (IQR) | 30 (22.00, 39.50) | 26 (21.00, 35.25) | 30 (26.00, 40.75) | -0.42 [-1.0, 0.16] |
| **Gender** | | | | |
| Female | 30(60%) | 19 (59.38%) | 11 (61.11%) | 0.04 [-0.54, 0.61] |
| Male | 20(40%) | 13 (40.63%) | 7 (38.89%) | |
| **APACHE II on Admission** | | | | |
| Median (IQR) | 16 (12.00, 19.00) | 14 (11.00, 16.00) | 19 (16.00, 25.75) | -1.2 [-1.8, -0.54] |
| **SOFA on admission** | | | | |
| Median (IQR) | 6.5 (5.25, 8.00) | 6 (5.00, 7.00) | 9 (7.00, 10.00) | -1.1 [-1.7, -0.45] |
| **Platelet count on admission** | | | | |
| Median (IQR) | 1.40 (1.11, 2.05) | 1.90 (1.40, 2.39) | 1.09 (1.01, 1.20) | 1.2 [0.59, 1.8] |
| **PT on admission** | | | | |
| Median (IQR) | 14 (13.25, 16.00) | 14 (14.00, 14.70) | 15.5 (12.25, 17.75) | -0.31 [-0.89, 0.27] |
| **INR on admissions** | | | | |
| Median (IQR) | 1.10 (1.08, 1.20) | 1.10 (1.07, 1.18) | 1.16 (1.09, 1.24) | -0.08 [-0.65, 0.50] |
| **SIC score on admission** | | | | |
| Median (IQR) | 3 (2.00, 3.00) | 2 (2.00, 3.00) | 3 (3.00, 4.00) | -1.5 [-2.2, -0.87] |

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2. Ren C, Li YX, Xia DM, Zhao PY, Zhu SY, Zheng LY, et al. Sepsis-Associated Coagulopathy Predicts Hospital Mortality in Critically Ill Patients With Postoperative Sepsis. Front Med. 2022;9:783,234
3. Saito S, Uchino S, Hayakawa M, Yamakawa K, Kudo D, Iizuka Y, et al. Epidemiology of disseminated intravascular coagulation in sepsis and validation of scoring systems. J Crit Care. 2019 Apr;50:23–30.
4. Not available

**Topic:** Transfusion and haemostasis disorders

## 000818

### Exploring the role and mechanisms of acute thymic atrophy in the immune dysfunction of sepsis

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**Introduction:** Immune dysfunction is a critical factor in the onset and progression of sepsis, significantly influencing patient outcomes. The thymus, responsible for T cell maturation, plays a crucial role in the immune response. Recently, a clinical study shed light on the significant role of the thymus in adult disease.Acute atrophy of thymus was was evident following cecum ligation and puncture (CLP) in animal experiments. Furthermore, thymic atrophy was also observed in the peripheral blood of septic patients, suggesting that this phenomenon may occur in individuals with sepsis as well. These findings underscore the importance of understanding the impact of thymic atrophy in adult disease and its potential implications for patient care. However, the link between acute thymic atrophy and immune dysfunction in sepsis, as well as the underlying mechanisms, remains poorly understood. This area of research warrants further investigation to enhance our understanding of sepsis pathophysiology and potential therapeutic interventions.

**Objectives:** This study aimed to investigate the impact and underlying mechanisms of acute thymic atrophy on immune dysfunction in sepsis.
**Methods:** In this study, C57/B6 mice were subjected to cecal ligation and puncture (CLP) to induce sepsis. The thymus was then examined for changes in appearance and weight at various time points post-CLP. Additionally, the ratios of thymic and peripheral T cell subpopulations, as well as the absolute numbers of T cells, were analyzed to understand the impact of acute thymic atrophy on the immune system in sepsis.Rag-GFP mice were subjected to cecal ligation and puncture (CLP) to induce thymic output, with the GFP fluorescence signal serving as a visual indicator at various time intervals. Thymectomy was conducted in C57/B6 mice to mimic the decrease in thymic output. Subsequently, two weeks later, cecal ligation and puncture (CLP) was performed to investigate the impact of thymectomy on the ratio and quantity of peripheral T cell subpopulations as well as their function post-CLP. We conducted sequencing of the transcriptome and proteome of crucial cell subpopulations believed to be involved in acute thymic atrophy. This approach aimed to identify specific molecular targets that may play a significant role in the development of thymic atrophy.
**Results:** CLP resulted in acute thymic atrophy with reduced thymic output, reduced peripheral T cell numbers, reduced naive T cell ratio, reduced TCR-stimulated proliferative function, and led to increased mortality after secondary infections($p < 0.05$). Thymectomy similarly resulted in reduced peripheral T-cell numbers, reduced Naive T-cell ratios, and reduced TCR-stimulated proliferative function, but thymectomy followed by CLP resulted in an observed attenuation of acute phase mortality compared with sham followed by CLP ($p < 0.05$). Transcriptome sequencing was conducted by isolating and sorting the subpopulation of CD4 + CD8 + double positive (DP) cells that exhibited the most notable changes during acute thymic atrophy. This analysis revealed differential gene pathways that were enriched for cellular pyroptosis. The identification of active-caspase1 has uncovered a significant occurrence of pyroptosis in TCRb- T lymphocytes during the initial phases of sepsis, involving in the development of multiple organ dysfunction syndrome in the acute stage of sepsis.
**Conclusions:** Acute thymic atrophy in the acute phase of sepsis is mainly caused by the pyroptosis of a large number of thymic immature T cells, which aggravates the multiple organ dysfunction syndrome of sepsis. Even worse, thymic atrophy leads to a decrease in the production of T cells by the thymus, further contributing to the long-term immune suppression in sepsis.

**Topic:** Sepsis

### 000820 Influence of fluid balance on the prognosis of critically ill patients with nutritional support

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**Introduction:** Fluid balance is a fundamental parameter in the management of critically ill patients that has been broadly investigated amongst patients with different characteristics. Nevertheless, there is sparse scientific evidence regarding its prognostic value in critically ill patients with nutritional support. The objective of this study is to analyze the influence that fluid balance in the first week of ICU admission has in terms of mortality, length of ICU stay and length of total hospital stay in critically ill patients with nutritional support.
**Methods:** This was an observational longitudinal retrospective unicentric study that took place in the ICU of a tertiary care hospital between September 2022 and February 2023. Patients aged ≥ 18 years with a hospitalization period ≥ 7 days, who received nutritional support for ≥ 2 days were included. The main outcome was survival, followed by length of ICU stay and total hospital stay.
**Results:** Data from 97 patients was analyzed, with 59.80% of them being males and an average age of 60.60 years. Mortality amongst the sample was 43.30% A significant difference in fluid balance on days 4–7 was found between survivors and non-survivors ($p < 0.05$). On the other hand, the fluid balance of days 1–3 showed no significant differences. After performing a multivariate analysis using the Cox regression model, fluid balance on days 4–7 was not confirmed to have a positive or negative effect on survival in relation to length of ICU stay or total hospital stay (OR = 1).
**Conclusions:** The results suggest an association between fluid balance in days 4–7 and mortality in the critically ill patient with nutritional support. However, this cannot be verified, as this association was not confirmed in the multivariate analysis. Further prospective studies with larger sample sizes are needed to obtain more representative and reliable results.

**Topic:** Metabolism, endocrinology, liver failure and nutrition

### 000821 Diagnostic Accuracy of the Geneva Clinical Scale for Diagnostic Prediction of Pulmonary Embolism in Adults Aged 18 and Older Admitted Between 2009 and 2020 with Suspected Pulmonary Embolism at a Third-Level Institution in Colombia: a retrospective cohort

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000821

**Introduction:** Venous embolism stands as the third most frequent cause of cardiovascular-related deaths, a phenomenon gaining increasing significance in aging populations (1). Standardized clinical decision rules (CDRs) have been formulated to establish this pre-test probability. These instruments incorporate variables extracted from medical history, physical examinations, and diagnostic tests to quantify the probability of a clinical diagnosis, prognosis, or response to treatment in each individual patient (2). For diagnosing pulmonary embolism, noteworthy CDRs include the Wells and Geneva scales, both of which have been simplified from their original versions and validated in diverse populations (3,4,5). The original Geneva scale, developed in 2006 through logistic regression analysis (2), is a CDR based on objective clinical elements, encompassing 8 independent variables with different weights contributing to the final result (4,6). To address potential calculation errors, a simplified version was derived, assigning equal weight to different variables. The exception is a double weighting for a heart rate exceeding 95 beats per minute. This simplified scale has been validated, demonstrating the possibility of simplifying the original scale without compromising diagnostic acuity (2,5). Both scales classify clinical probability based on the score into mild, moderate, and severe categories, or probable and improbable cases of thromboembolism.
**Objectives:** Evaluate the general applicability of the Geneva scale for diagnosing PE in adults aged 18 and older admitted with suspected PE to a Third-Level Institution in Colombia. Secondary objectives included characterizing the population with suspected PE based on clinical probability, risk factors, and established diagnostic criteria, as well as determining diagnostic performance applied to a Third-Level Institution.
**Methods:** A retrospective cohort study with diagnostic test analysis was conducted on patients in the emergency department or hospitalized between 2009 and 2020 with suspected pulmonary embolism at a Third-Level Institution in Colombia. The original and simplified Geneva

scores were applied to 1237 subjects aged 18 and older with suspected pulmonary embolism and compared with confirmatory results from pulmonary angiography. All necessary variables for constructing the original and simplified Geneva rules were recorded, and calculations for sensitivity, specificity, likelihood ratios 50 (LR), and Receiver Operating Characteristic Curves (ROC) curves were performed.

**Results:** From the sample collected between 2009 and 2020, information from 2098 patients was gathered. Among these, 1237 met the inclusion criteria, constituting 58% of the collected sample (Figure 1). The mean age was 60.49 with an SD of 19.38, and a majority of patients were female (52.8%). Exclusions comprised 860 patients, representing 42% of the initial sample. Among them, 18 were pregnant, 9 were under 18 years old, and 830 lacked suspicion or clinical signs of PE upon admission or during hospitalization. Out of the excluded, 488 patients (39%) were confirmed with a PE diagnosis by CTPA.

The Geneva original score exhibited a sensitivity, specificity, Positive Likelihood Ratio (LR+), Negative Likelihood Ratio (LR-), and Area Under the Curve (AUC) of 60%, 54%, 1.3, 0.728, and 0.506, respectively. The simplified Geneva score showed 59%, 57%, 1.4, 0.7, and 0.546 for sensitivity, specificity, LR+, LR-, and AUC, respectively.

**Conclusions:** The use of the original or simplified Geneva score in our population may not be useful for a diagnostic approach to pulmonary embolism. Both scales demonstrate almost negligible discriminatory capacity, necessitating the evaluation of other standardized clinical decision rules to assess the diagnosis and pretest probability of pulmonary thromboembolism.

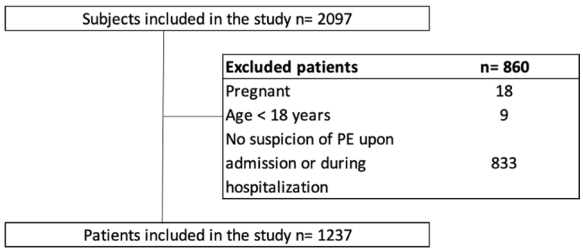


**Fig. 1 (abstract 000821)** Flowchart of the admission of subjects to the study

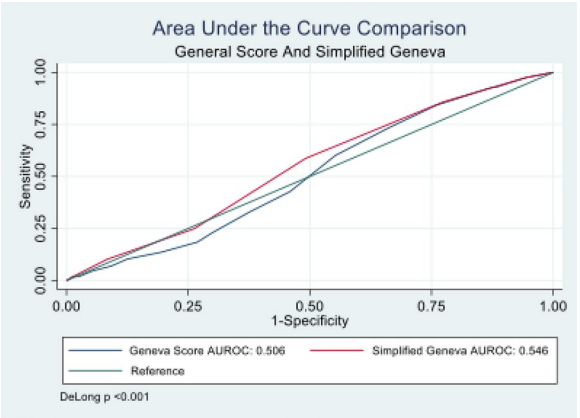


**Fig. 2 (abstract 000821)** Area Under the Curve Comparison

**Table 1 (abstract 000821)** Clinical and Demographic Characteristics of 1237 patients included

| Variable | All Patients (n) 1237 | Percentage (%) | Diagnosis of PE by CTPA (n) 488 | Percentage (%) | PE excluded by CTPA (n) 749 | Percentage (%) |
|---|---|---|---|---|---|---|
| Age (SD) | 60,49 | 19,38 | 61,48 | 19,54 | 59,84 | 19,26 |
| Female n (%) | 653 | 52,8% | 253 | 51,8% | 400 | 53,4% |
| Age > 65 years n (%) | 614 | 49,6% | 263 | 53,9% | 351 | 46,9% |
| History of PE/DVT n (%) | 189 | 15,3% | 79 | 16,2% | 110 | 14,7% |
| Surgery or fracture in the last month | 275 | 22,2% | 113 | 23,2% | 162 | 21,6% |
| Malignancy n (%) | 123 | 9,9% | 54 | 11,1% | 69 | 9,2% |
| Unilateral leg pain n (%) | 182 | 14,7% | 80 | 16,4% | 102 | 13,6% |
| Hemoptysis n (%) | 71 | 5,7% | 37 | 7,6% | 34 | 4,5% |
| Heart rate 75 - 94 bpm n (%) | 480 | 38,8% | 195 | 40,0% | 285 | 38,1% |
| Heart rate >= 95 bpm n (%) | 527 | 42,6% | 230 | 47,1% | 297 | 39,7% |
| Edema or tenderness n (%) | 186 | 15,0% | 81 | 16,6% | 105 | 14,0% |

EP: Pulmonary Embolism. CTPA: Computed Tomography Pulmonay Angiographic. D:Standard Deviation. DVT: Deep Vein Thrombosis. BPM: Beats Per Minute.

**Table 2 (abstract 000821)** Epidemiological Measures of Geneva Score Variables

| Variable | S[1] (%) | E[2] (%) | RR[3] | VPP[4] (%) | VPN[5] (%) | LR+[6] | LR-[7] | Prevalence | *p* |
|---|---|---|---|---|---|---|---|---|---|
| Age > 65 years | 54% | 53% | 1,186 | 43% | 64% | 1,15 | 0,8677 | 43% | 0,005 |
| History of PE /DVT | 16% | 85% | 1,071 | 42% | 61% | 1,102 | 0,9824 | 42% | 0,4336 |
| Surgery or fracture in the last month | 23% | 78% | 1,054 | 41% | 61% | 1,071 | 0,9805 | 41% | 0,4732 |
| Malignancy | 11% | 91% | 1,127 | 44% | 61% | 1,201 | 0,9796 | 44% | 0,2609 |
| Unilateral leg pain | 16% | 86% | 1,137 | 44% | 61% | 1,204 | 0,9679 | 44% | 0,1433 |
| Hemoptysis | 8% | 95% | 1,347 | 52% | 61% | 1,67 | 0,9681 | 52% | 0,0201 |
| Heart rate 75 - 94 bpm | 40% | 62% | 1,05 | 41% | 61% | 1,05 | 0,9692 | 41% | 0,3869 |
| Heart rate >= 95 bpm | 47% | 60% | 1,201 | 44% | 64% | 1,189 | 0,8761 | 44% | 0,0005 |
| Edema or tenderness | 17% | 86% | 1,125 | 44% | 61% | 1,184 | 0,97 | 44% | 0,1769 |

S: Sensitivity . E: Specificity. RR: Relative Risk. VPP: Positive Predictive Value. VPN: Negative Predictive Value. LR+: Positive Likelihood Ratio. LR-: Negative Likelihood Ratio. PE: Pulmonary Embolism. DVT: Deep Vein Thrombosis. BPM: Beats Per Minute.

**Table 4 (abstract 000821)** Dichotomous Results of Geneva Original and Simplified Score

| Variable | S (%) | E (%) | RR | VPP | VPN | LR+ | LR- | P |
|---|---|---|---|---|---|---|---|---|
| Original | 60 | 54 | 1,44 | 0,463 | 0,678 | 1,324 | 0,728 | <0,001 |
| Simplified | 59 | 57 | 1,48 | 0,473 | 0,682 | 1,377 | 0,717 | <0,001 |

S: Sensitivity. E: Specificity. RR: Relative risk. VPP: Positive predictive value. VPN: Negative predictive value. LR+: Positive likelihood ratio. LR-: Negative likelihood ratio.

**Table 5 (abstract 000821)** Area Under the Curve Comparisone

| Escala | AUC | CI-95% |
|---|---|---|
| Geneva Original | 0.506 | 0,479-0,533 |
| Geneva Simplified | 0.546 | 0,519-0,573 |

AUC:Area Under the Curve. CI: Confidence Interval.

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**Topic:** Cardiovascular issues in ICU

## 000822

### Relatives' perceptions of their involvement in decision-making for patients in ICU: a pilot study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000822

**Introduction:** This pilot study examines the current practice of the involvement of patients' relatives in the context of ICU decision-making. Against the legal and professional backdrop of placing the patient and their subjective values, beliefs, and wishes at the heart of all treatment decisions, we explore the extent to which relatives believed they were involved in the decision-making and how they perceived their actual and desired role. We are increasingly aware that relatives are also susceptible to suffering from post-intensive care syndrome so understanding their involvement in the decision-making process for their loved one is an important aspect of care. We set out briefly the current legal framework that applies to decision-making and the role of relatives, before presenting our findings and analysis. The work is ongoing with the next stage starting in 2024/2025 looking at the role of relatives across the UK in a number of sites, funded by a grant from the MPS Foundation. It is anticipated that the project will be replicated across the member states of the ESICM in due course.
**Methods:** This was a pilot study to identify areas of decision-making practice which would benefit from greater scrutiny to improve both patient and relative experience and to ensure that HCPs have a consistent approach to the implementation of shared decision-making which respects the fundamental need to place the parent at the heart of their treatment: 'no decision about me, without me'. The study adopted a phenomenological approach to increase insight into individual experiences of the patients' relatives in the decision-making process including their own perception of their role. Coupled with a grounded theory approach, the study enabled us to examine how the existing framework is both applied and perceived in practice.
The study used anonymous questionnaires administered to relatives of patients admitted to one of the intensive care units within the hospital.
**Results:** What is apparent from our small-scale pilot study is that the necessary engagement with relatives about the patient's wishes (i) does not always happen; and (ii) when it does, the perception of many relatives is that the purpose is simply to be told of the decision that the HCP has taken. Nearly 87% of respondents (52/60) thought that part of their role was to listen and be told of the clinical treatment decision and out of this group nearly 50% (24/52) thought this was their only role. Only 4/52 (8%) thought they should also convey what they knew the patient wanted. Across all of the respondents, 25/57 (44%) said they knew the Patient's opinion, but only 9/57 (16%) said they had conveyed this to the clinical team.
Interestingly, overall respondents indicated that they thought their role *should* be to say what *they* think is best for the patient (25/57; 44%). However, out of these 25 respondents, only 9 thought that should be their sole role.
**Conclusions:** Notwithstanding the limits of this small study, some interesting observations can be made which support further research through a larger representative study. Most notably, whilst decision-making requires greater engagement with the patient's own values, beliefs and opinions, it appears that in practice, HCPs are not routinely able to identify these, at least where the patient cannot communicate. This suggests that further training may be helpful for HCPs to clarify their role and to assist them in explaining to relatives what part they can legally play in the decision-making process.
It seems that the belief that 'doctor knows best' is deeply entrenched, as illustrated by the proportion of our respondents who thought their role was to listen and be told what treatment decisions had been taken. This has not really changed as Epstein found in 2011 that 'family members' contributions to decision-making are frequently ignored in clinical consultations and in research on decision-making'. The feeling of disempowerment is one factor that may lead to family members developing Post Intensive Care Syndrome – Family (PICS-F).

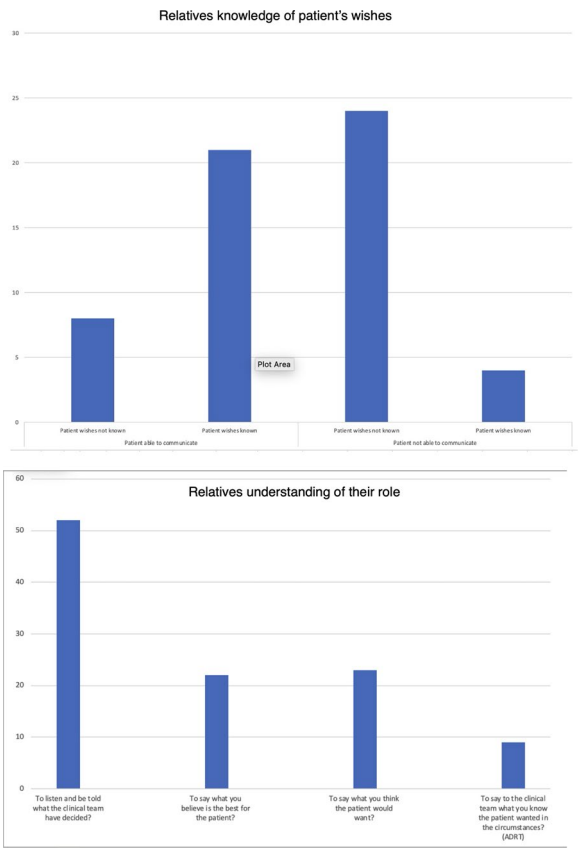


**Fig. (abstract 000822)** Relatives understanding of their role in ICU

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**Topic:** Ethics and end-of-life care

## 000823

### Analysis of the clinical and evolutionary characteristics of in-hospital cardiorespiratory arrest in a tertiary care center

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000823

**Introduction:** In-hospital cardiac arrest (IHCA) is a potentially fatal emergency that demands immediate and coordinated action to maximize patient survival. Successful outcomes for IHCA rely on a proficient resuscitation team, immediate initiation of effective cardiopulmonary resuscitation and defibrillation, and organizational frameworks to facilitate IHCA response (1).
**Objectives:** The main objective of the study is to describe the clinical and evolutionary characteristics of patients attended by the IHCA team at our center. As a secondary objective, we aim to retrospectively identify abnormalities in vital signs or the appearance of potentially alarming symptoms in the hours preceding cardiac arrest (CA).
**Methods:** This is a descriptive retrospective study that includes all patients assessed by the in-hospital cardiac arrest team over a period of 3 years. For each patient, demographic and clinical variables (admission department, cause of CA), information related to CA management (initial electrocardiographic (EKG) rhythm, therapeutic interventions), evolutionary data (return of spontaneous circulation, hospital discharge), and abnormalities in vital signs or mention of potentially alarming symptoms in the nursing records preceding CA were collected. Statistical analysis was conducted using R 4.1.2 for Windows.
**Results:** 93 patients were included. The median age was 73 years (IQR 59–81). 73% of the patients were male. The causes of cardiac arrest, initial rhythm, evolution, and reasons for non-initiation/interruption of maneuvers are detailed in Table 1. In 31 patients (33%), abnormalities in vital signs or the appearance of potentially alarming symptoms were identified and, of those, the most frequent were: low oxygen saturation (16%), arterial hypotension (10%), increased work of breathing (7%), and oliguria (5%).

**Table 1 (abstract 000823)** Causes of CA, initial rhythm, evolution, and reasons for non-initiation/interruption of maneuvers

| Service where IHCA occurs: | Percentage |
|---|---|
| Medical Service | 74 |
| Surgical/Medical-Surgical Service | 26 |
| Cause of CA: | |
| Unknown | 35 |
| Respiratory Insufficiency | 23 |
| Procedure-related | 10 |
| Hemorrhage | 5 |
| Others | 27 |
| Initial EKG rhythm (only in confirmed CA): | |
| Asystole | 80 |
| Pulseless Electrical Activity | 13 |
| Ventricular Fibrillation | 5 |
| Ventricular Tachycardia | 2 |
| Outcome: | |
| False CA | 24 |
| Does not regain spontaneous circulation | 51 |
| Dies in ICU | 5 |
| Survives hospital discharge | 20 |
| Reasons for not initiating/terminating CPR: | |
| False CA | 62 |
| Poor prognosis/Futility | 35 |
| Do Not Resuscitate order | 3 |

**Conclusions:** In our registry, survival following an episode of IHCA is globally low. The most frequently identifiable causes of IHCA are respiratory failure and procedure-related. In a significant proportion of patients, abnormalities in vital signs or the appearance of potentially alarming symptoms are identified in the hours preceding IHCA.

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**Topic:** Cardiac arrest

## 000824

### Suprasternal aortic velocity peak variability and internal jugular vein collapsibility to predict fluid-responsiveness in healthy volunteers: a pilot prospective study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000824

**Introduction:** Assessment of fluid-responsiveness (FR) is crucial in cardiac surgery patients. Assessment of Inferior Vena Cava collapsibility (IVCc) and Aortic Valve Velocity Peak variability (AV-Vpeak) are commonly utilized for FR. However, several obstacles preclude their use in cardiac surgery patients (chest drains, poor acoustic windows). Appealing alternatives might be the variability of Ascending/

Descending Aortic Velocity Peak (Aorta-Vpeak) from the suprasternal window, or Internal Jugular Vein collapsibility (IJVc).
**Objectives:** To determine the feasibility of alternative methods for FR assessment.
**Methods:** Prospective observational single-centre study on 56 healthy volunteers (Ethical Approval obtained). We evaluated the feasibility of Aorta-Vpeak variability [(Velocitymax-Velocitymin)/Velocitymean] and of IJVc [(Diametermax-Diametermin)/Diametermax], and their ability in predicting FR. These were compared with other parameters: AV-Vpeak variability and the IVCc (both subcostal and transhepatic window, both M-mode and with automated border detection software). FR was determined according to changes in cardiac output (CO) between baseline and its highest value within two minutes after passive leg raising. A cut-off of 10% increase was used to define FR. CO was obtained with non-invasive continuous monitoring. We analysed the Area Under the Receiver Operating Characteristic Curve (AUC-ROC); the correlation between variables was analysed with Pearson r coefficient.
**Results:** Feasibility of suprasternal Aorta-Vpeak and IJVc were 96.4% and 94.6%, respectively. The highest value of AUC-ROC was observed for AV-Vpeak (0.83; cut-off 10%, sensibility 88%, specificity 64%), whilst the performance of other methods was suboptimal (Table 1). Suprasternal Aortic-Vpeak showed significant correlation with AV-Vpeak ($p = 0.003$; moderate degree $r = 0.40$). Conversely, IJVc had no correlation with all the IVCc measurements (subcostal or transhepatic, M-mode or automated border detection).
**Conclusions:** Despite limited FR predictivity, in healthy volunteers we found excellent feasibility for Suprasternal Aorta-Vpeak variability and IJVc, warranting further investigations in cardiac patients. The significant correlation of Aorta-Vpeak with the AV-Vpeak variability is physiologically sounded and seems worth of investigation in patients.

| Method | AUC value |
|---|---|
| AV-V peak (5-chamber view) | 0.83 |
| Suprasternal Aortic-V peak | 0.50 |
| IJVc M-Mode | 0.46 |
| IVCc subcostal in M-mode | 0.56 |
| IVCc subcostal in automated border detection | 0.62 |
| IVCc transhepatic in M-Mode | 0.54 |
| IVCc transhepatic in automated border detection | 0.67 |

**Fig. (abstract 000824)** Area Under the Curve (AUC) of different methods for prediction of fluid responsiveness in healthy volunteers. AV-V:Aortic valve velocity; IVC: inferior vena cava collapsibility; IJV: Internal jugular vein collapsibility

**Topic:** Cardiovascular issues in ICU

## 000825

### Effects of a combined exercise and high protein nutrition intervention on change in myofiber cross-sectional area and contractility, quadriceps muscle layer thickness and fat free mass in critically ill patients

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000825

**Introduction:** Nutrition and exercise may mediate preservation of muscle mass and function, but studies on the effectiveness of a combined intervention in critically ill patients are lacking. Hence, we studied the effect of a combined exercise and high protein nutrition intervention on muscle mass and function in critically ill patients.
**Methods:** We performed a randomized controlled trial (RCT) in adult critically ill patients. All patients received standardized exercise and 1.5 (intervention) or 1.0 (control) g/kg/day protein. The primary outcome was a change between day 1–3 (T1) and day 8–10 (T2) in contractility of single myofibers (maximum force, normalized force, and calcium sensitivity of both slow-twitch fibers and fast-twitch fibers). Secondary outcomes were myofiber cross-sectional area (CSA) and proportion of fast-twitch fibers from cryosections, bio-electrical impedance derived fat free mass (FFM), ultrasound-derived quadriceps muscle layer thickness (QMLT) and diaphragm thickness. Differences between groups were tested by using Mann–Whitney U tests. Correlations for both separate measurements and change over time between in vitro and bedside measurements were studied by Pearson's Rho correlation coefficient.
**Results:** In total, 10 patients had two muscle biopsies taken. Protein provision was not significantly different between groups (intervention 1.1[1.7] vs control 0.9[0.1] g/kg). Myofiber contractility did not significantly change in the total group, and changes were not significantly different between study groups (Fig 1). Myofiber CSA did not significantly change over time in the total group (-737 ± 1254 um2). FFM and QMLT did not significantly change over time, nor were there significant differences between groups. We found strong and significant correlations for separate measurements for myofiber CSA and FFMI ($r = 0.68$, $p = 0.010$, Fig 2-A) and maximum force of the fast-twitch fibers and QMLT ($r = 0.72$, $p = 0.029$, Fig 2-B). Regarding change over time, we found strong and significant correlations for slow-twitch fibers and FFM ($r = 0.97$, $p = 0.002$, Fig 2-C) and maximum force of fast-twitch fibers and QMLT ($r = 0.96$, $r = 0.039$, Fig 2-D).
**Conclusions:** To our best knowledge, this RCT is the first to study the effect of a combined exercise and high protein nutrition intervention on changes in myofiber CSA and contractility in critically ill patients. We found a mean decrease of approximately 17% of myofiber CSA. Albeit, we found no significant change in contractility parameters or bedside measurements over time for the total group nor differences between study groups. Changes in contractile parameters over time were widely spread, possibly reflecting the heterogeneous patient population. We did find strong correlations between contractility parameters and both FFMI and QMLT, and myofiber CSA and FFMI. Bedside measurements such as FFM and QMLT may provide valuable information on muscle function, but further research is needed.

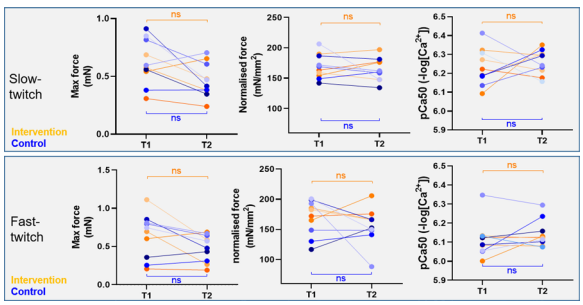


**Fig. 1 (abstract 000825)** Contractility of single myofibers between T1 and T2 (each line represents an individual patient)

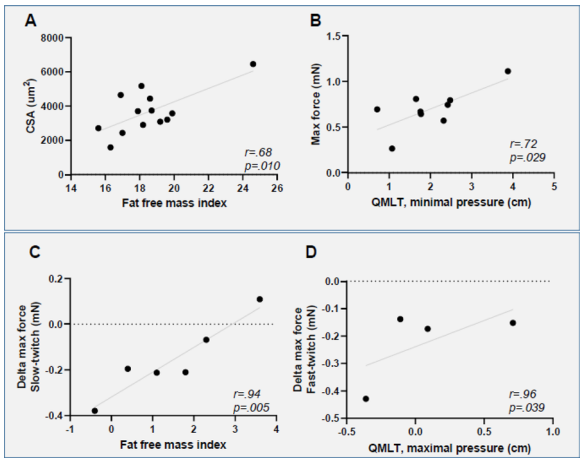


**Fig. 2 (abstract 000825)** Scatter plots for significantly correlated contractility and bedside measurements

**Reference(s)**

1. This work was supported by an unrestricted grant from Nestlé.

**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000826

### A prospective observational study of neutrophil lymphocyte count ratio, red cell distribution width, procalcitonin, c reactive protein in diagnosis and prognosis of sepsis in multidisciplinary medical ICU patients

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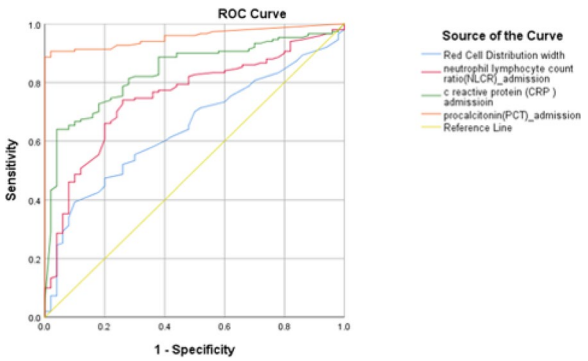
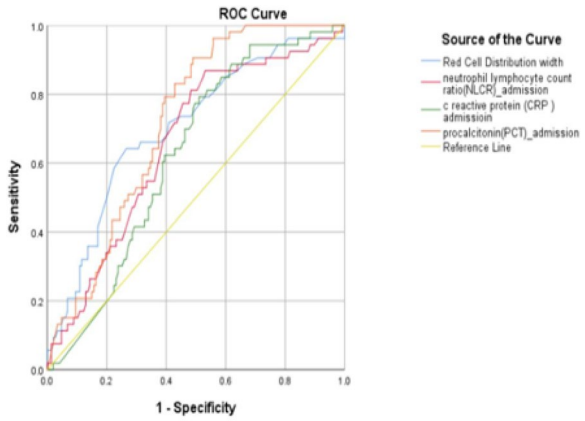
**Introduction:** Sepsis is still a common cause of morbidity and mortality worldwide. Delay in treatment of patients with sepsis and septic shock increases mortality. The blood biomarkers may provide faster information for the assessment of the microbial etiology of infection. In our study we compared 4 biomarkers, neutrophil–lymphocyte count ratio [NLCR], red cell distribution width [RDW], procalcitonin [PCT], c reactive protein [CRP]) for their diagnostic and prognostic ability in sepsis/septic shock.
**Objectives:** Comparison of biomarkers (neutrophil–lymphocyte count ratio, red cell distribution width, procalcitonin, c reactive protein) in diagnosis and prognosis of sepsis/septic shock.
**Primary Objective** Comparative efficiency of neutrophil–lymphocyte count ratio (NLCR), Red cell distribution width (RDW), which are a part of complete blood count with the traditional biomarkers, procalcitonin (PCT) and C reactive protein (CRP) for their diagnostic and prognostic ability in sepsis and septic shock.
**Secondary Objective** Association of RDW, NLCR, CRP, PCT with 28 days morbidity and mortality in patients with sepsis and septic shock.
**Methods:** After review of the Institutional Ethical Board, our study was conducted over a period of 1 year. It was a prospective observational study where data was collected from patient admitted to Intensive Care Unit with sepsis and septic shock and meeting the inclusion criteria. Patients were managed according to the Surviving Sepsis Campaign. On admission, along with patient's demographic characteristics, baseline vital parameters (heart rate, blood pressure, oxygen saturation, temperature, respiratory rate) and baseline laboratory investigations were noted. The RDW, NLCR, CRP, and PCT values were followed up over a period of 28 days or till discharge/death of the patient. Also, the duration of ICU stay, requirement of dialysis, mechanical ventilation, and vasopressors were noted, along with the 28 days ICU outcome.
**Results:** A total no of 200 patients were included in the study, of whom 150 patients had sepsis and septic shock and 50 patients had non septic conditions. Out of a total of 150 sepsis/septic shock patients 97 (65%) survived and 53(35%) patients died.PCT had the highest diagnostic AUROC when compared with other biomarkers (AUC of 0.956, sensitivity of 90% and specificity of 98%). Also, PCT had the highest prognostic AUROC amongst other biomarkers in our study (AUC of PCT for prognosis over 28 days period was 0.720).
The baseline mean RDW was 15.994 ± 2.34 in survivors and 17.423 ± 3.11 in non-survivors (p **0.04**). The baseline mean values of other biomarkers were not significant between survivors and non-survivors. The median survival time in patients with elevated RDW was 21.3 days compared to 26.5 days in patients with normal RDW (p **0.011**).
**Conclusions:** Rapid identification and early institution of therapy for sepsis and septic shock has a major impact on the clinical course, management, and outcome of critically ill intensive care patients.
We performed the present study to compare the diagnostic and prognostic efficiency of NLCR, RDW, PCT, and CRP in sepsis and septic shock.
Procalcitonin showed better diagnostic and prognostic performance when compared with other biomarkers of sepsis i.e. C reactive protein, Red cell distribution width, and Neutrophil Lymphocyte count ratio. Procalcitonin had an even better diagnostic efficiency in bloodstream infections when compared with other biomarkers.
However, Red cell distribution width at admission and increase in RDW level was associated with a reduced median survival time over 28-day period in the ICU and hence may be used as a prognostic tool in sepsis/septic shock patients.




**Graph 1 (abstract 000826)** Shows AUC-ROC diagnostic curve of different biomarkers




**Graph 2 (abstract 000826)** Shows AUC-ROC prognostic curve of different biomarkers

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**Topic:** Sepsis

## 000827

### Impact of night-time room entries on sleep in ICU: a polysomnographic observational study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000827

**Introduction:** Sleep in intensive care unit (ICU) patients is very frequently disturbed. These sleep disruptions are associated with prolonged duration of weaning from a ventilator and with higher mortality. Noise and light levels are often reported by patients as sleep-disrupting factors. Room entries by healthcare providers during night-time might also disrupt sleep. The aim of this study was to quantify their impact on sleep.
**Methods:** This is an observational monocentric prospective study involving conscious adults admitted to ICU, not receiving sedatives. Patients with brain diseases or treated with neurological drugs were

not included. After participants' informed consent, sleep was recorded from 7 pm to 8 am using a mini-polysomnograph. Sleep was scored manually by an expert sleep specialist. An entry-exit counter (infrared beam) positioned at the doorstep of the patient's room recorded the number, the hour, and the direction of the passage (in or out).
**Results:** Among 45 included patients, 27 were analyzed. Median [25th – 75th] age was 65 years [59–69]. The main reason for ICU admission was acute respiratory failure (70%). Among the 27 patients, 19 were receiving non-invasive oxygenation support, 4 were intubated, and 4 were spontaneously breathing with ambient air.
The median duration of sleep recording was 675 min [641–699]. Median sleep time was 180 min [108–214] and 3 patients (11%) displayed atypical sleep. The median number of room entries during sleep recording was 29 [22 -36] and 21% [14–36] occurred while patients were sleeping.
Considering the 27 recordings and all entries, median sleep time in the 10 min *after* room entry was significantly lower than sleep time during the 10 min *before* (0.0 min [0.0–1.8]) vs. 2.3 [1.0- 4.0], respectively, $p = 0.001$).
**Conclusions:** Our study confirms that sleep duration is short in ICUs. Room entries by healthcare providers during nighttime may be an important sleep-disrupting factor. Real-time sleep monitoring of ICU patients could be of interest to reduce room entries while patients are sleeping. Such monitoring could be of help to combat sleep disruptions and their consequences and, more generally, to improve sleep in ICUs.

**Reference(s)**
1. We wish to thank all the nurses of the Medecine intensive et reanimation unit for their participation

**Topic:** Acute respiratory failure and mechanical ventilation

## 000828

### Impact of inhaled sedation on delirium incidence and neurological outcome after a cardiac arrest – a propensity-matched control study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000828

**Introduction:** In 2016, the local sedation protocol for post-cardiac arrest (CA) patients in Brest, France treated with targeted temperature management (TTM) was changed from iv midazolam to inhaled isoflurane. The pharmacokinetic profile of isoflurane may potentially facilitate a rapid wake-up and better short-term cognitive function, facilitating earlier extubation and ICU discharge.
**Objectives:** We aimed to explore the impact of introducing inhaled sedation in our ICU as first-line therapy for post-CA survivors with a focus on delirium incidence and neurological outcome at ICU discharge.
**Methods:** Among 510 post-CA patients admitted to our ICU during the study period, 87 midazolam-sedated patients and 87 patients receiving isoflurane via the Sedaconda ACD were analyzed after propensity matching based on age, time to return of spontaneous circulation, gender and first rhythm. Opioid analgesia was provided in both groups. TTM at 33 °C was maintained for 24 h, followed by slow rewarming at 0.25 °C/h. Neurologic assessment included daily CAM-ICU assessments for delirium and Cerebral Performance Category (CPC) scoring at ICU discharge, where a value $\geq 3$ was considered a good neurological outcome.
**Results:** Isoflurane patients had lower delirium incidence than midazolam patients (16.1% vs 32.2%; $P = 0.03$), while there was no significant difference in CPC scores at ICU discharge. Mortality did not differ between groups. Isoflurane patients had lower cumulative sufentanil dose ($956 \pm 1418$ vs $1433 \pm 1148$ ug, $P < 0.001$), shorter ventilation duration ($78 \pm 99$ vs $167 \pm 155$ h, $P = 0.01$), shorter ICU length of stay ($7.9 \pm 6.4$ vs $8.5 \pm 9.4$ days, $P = 0.01$) and needed renal replacement therapy less frequently (17.8% vs 37.9%, $P = 0.03$).
**Conclusions:** Isoflurane sedation during TTM after CA was associated with a reduction in delirium incidence, ventilator duration and ICU length of stay. Neurological outcomes at ICU discharge and mortality did not differ between groups.

**Topic:** Cardiac arrest

## 000830

### Mortality after cardiac arrest during the first year of the COVID-19 pandemic in the United States

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000830

**Introduction:** Cardiac arrest (CA) in patients with COVID-19 is associated with poor survival. Early reports of outcomes of COVID-19 patients who suffered in-hospital cardiac arrest (IHCA) or out-of-hospital cardiac arrest (OHCA) suggested mortality rates of 97–100%. However, large-scale studies examining the impact of COVID-19 on outcomes after CA are limited.
**Objectives:** To compare mortality rates and risk factors for mortality after CA in patients with and without COVID-19 in the first year of the pandemic (2020) and in the year preceding the pandemic (2019).
**Methods:** We performed a retrospective cohort analysis of hospitalized adult patients with CA (both IHCA and OHCA) using the 2019–2020 Nationwide Inpatient Sample (NIS), a large national database in the United States. We stratified patients based on the presence or absence of COVID-19 infection at the time of CA. We performed multivariable logistic regression analyses using patient demographics (age, sex, race, home income quartile, insurance coverage, do-not-resuscitate order), the 31 Elixhauser comorbidities, and hospital demographics (size, teaching status, rural hospital) as covariables.
**Results:** We identified 129,737 patients who had a CA during the study period. In 2020, 70,806 patients had a CA, of which 11,134 (15.7%) had COVID-19 infection. The unadjusted post-CA mortality in patients with COVID-19 was higher (88.2%) compared to patients without COVID-19 in 2020 (59.1%) and 2019 (56.4%). In 2020, mortality after CA in COVID-19 patients was highest in December (91.3%) (Supplementary Table 2). Patients who survived CA with COVID-19 had a longer mean length of stay in the hospital, compared to those without COVID-19 (9 vs 4 days) and were less likely to receive the percutaneous coronary intervention (1.6% vs 14.6% without COVID-19 in 2020 and 16.1% in 2019). Of CA patients with COVID-19, 2.0% were discharged home, compared to 14.6% of CA patients without COVID-19 in 2020 and 15.5% without COVID-19 in 2019.
In the multivariable logistic regression model, factors associated with increased odds of mortality after CA in patients with COVID-19 were obesity (OR 1.33; 95% confidence interval (CI) 1.14–1.54), uncomplicated diabetes (OR 1.60; 95%CI 1.32–1.93) and renal failure (OR 1.24; 95%CI 1.04–1.48). Patients with COVID-19 had four times higher odds of mortality from CA compared to patients without COVID-19 in 2020 (OR 4.02; 95%CI 3.75–4.32). Patients without COVID-19 who suffered a CA in 2020 had an increased odds of mortality compared to patients without COVID-19 in 2019 (OR 1.22; 95%CI 1.13–1.33).
**Conclusions:** Mortality after CA was increased in patients with COVID-19 compared to those without COVID-19 in 2020. In addition, mortality after CA in patients without COVID-19 increased in the first year of the pandemic (2020) relative to the year prior (2019).

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**Topic:** Cardiac arrest

## 000831

### Phenotypic characterization of intensive care patients with infection: a cluster analysis

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**Introduction:** Infection and sepsis present significant challenges in intensive care units (ICUs), often leading to adverse outcomes such as increased mortality and prolonged hospitalization. Its severity and clinical course are influenced by a multitude of factors, including host characteristics and pathogen virulence. While numerous studies have examined the predictors and outcomes of infection and sepsis in ICUs, according to risk factors or clinical evolution, the heterogeneity of the patient population and the infectious agents poses challenges to developing universally applicable treatment approaches.
**Objectives:** To develop a phenotyping method through cluster analysis using host and pathogen characteristics, to better understand the heterogeneity of patients with infection and sepsis.
**Methods:** Retrospective study, conducted at the ICU of Hospital Vila Franca de Xira. Data from patients admitted between January 2015 and December 2019 were collected. Cluster analysis was performed using three variables: patients' age (categorized into four groups), infection focus, and isolated microorganisms (categorized into 15 subgroups). Primary outcomes assessed included ICU and hospital, both mortality rate and length of stay (LOS).
**Results:** Among 1923 patients, 721 (37.5%) had at least one microbiological isolate during their ICU stay. Infected patients were characterized by older age and higher severity, and experienced increased mortality and longer ICU LOS. Cluster analysis identified five distinct patient clusters with different trajectories and outcomes (fig. 1), including differences in mortality rate, ICU LOS, vasopressor, renal replacement therapy, and invasive mechanical ventilation requirements (Table 1).

**Table 1 (abstract 000831)** Host characteristics and outcomes by cluster

| | Cluster 1 (N 253) | Cluster 2 (N 146) | Cluster 3 (N 43) | Cluster 4 (N 127) | Cluster 5 (N 152) | *p* |
|---|---|---|---|---|---|---|
| Age* | 68.0 ± 13.7 | 65.7 ± 14.1 | 69.3 ± 13.5 | 68.1 ± 13.6 | 68.2 ± 13.6 | 0.373 |
| Male (%) | 136 (54) | 91 (62.3) | 28 (65.1) | 84 (66.1) | 94 (61.8) | 0.129 |
| SAPS II Score * | 48.5 ± 18 | 48.6 ± 17.2 | 56.3 ± 19.7 | 50 ± 19.6 | 52.4 ± 19.7 | 0.055 |
| ICU Mort. (%) | 37 (14.6) | 45 (30.8) | 16 (37.2) | 18 (14.2) | 59 (38.8) | **< 0.001** |
| H Mort. (%) | 77 (30.6) | 63 (43.2) | 23 (53.5) | 36 (28.3) | 77 (51) | **< 0.001** |
| ICU Length of Stay** | 3.9 [2.0–6.6] | 3.9 [1.8–7.9] | 4.7 [2.8–8.7] | 3.9 [1.8–7.7] | 3.7 [1.6–6.5] | 0.242 |
| H Length of Stay** | 19 [10–37] | 13.5 [6–28] | 16 [8–28] | 26 [15–48] | 11 [6–25] | **< 0.001** |
| Invasive Mec. Vent. (days)** | 3 [2–6] | 4 [2–8] | 6 [3–9] | 3 [2–7] | 3 [2–7] | **0.047** |
| RRT (%) | 76 (30) | 44 (30.1) | 18 (41.9) | 40 (31.5) | 56 (36.8) | 0.386 |
| Vasopressor (%) | 124 (49) | 83 (56.8) | 37 (86) | 73 (57.5) | 113 (74) | **< 0.001** |

SAPS II – Simplified Acute Physiology Score II; ICU—Intensive Care Unit; H—Hospital; RRT—Renal Replacement Therapy. Data presented as N (%) except *- mean ± standard deviation or ** Median [interquartile range].

**Conclusions:** There is considerable heterogeneity of the ICU population admitted with infection and sepsis. Using pathogen (isolated microorganism) along with host (focus of infection, age) characteristics allows phenotypic characterization.
Identifying distinct patient clusters with differing outcomes, contributes to the development of personalized approaches to clinical trials, management, and resource allocation in the critical care setting, ultimately aiming to improve patient outcomes.

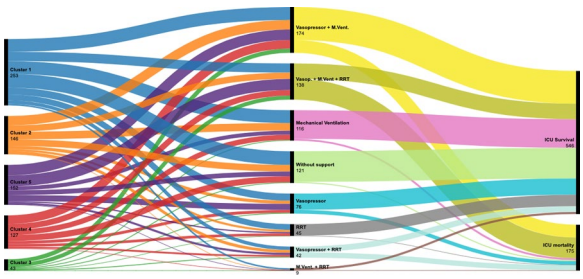


**Fig. 1 (abstract 000831)** Patients trajectories according to 5 individualized clusters. ICU – Intensive Care Unit. RRT—Renal Replacement Therapy; M. Vent. – Mechanical Ventilation

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**Topic:** Sepsis

## 000833

### The characteristics of *Candida* parapsilosis bloodstream infection (CP-BSI) in critically ill patients: a case–control study

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**Introduction:** *C. parapsilosis* (CP) is an increasing cause of invasive infection in critically ill patients. We studied risk factors for ICU-acquired CP-BSI, the incidence of fluconazole and echinocandin resistance and outcomes.
**Methods:** Patients admitted between January 2013 and October 2022 with at least one positive sample for CP during their ICU stay (infection and/or tracheal colonization) were included. Risk factors for CP-BSI and for fluconazole and echinocandin susceptibility were studied.
**Results:** 144 patients with *CP* were identified, 45 (31.3%) of whom had CP-BSI. 17 of the 45 CP-BSI (37.8%) were catheter-related and 28 (62.2%) cases were classified as primary BSI. Patients with CP-BSI were comparable to the 99 non-BSI in demographics (sex, age, diagnostic category, urgent and elective admission, incidence of diabetes, hypertension, cardiovascular disease, chronic renal dysfunction, immunosuppression, severe acute pancreatitis, prior abdominal surgery, COVID-19, APACHE-II, and specific risk factors (invasive mechanical ventilation, vasopressors, acute kidney failure, renal replacement therapy, parenteral nutrition > 6 days, steroids > 2, propofol infusion, central venous catheter > 6 days, antibiotics > 6 days, and prior antifungals). ICU-Length of stay was significantly longer in CP-BSI than in non-BSI patients (63.5 ± 37.7 *vs*. 46.6 ± 51.4, $p = 0.037$). The mean (SD) timepoint of CP-BSI was 29.3 ± 26.0 days into ICU admission. Attributable mortality rates were comparable. Susceptibility for fluconazole was 55% (54 of 100) and 59% for echinocandins (59 of 100). There were statistically significant differences in susceptibility of blood and all other site isolates for fluconazole (13 of 45, 28.9% vs. 42 of 55, 76.4%, $p = 0.000$) and echinocandins (19 of 45, 42.2% vs. 40 of 55, 72.7%, $p = 0.002$), respectively. Appropriate empirical antifungal therapy was significantly lower in CP-BSI (23 of 40, 57.5% vs. 29 of 35, 82.9%, $p = 0.018$).
**Conclusions:** We did not identify specific risk factors for ICU-acquired CP-BSI in critically ill patients with CP isolates. We observed a higher fluconazole and echinocandin resistance in CP-BSI, a finding with important implications for empirical treatment.

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**Topic:** Infections and prevention

## 000834

## "Glad to be saved but still longing for death"- The complexity of needs in patients admitted to the ICU after suicide attempt


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**Introduction:** Patients admitted to an Intensive Care Unit (ICU) after a suicide attempt are in a vulnerable situation. ICU stays are characterized by significant distress and discomfort, but we lack knowledge about the experiences of patients in ICU after suicide attempts. Therefore, exploring the suicide attempt patients' experiences with care at the ICU can provide valuable insights for optimizing their treatment and recovery process. There is an urgent need for deeper insights into patients' experiences of care during ICU treatment, as the treatment of attempted suicide begins at the ICU.
**Objectives:** This study aims to explore the patient experiences of care while admitted to an ICU after a suicide attempt, and to understand which aspects are important for patients to experience themselves being well taken care of emotionally.
**Methods:** A qualitative study was conducted, and data were collected through semi-structured interviews of patients treated in the ICU after a suicide attempt. The studies were performed at four ICUs in Oslo, Norway from 2022 to 2023. Patients were asked for inclusion while in the ICU. Inclusion criteria: ≥ 18 years, stayed ≥ 12 h in the ICU, and have attempted suicide. Exclusion criteria: Psychologically unable to be interviewed, not able to read or understand Norwegian. Ten individual interviews were conducted by the first author, an ICU nurse/PhD candidate, shortly after the suicide attempt. The sample includes patients aged 19–96 (median 40), 4 females and 6 men. The interviews were analyzed by using Thematic Analysis.
**Results:** We developed three main themes: *Professionals displaying authenticity*, *Addressing suicidality*, and *Importance of small talk and simple gestures*. Patients expressed the importance of healthcare professionals shedding their professional facades and being more personal. Patients emphasized the importance of direct conversation regarding suicidality, accompanied by a willingness to engage in conversation. They highlighted the value of casual conversation, such as greeting with a smile and engaging in small talk, as it requires minimal effort but can have a profound impact. An example could be to engage in small talk while the blood pressure was being measured. Additionally, the patients appeared highly sensitive to feelings of rejection, indicating that seemingly gestures such as not taking time to sit down or not seeking eye-contact might be perceived as off-putting. The patients felt well taken care of regarding the somatic aspects.
**Conclusions:** The patients wanted the healthcare professionals to be authentic in their interactions to promote trust and openness, engage in conversations about suicidality and create a friendly and safe atmosphere through simple gestures and small talk. In forthcoming patient encounters in the ICU, this insight can be utilized to improve treatment and care for this subgroup of ICU patients and to inspire further research.

**Topic:** Nursing care and physiotherapy

## 000835

### Transition from ICU to hospital ward – the experience of patients and their relatives

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**Introduction:** The transition from ICU to hospital wards is a vulnerable time for patients and their relatives [1,2,3]. Unplanned transitions may expose patients to the risk of medical errors and adverse events and lead to poor patient and family satisfaction with care [4].
Previous studies have indicated that relatives have a significant role in providing support during the transition phase [5].
Transition from ICU to ward has been studied previously, although mostly from the administrative perspective [2,6,7]. In this study, we are looking at the transition phase from both the patient and their relative's perspectives.
**Objectives:** To gain insight into patients and theirs relatives experiences of the transition phase from ICU to hospital ward.
**Methods:** A qualitative study using semi-structured interviews of patients and their relatives two days after ICU discharge. Interviews were transcribed and key themes identified using thematic content analysis. All participants gave their informed consent.
**Results:** We interviewed six patients and seven relatives. The median age of the patients was 76 (IQR 69–79) years and 33% were female. The median age of the relatives was 68 (IQR 68–78) years and 72% were female. The median time in the ICU was 3 (IQR 3–8) days. All patients had received organ support, including invasive or non-invasive respiratory support.
Five main themes related to transfer from ICU to a standard hospital ward were identified: 1. Relief (of being past the most critical phase); 2. Feeling unsafe; 3. Lack of communication; 4. Not being acknowledged; 5. Another level of care.
Interestingly, the relatives' perspectives differed noticeably from the patients in some areas. Whereas several patients emphasized a feeling of being abandoned: *"Well – care and attention? [I wish] that someone would come by and ask- are you okay? Because there was nothing", t*he relatives were more concerned about the lack of information from the staff: *"So, when I came as a relative, I would have liked to be greeted and for someone tp explain what had happened and how things work here—that is basically the most important thing".*
The themes that were most dominant in both groups were lack of communication and feeling unsafe (Tables 1 and 2).
**Conclusions:** The first days after arriving at the ward after ICU discharge seem to be when patients and their relatives are most vulnerable. The way the staff meet them is of the uttermost importance. Therefore, as ICU nurses, we should aim to facilitate this process together with nurses at the receiving ward, structuring the transition around the needs of patients and their relatives.

**Table 1 (abstract 000835)** Feeling unsafe

| Not sure the treatment is correct |
|---|
| *"She didn´t know so much, the nurse. She didn´t know if I had pneumonia, and nothing about the pain relievers – or about anything at all"* |
| *"I had to talk to two doctors and they said the opposite of each other. So, one person said one thing, and then she went home and the other doctor did the opposite"* |
| *"Things didn't really seem to be in control, and it made me feel unsafe when I left [my relative] at the place because I wasn´t sure they knew what they were doing"* |

**Quotes from patients and relatives**

**Table 2 (abstract 000835)** Lack of communication

| Not being greeted at arrival at the ward |
|---|
| *"Well, I think it´s great that the nurse from ICU accompanies the patient [to the ward] but it would be good if there also was someone here to receive you. So it was like a transition that the patient was a part of"* |
| *"It would have helped if a nurse, or at least somebody from the ward, had said "Hello, we are here and we will take care of him". It would have helped a lot because I was so sad when I left...[Getting emotional]"* |
| *"It was busier down here [at the ward]. There is not exactly a caretaker available immediately and I would say that is actually a shame, because you feel a bit abandoned"* |

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**Topic:** Nursing care and physiotherapy

## 000836

### Difficult airways, easy solutions: a two-cycle standards-based prospective audit

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**Introduction:** The results of the fourth national audit project (NAP4) showed that at least one in four major airway events in a hospital are likely to occur in the intensive care unit (ICU) or the emergency department; some of the key reasons for this include poor identification of at-risk patients, inadequate provision of skilled staff and equipment to manage these events successfully, and a failure to anticipate and plan for problems. Airway strategies are defined as "a predetermined set of sequential plans designed to manage the failure of previous attempts at airway management and ultimately achieve oxygenation, ventilation and protection against aspiration", with NAP4 recommending that every ICU should identify patients at risk of airway events and an airway strategy including primary and back-up plans should be made and documented for each patient. The plan should also identify any additional equipment and skills needed to carry out the plan and be clearly communicated in case of an airway emergency. After a case series of critically unwell patients at high risk of airway events in the ICU of a district general hospital, an ICU emergency plan was designed (Figure 1) but uptake and documentation remained poor.
**Objectives:** Every ICU patient should have an algorithm to manage intubation; the default should be the generic difficult airway society (DAS) algorithm but pre-identified patients, e.g. with known previous difficult intubation, known tracheostomy or laryngectomy, should have alternative plans in the DAS format.
**Methods:** The ICU emergency airway plan was designed to include key information relevant to the NAP4 guidelines. This included patient details, airway classification (native, tracheostomy, or previous laryngectomy), intubation details (Cormack-Lehane grade or VCI score, endotracheal tube size and length, date of tracheostomy, type of tracheostomy), whether the patient required the generic or a modified DAS airway plan, and a turning plan.
A two-cycle closed loop audit was performed involving serial snap audits of all ICU patients assessing four key points: level of acuity; whether a poster was present; whether the patient had been previously intubated, and if so, whether the grade and blade were detailed

or an alternative airway plan was needed or given; whether a tracheostomy was present, and if so, whether details were recorded or an alternative airway plan was needed or given.
An action plan to improve uptake and documentation between the two snap audits was designed that included multidisciplinary staff education, the printing and laminating of additional posters, ensuring the posters and board markers were easily accessible, and the design of a reminder poster (Figure 2) in the doctor's office and nursing stations.
**Results:** There were similar numbers of patients across both audits (16 vs 17), with slightly lower patient acuity in the second audit likely due to seasonal differences (69% level 2 and 31% level 3 vs 82% level 2 and 18% level 3) and fewer patients with tracheostomies (31% vs 18%). There was a large increase in the number of posters at bedside (50% vs 94%); a similar number of patients previously intubated (69% vs 59%); but a significant increase in the documentation of previous grade (36% vs 90%) and type of blade used (80% vs 18%) for intubation. There was also a large increase in the documentation of complete tracheostomy information given by type, size, and date inserted (20% vs 100%). One patient in each cycle required an alternative DAS plan, with this not being documented in the first cycle, but documented appropriately in the second cycle.
**Conclusions:** The use of laminated, reusable, easy-to-fill-out ICU airway emergency plans, together with simple interventions such as reminder posters and multidisciplinary education, can significantly improve patient safety with regard to airway management in ICUs. Further work will be needed to be done to continue to ensure high stakeholder involvement in documentation, especially given the high turnover of patients in our unit, and the regular rotation of trainee doctors. Our airway posters and interventions can also be easily adapted to suit other units with similar and different patient populations.

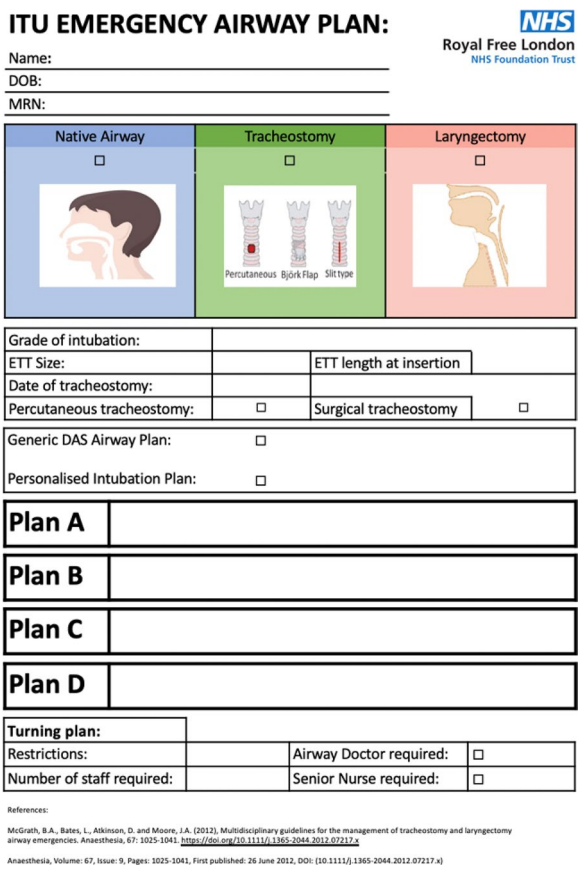


**Fig. 1 (abstract 000836)**

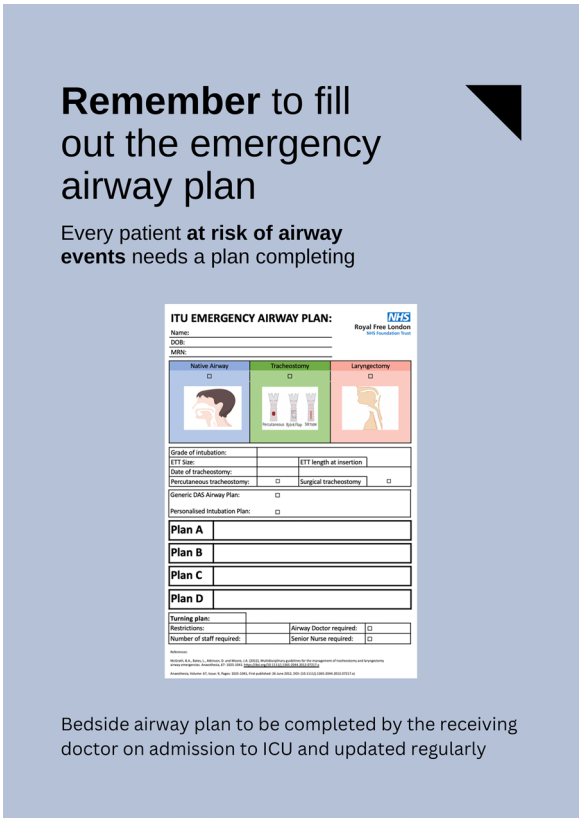


**Fig. 2 (abstract 836)**

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3. N/A

**Topic:** Acute respiratory failure and mechanical ventilation

## 000837

**"Forward together: bridging gaps in intensive care medicine through reverse mentorship"**

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**Introduction:** The Faculty of Intensive Care Medicine (FICM) initiated a "Reverse Mentoring Programme" in 2023, aimed at addressing challenges faced by doctors in training (DiT) from ethnic minority or

international medical graduate (IMG) backgrounds. This initiative stemmed from a successful pilot in the Yorkshire and Humber deanery for Training Programme Directors (TPDs) and aimed to tackle "differential attainment" persistently observed among its workforce. By recruiting minority ethnic and IMG DiT to mentor senior Faculty members, the FICM sought to enhance awareness of race-related issues in medical training among educational leaders, thereby fostering more equitable training opportunities.
**Objectives:** The objectives of the Reverse Mentoring Programme were twofold: to enhance the understanding of senior FICM educational leadership regarding challenges faced by ICM DiT related to race, ethnicity, or background, and to explore the feasibility of expanding reverse mentoring to reach a broader audience. Mentors aimed to increase awareness of challenges faced by ethnic minorities and IMG DiT, raise consciousness about unconscious bias and discrimination, gain insights into root causes of microaggressions, and develop strategies to disseminate data on training inequity.
**Methods:** The programme utilized a structured approach for participant selection and engagement. Fourteen mentor–mentee pairs were identified, engaging in meetings spanning approximately six months, focusing on semi-structured discussions about individual training experiences. Facilitated inductions, midpoint, and end-point meetings to ensure collective reflection and strategy discussion. Virtual meetings were conducted via Microsoft Teams, with recordings for absentees.
**Results:** Feedback from both mentor and mentee groups indicated positive experiences with the programme. Key recommendations emerged, including publishing, and disseminating findings widely, incorporating education on ethnic diversity and inclusivity (EDI) throughout the ICM curriculum, recognizing the importance of cultural education alongside clinical training, improving allyship through support networks, ensuring transparency and active utilization of data, and appointing specific EDI leads.
**Conclusions:** The Reverse Mentoring Programme proved effective in improving understanding of challenges faced by ethnic minorities and IMG DiT. It led to positive changes in personal practice and approach to diversity and inclusion. Expansion of the programme, along with implementing recommendations, is crucial to fostering equitable conditions for all doctors to thrive in their careers. Mentors also reported gaining management and leadership skills, as well as a deeper insight into the mindset of trainers, resulting in increased optimism for the future of diversity and inclusion in ICM training.

**Reference(s)**


1. We would like to thank each of the doctors taking part in the project and acknowledge the significant contributions made by each of the doctors in training who volunteered as mentors. They have all dedicated a significant portion of their own free time in order to share their own experiences on what is often a very emotive and personal subject. We would also like to acknowledge and thank Dr. Alice Pullinger – Leadership Fellow in Diversiry, Equity and Inclusion—NHSE Yorkshire And Humber for her help and support in setting up the project. Reverse Mentor Group: Dr. Hagar Aly; Dr. Soumyanil Saha; Dr. Angela Lim, Dr. Jonathan La-crette, Dr. Shah Rahman, Dr. Tijesunimi Afolabi, Dr. Hannah Wilkincrowe, Dr. Sekina Bakare, Dr. Kyron Chambers, Dr. Ben Hylton, Dr. Dong Lin, Dr. Ayshea Redford, Dr. Enyioma Anomelechi
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**Topic:** Health Services Research and Outcome

## 000838

### Rational prescription of proton pump inhibitors in intensive care unit: towards improved efficiency and resource allocation


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**Introduction:** High prevalence of inappropriate proton pump inhibitor (PPI) prescriptions in Intensive Care Units (ICU) mainly relates to administration route. Despite evidence about the potential risks of PPIs' overuse, transition from intravenous to enteral PPI administration upon initiation of enteral nutrition remains inconsistently implemented, imposing financial burdens and affecting patient care. Focusing on enhancing PPI prescriptions in an ICU from a tertiary hospital, we designed a quasi-experimental, single-center, audit-type study followed by feedback. The study was authorized by the hospital's Ethics Committee (nº 125/2023).
**Objectives:** Primary objective: To determine the time, in days, during which ICU patients have an appropriate PPI prescription (indication and posology).
Secondary objectives: To assess the perception of medical staff regarding the adequacy of PPI prescriptions and, to characterize inadequate PPI prescriptions and the direct costs associated.
**Methods:** The study was divided into three phases:
1) A retrospective analysis of the first 50 patients discharged from the ICU since January 2023. Patients with a length-of-stay under 24 h were excluded. Indications for treatment with PPI were considered correct if they aligned with current guidelines. Route of administration was considered inadequate if the patient was on enteral nutrition and PPI was administered intravenously. Costs per unit were considered for IV pantoprazole, pantoprazole capsules, and for lansoprazole orodispersible tablet. Data collection and analysis used Microsoft SQL Server Management Studio and Microsoft Excel.
2) Implementation of an anonymous online questionnaire to assess the perception of medical staff ($n = 49$) regarding PPI prescriptions in the ICU (June 2023), followed by presentation of the results.
3) Implementation of measures aligned with the results of both phases.
**Results:** 1) We included 98 patients (62 years median age, 33% female). A total of 137 PPI prescriptions were found, corresponding to 889 days of treatment; 25.98% of the prescriptions were adequate both in indication and dose. The route of administration was inadequate in 60.07% of the prescriptions days, representing an extra cost between 222,87€ and 273,62€ + VAT (see Table 1).
2) Online questionnaire was answered by 93.9% of the medical team. When questioned "I consider that, in my clinical practice, I prescribe PPI appropriately (indication and route of administration)", 69.6% of the medical team answered 'mostly yes'.
3) A proposal for hospital introduction of lansoprazole orodispersible tablets was submitted and a protocol will be implemented after approval.
**Conclusions:** Frequency of inadequate PPI prescriptions in our ICU was similar to current literature. Nevertheless, the medical team was unaware of the inadequacy of PPI prescription, giving us the possibility to improve medical care. Evaluating prescription practices might improve efficiency of resource allocation in ICU.

**Table 1 (abstract 000838)** Characterization of inadequate PPI prescription

| Inadequacy | Days (n) | Days (%) | Cost (€) | Cost with correct prescription (€) | Potential savings (€) |
|---|---|---|---|---|---|
| No indication | 59 | 6,64 | 37,44 | – | 37,44 |
| Inadequate route | 534 | 60,07 | 390,35 | 116,73–167,48 | 222,87–273,62 |
| IV-PPI + oral feeding | 111 | 12,49 | 81,14 | 2,22 | 78,92 |
| IV-PPI + feeding tube | 423 | 47,58 | 309,21 | 114,51–165,26 | 143,95–194,70 |

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**Topic:** Health services research and outcome

## 000840

### A restrictive versus a liberal transfusion strategy in patients with spontaneous intracranial hemorrhage: a randomized study

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**Introduction:** There is a lack of data on the optimal hemoglobin threshold for blood transfusions in patients with acute spontaneous intracranial hemorrhage (ICH).
**Methods:** In this secondary analysis of a multicenter, parallel-group, pragmatic trial (NCT02968654), patients admitted to the intensive care unit with an acute brain injury were randomized to receive 1 unit of red blood cells when their hemoglobin levels dropped to 7 g per deciliter or less (restrictive group) or 9 g per deciliter or less (e.g. liberal group) over 28 days. For this study, only patients with ICH were analyzed. The primary outcome was the occurrence of an unfavorable neurological outcome, defined as a Glasgow Outcome Scale Extended score of 1–5, at 180 days post-randomization.
**Results:** On a total of 850 patients eventually randomized to the trial, 144 (16.9%) patients presented with ICH and were analyzed for the primary outcome; 73 in the restrictive group and 71 in the liberal group. As the results of the main trial are under revision, findings on baseline characteristics, transfusion protocols compliance, hemoglobin values over time as well as on primary outcome comparing the two groups will be presented at the ESICM congress in Barcelona.
**Conclusions:** In this subgroup analysis of a large randomized trial, we will provide the first evidence on the impact of two different transfusion strategies on the occurrence of unfavorable neurological outcome in ICH patients.

**Reference(s)**
1. Funded by the European Society of Intensive Care Medicine (ESICM – Next GRANT) and "La Fondation des Geules Cassées" (France); ClinicalTrials.gov number, NCT02968654

**Topic:** Neurointensive care

## 000841

### Genetic variants associated with hyperinflammation and immune suppression during experimental human endotoxemia

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**Introduction:** The heterogeneity in the host response in sepsis, which can entail both hyperinflammation and profound immune suppression, has hampered the development of effective immunomodulatory treatments. Therefore, a shift towards a more individualized treatment approach tailored to individual patient factors is warranted. We aimed to identify genomic markers associating with the magnitude of the inflammatory response and the extent of immune suppression during experimental human endotoxemia, a standardized controlled model of systemic inflammation induced by bacterial lipopolysaccharide (LPS), resembling hallmarks of both the hyperinflammatory and immunosuppressive phenotypes observed in sepsis patients.
**Methods:** LPS (1 ng/kg) was administered intravenously twice one week apart to 101 healthy volunteers (50 female, 51 male, age 23 [21–25] years). During both LPS challenge days, blood was serially sampled

to determine plasma cytokine concentrations. Area under the in vivo (IV) plasma cytokine concentration–time curves (AUCs) served as an integral measure of the cytokine response (Fig. 1). The first LPS challenge served to quantify the primary IV (hyperinflammatory) cytokine response, while the difference in cytokine response between the first and second LPS challenge was used to determine the degree of IV endotoxin tolerance, which bears many similarities to sepsis-induced immunosuppression. Furthermore, on the first challenge day, circulating CD14 + /CD16- monocytes were isolated at two time points: one hour before ($T = -1$) and 4 h after ($T = 4$) LPS administration, and RNA sequencing was performed. Ex vivo (EV) cytokine production capacity EV tolerance was assessed by stimulating isolated monocytes at both timepoints with LPS for 24 h and measuring cytokine concentrations in supernatants. To identify genomic regions associating with interindividual differences in the host response, the cohort was genotyped, and quantitative trait locus (QTL)-analysis was performed using matrix eQTL. Significance was determined at FDR < 0.05.

**Results:** We associated 3,333,357 genetic variants with IV cytokine production and IV tolerance, thereby identifying one cytokine (c) QTL and one tolerance (t)QTL. SNP rs10261383 was identified as a cQTL, although not reaching genome-wide significance, it was associated with the magnitude of the primary IV TNF response (FDR < 0.05, *p*-value 1e−07, Fig. 2A). Subjects carrying two alternate alleles for this SNP exhibited a more pronounced response for most pro-inflammatory cytokines (Fig. 2B). No associations with EV cytokine production capacity were found (Fig. 2C). SNP rs7576783 emerged as a genome-wide tQTL associated with TNF and G-CSF tolerance (FDR < 0.05, *p*-value 1e−08, Fig. 3A). Subjects homozygous for the alternate allele developed little IV tolerance for any of the cytokines, except for IL-10 (Fig. 3B). No associations with EV tolerance were identified (Fig. 3C). The SNPs of the identified c- and tQTLs are located within *LINC00525* and in the promotor-region of *AC104623.2*, respectively. According to the Genotype-Tissue Expression (GTEx) Project, both SNPs are cis-expression (e)QTLs for their respective genes in various tissues. However, eQTL analysis using our monocyte RNA-seq data did not identify these SNPs as eQTLs, as both genes were not expressed in this cell type.

**Conclusions:** There is considerable variability in the in vivo host response and development of endotoxin tolerance following LPS administration, even within a highly homogeneous cohort of healthy volunteers. We identified two genetic variants associated with this in vivo immunological variation, but not with ex vivo cytokine responses or tolerance in isolated monocytes. This, in combination with the lack of expression of the associated eQTL genes, suggests that these SNPs influence the host response by affecting cells other than monocytes. Further elucidation of this influence and exploration of these genetic variants in patient cohorts could ultimately prove to be of value in identifying sepsis patients eligible for immunomodulatory treatments.

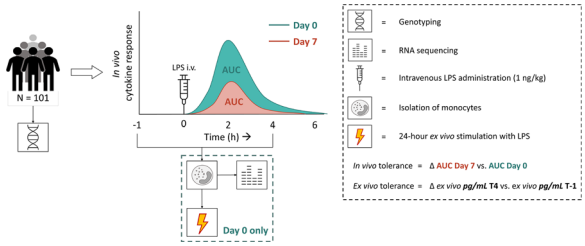


**Fig. 1 (abstract 000841)** Schematic overview of the study procedures. LPS, lipopolysaccharide; AUC, area under the cytokine time-concentration curve

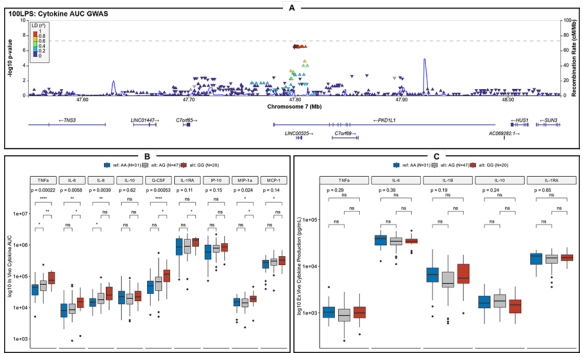


**Fig. 2 (abstract 000841)** Regional association plot and IV/EV cytokine response for cytokine-QTL (cQTL) rs10261383. **A**. Regional association plot at the cQTL loci indexed around the cQTL SNP. Corresponding p-values (as -log10 values) of all SNPs in the region were plotted against their chromosomal position. **B.** Primary in vivo cytokine response of genotype-stratified cohort, reflected by area under the cytokine time-concentration curve (AUC) values on the first LPS challenge day (day 0). **C**. Ex vivo LPS-induced cytokine production by monocytes obtained before the first in vivo LPS challenge (day 0, $T = -1$) of genotype-stratified cohort. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, ****$p < 0.00001$

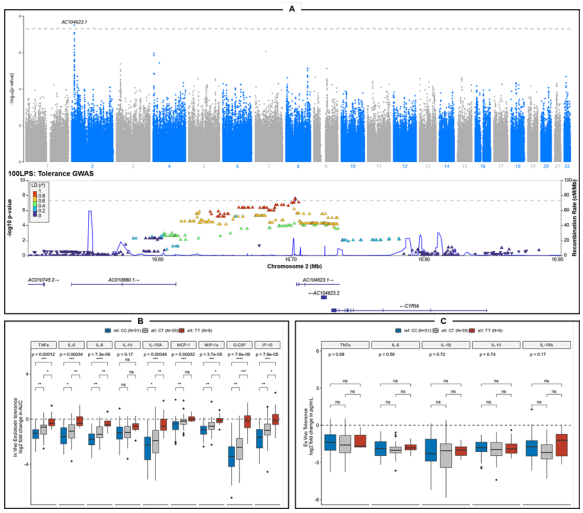


**Fig. 3 (abstract 000841)** Manhattan and regional association plot and IV/EV tolerance for tolerance-QTL (tQTL) Rs7576783. A. Manhattan plot showing the genome-wide significant tQTL loci and regional association plot at the tQTL loci indexed around the tQTL SNP. Corresponding p-values (as -log10 values) of all SNPs in the region were plotted against their chromosomal position. **B**. In vivo endotoxin tolerance of genotype-stratified cohort, reflected by the log2 fold change in area under the cytokine time–concentration curve (AUC) values between the first (day 0) and the second (day 7) LPS challenge. **C**. Ex vivo tolerance of genotype-stratified cohort, reflected as the log2-fold change in LPS-induced cytokine production of monocytes obtained before ($T = -1$) and 4 h after ($T = 4$) the first in vivo LPS challenge (day 0). *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, ****$p < 0.00001$

**Reference(s)**
1. This work was internally funded by the Department of Intensive Care Medicine of the Radboud University Medical Center in Nijmegen, The Netherlands.

**Topic:** Sepsis

## 000842

### Life after critical care: post-COVID-19 pandemic adult ICU rehabilitation goal setting and documentation in a UK district general hospital

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**Introduction:** Post-intensive care syndrome (PICS) is the cognitive, psychiatric and/or physical disability occurring after admission to the intensive care unit (ICU). 1, 2 It can lead to impaired role functioning and quality of life for the survivor, as well as psychological impairment for family members. 2 Rehabilitation goal setting during the ICU admission reduces the risk of PICS-related morbidity. 3 In order to improve daily functioning and prevent future morbidity and mortality, in the UK, quality standards from the National Institute for Health and Care Excellence state that 100% of adults in critical care should have their rehabilitation goals agreed within 4 days of admission to critical care or before discharge. 4 With services exiting the emergency response phase of the COVID-19 pandemic, it is essential to re-prioritise rehabilitation goal setting.
**Objectives:** To evaluate the documentation of rehabilitation goals to determine the extent to which Stoke Mandeville Hospital ICU is performing in relation to the NICE Quality Statement 158 (QS158).
**Methods:** Retrospective observational cohort review of admissions to Stoke Mandeville Hospital ICU between 1 January 2022 and 31 March 2022. Admissions were excluded if medical records were not available or if the patient transitioned to end-of-life care within 4 days of admission. A data collection proforma was used to systematically appraise scanned medical records by 2 auditors, with 10% of records dual screened to ensure inter-rater reliability. Discrepancies were discussed with intensive care consultants. Admissions were analysed according to length of stay [short stay ($\leq$4 days), and long-stay (>4 days)]. Rehabilitation goals were defined as non-treatment goals aiming to optimise functioning or reduce disability.
**Results:** Of 127 ICU admissions during the study period, 24 were excluded (6 no records available; 18 end-of-life care). Notes from 103 admissions were analysed [62(60%) short stay ($\leq$4 days); 41 (40%) long stay (>4 days)]. At least 1 rehabilitation goal was set in accordance with QS158 timeframe in 52 (84%) and 34 (83%) of short versus long stay admissions, respectively. Goals were most commonly set by doctors for both groups. Rehabilitation goals set by other multidisciplinary team members varied between groups in a manner that was generally consistent with duration of critical illness, ICU-related interventions, and phases of rehabilitation.
**Conclusions:** There is a need for a standardised approach to documenting holistic rehabilitation goals in a manner that has low administration burden. Such an approach should clearly delineate the difference between treatment versus rehabilitation goals and be integrated into bedside electronic patient records. A more systematic approach to documentation may lead to improved rehabilitation for patients during their ICU admission, which may in turn reduce the burden of PICS.

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**Topic:** Health services research and outcome

## 000843

### Diaphragmatic motion characteristics in patients weaning with PSV and NAVA: an ultrasonographic study

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**Introduction:** Ultrasonography has extensively been used to evaluate diaphragmatic motion characteristics, such as excursion and thickening, both in healthy subjects and ICU patients. More recently, the ultrasonographic technique of diaphragmatic Tissue Doppler Imaging (TDI) has also allowed real-time recording of the diaphragmatic motion velocity waveform.
**Objectives:** To examine the changes in the special features of diaphragmatic motion when shifting between different modes of assisted ventilation using ultrasonography.
**Methods:** Consecutive ICU patients in weaning progress while on pressure support ventilation (PSV) were studied; the level of support was the minimum to obtain a tidal volume (Vt) between 6 and 8 ml/kg of predicted body weight (PBW). Ultrasonographic measurement of thickening fraction (TF), peak contraction (PCV) and peak relaxation (PRV) velocities and relaxation rate (slope of TDI diaphragmatic relaxation waveform) was performed, before ventilation mode was switched to NAVA. In NAVA, the NAVA gain was set to obtain the same peak pressure as that during PSV, and Vt between 6 and 8 ml/kg of PBW. The same ultrasonographic parameters (TF, PCV, PRV, relaxation rate) were assessed when a stable respiratory pattern on NAVA was achieved.
**Results:** Two-hundred and nineteen respiratory cycles [109 in PS mode (PS level $10.0 \pm 7.0$ cmH20) and 110 in NAVA mode (NAVA level $1.4 \pm 1.0$ cmH20/μV)] were analysed in 19 patients (8 female), aged $58.1 \pm 12.7$. Due to study design, there were no significant differences between PSV and NAVA modes in ΔPressure (11.2 cmH20 vs 12.1 cmH20, $p=0.41$), Ppeak (18.5 cmH20 vs 19.4 cmH20, $p=0.48$), Vt (504.2 ml vs 493.4 ml, $p=0.70$) and Cdyn (57.0 ml/cmH20 vs 61.4 ml/cmH20, $p=0.48$). There were also no differences between PS and NAVA modes in Edimax (9.5 μV vs 10.1 μV, $p=0.57$) and Edimin (1.5 μV vs 1.7 μV, $p=0.64$). Similarly to the ventilatory parameters, assessment of the sonographic indices of diaphragmatic motion also revealed no differences between PS and NAVA modes [PCV (2.55 cm/s vs 2.65 cm/s, $p=0.64$), PRV (2.34 cm/s vs 2.52 cm/s, $p=0.42$), relaxation rate (14.1 cm/s2 vs 17.2 cm/s2, $p=0.21$) and TF (0.25 vs 0.27, $p=0.64$)].
**Conclusions:** Diaphragmatic ultrasonography, including TDI, allows real-time assessment of special features of diaphragmatic motion. Our study demonstrated that despite the unique characteristics of the two different assisted ventilation modes used, no significant differences in the ultrasonographic indices of diaphragmatic motion were recorded when similar inspiratory pressures were used.

**Topic:** Imaging in intensive care

## 000844

### Critical Care Unit bed availability and postoperative outcome: a multinational cohort study

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**Introduction:** Critical care beds are a limited resource, yet research indicates that recommendations for postoperative critical care admission based on patient-level risk stratification are not reliably followed (1–3). It is unclear how prioritisation decisions are made in real-world settings, and the effect of this prioritisation on postoperative outcomes. Observational studies attempting to answer this question have produced mixed results due to confounding-by-indication, whereby patients chosen for critical care admission often have more risk factors for poor postoperative outcomes, which may be unobserved (4–9).
**Objectives:** This study had two aims. Firstly, to determine if the probability of postoperative critical care admission is affected by critical care bed availability. Secondly, to determine the effect of postoperative critical care admission on morbidity using instrumental variable techniques to reduce the effect of unobserved confounding.
**Methods:** This was a pre-specified analysis of an observational cohort study of adult patients undergoing inpatient surgery, conducted in 274 hospitals across the United Kingdom and Australasia (10). The primary outcome was postoperative morbidity at day seven. Patients with absolute indications for critical care admission or having very low-risk procedures were excluded. Critical care occupancy prior to surgery was recorded. Logistic regression models were used to evaluate the relationship between critical care admission and patient and health system factors. The causal effect of critical care admission on outcome was estimated using variation in critical care occupancy as a natural experiment in an instrumental variable analysis.
**Results:** 19,491 patients from 248 hospitals were eligible for analysis, of whom 2107 had direct postoperative critical care admission. Increasing surgical risk predicted critical care admission as did increased availability of critical care beds (Odds Ratio 1.04 [1.02 to 1.06] per available bed), however the probability of admission varied significantly between hospitals (median OR 3.05). Morbidity occurred in 15% of patients and was associated with surgical risk. There was no evidence of a difference in morbidity with critical care admission [Odds Ratio 0.91 (0.57 to 1.45)], although there was a trend towards increasing benefit with increasing preoperative surgical risk (Fig. 1). The estimate of harm in the instrumental variable analysis was significantly reduced compared to methods that adjust for observed characteristics only (Fig. 2).
**Conclusions:** Postoperative critical care admission is variable and related to bed availability. Statistical methods that adjust for unobserved confounding significantly reduced estimates of harm previously associated with postoperative critical care admission. Our findings provide rationale for a clinical trial to evaluate the potential for benefit of postoperative critical care for patients in whom there is no absolute indication for admission.

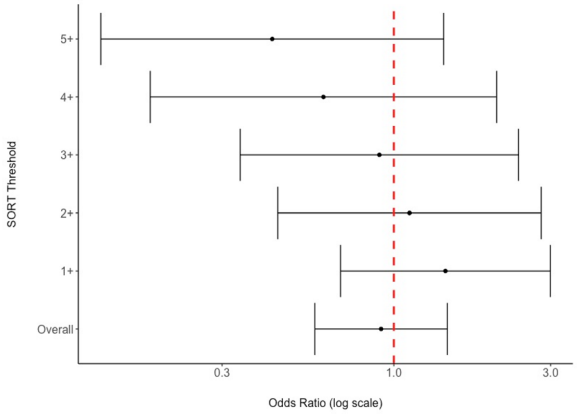


**Fig. 1 (abstract 000844)** Odds ratio estimates for postoperative morbidity incidence associated with Critical Care admission, stratified by SORT mortality estimate, in the instrumental variable analysis. SORT, Surgical Outcomes Risk tool.

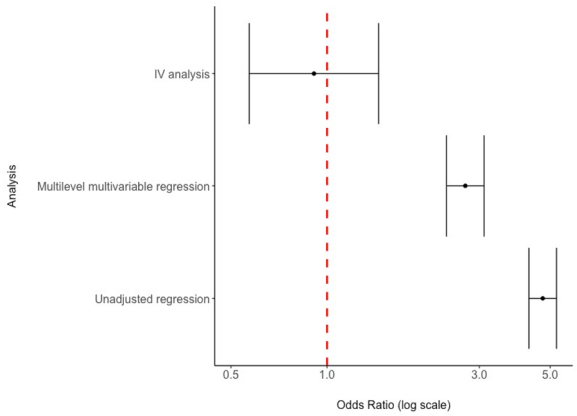


**Fig. 2 (abstract 000844)** Odds ratio estimates for postoperative morbidity incidence associated with Critical Care admission for logistic regression models, which perform risk adjustment on observed confounding only, and the instrumental variable analysis. Multilevel multivariable regression was adjusted for patient and surgical risk factors, with hospital site as a random effect

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of study conduct SRM and SKH were Improvement Science Fellows funded by the Health Foundation and SRM was supported for her role as Director of the NIAA Health Services Research Centre by funding from the Royal College of Anaesthetists. DJNW received a clinical salary from The London Clinic hospital and a clinical research fellowship salary from the University College London (UCL) /UCL Hospitals Surgical Outcomes Research Centre. SRM and SKH are supported by the UCLH National Institute for Health Research (NIHR) Biomedical Research Centre and the NIHR Central London Patient Safety Research Collaboration. PSM is supported by an Australian National Health and Medical Research Council Investigator Grant. The views expressed are those of the authors and not necessarily those of NHS England, or the UK's National Institute for Health Research or Department of Health and Social Care.

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**Topic:** Perioperative care

## 000846

### Association between beta-lactam concentration and liver injury in critically ill patients

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**Introduction:** Antibiotics represent one of the classes of drugs most commonly associated with elevations in liver enzymes. In some instances, they may precipitate drug-induced liver injury (DILI) [1], a severe adverse event that can progress to acute liver failure (ALF) [2].
**Objectives:** The aim of this study was to assess whether, in critically ill adult patients, there is an association between beta-lactam antibiotic concentrations and the elevation of liver enzymes.
**Methods:** A single-center retrospective cohort study including critically ill adult patients admitted to the intensive care unit of Erasme University Hospital (Brussels, Belgium) was conducted from January 2009 to December 2014. Therapeutic Drug Monitoring of broad-spectrum beta-lactam antibiotics was performed according to the decision of the treating physician. To compare the concentrations of the different types of antibiotics, the ratio between the trough drug concentration (C0) and the minimal inhibitory concentration (MIC) corresponding to the latest EUCAST clinical breakpoints for *Pseudomonas aeruginosa* (C0/MIC), following local protocols, was used. Liver enzymes were measured on the day of the TDM measurements. Liver enzyme elevation were categorized into hepatocellular (HI), cholestatic (CI), and mixed (MI) injury, based on the R-Ratio; this ratio was calculated by dividing the alanine transferases (ALT) by the alkaline phosphatases (ALP), utilizing multiples of the upper limit of normal for both values: an R-Ratio greater than 5 indicated HI, while a ratio less than 2 signified CI and between 2 and 5 a MI. A multivariate logistic regression analysis was performed, considering severity on admission, age, gender, use of anti-inflammatory drugs and concomitant antibiotics to assess the association of beta-lactam antibiotic concentrations with liver injury.
**Results:** Out of the 425 patients included in this study, 154 (36.2%) developed liver enzyme elevation; which were classified as HI in 40 (10.1%), CI in 22 (7.8%) and MI in 11 (2.6%) patients, respectively. The median time from admission to TDM was 5 (3–8) days and from antibiotic initiation to TDM measurement 2 (1–4) days. The C0/MIC was significantly higher in patients with elevated liver enzymes when compared to others (2.79 [1.35–5.00] vs. 2.34 [1.00–4.49] mg/dL, $p < 0.05$). However, from the logistic regression analysis, C0/MIC was not significantly associated with the occurrence of liver injury. In a subgroup analysis considering patients treated with piperacillin/tazobactam ($n = 164$), a threshold concentration of 20.95 mg/L was identified as an independent risk factor for liver enzyme elevation [odds ratio 2.58 (1.20–5.55)].
**Conclusions:** In this retrospective analysis, we did not observe a significant association between plasma concentrations of all beta-lactams and liver enzyme elevation. Nevertheless, exposure to high piperacillin/tazobactam levels may increase the risk of this complication.

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**Topic:** Infections and prevention

## 000847

### Experience of using the bidirectional femoral arterial cannula (Biflow) for adult patients' cannulation in VA ECMO as a strategy for prevention of limb ischemia: case series

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**Introduction:** In 2019, the Society for Cardiovascular Angiography and Interventions (SCAI) proposed a new classification of cardiogenic shock emphasizing the use of extracorporeal mechanical support from stage C onwards. (1) Following this update, the use of veno-arterial ECMO (VA) has been increasingly consolidated as part of the tools to provide hemodynamic support, thereby increasing the need to implement strategies for possible risks associated with cannulation. Within the types of cannulations in the setting of non-cardiotomy associated cardiogenic shock, percutaneous femoro-femoral peripheral cannulation has been implemented, thus increasing the inherent complications such as bleeding, ischemia, and limb amputation. Therefore, there has been a need to implement strategies aimed at reducing these risks with a femoral artery cannula with bidirectional perfusion hole (Biflow) (2)
**Objectives:** Describe the implementation of using the BiFlow cannula in the VA-ECMO scenario within the context of cardiogenic shock as a strategy to reduce the risk of limb ischemia associated with cannulation.
**Methods:** A case series study was conducted to evaluate patients admitted to the extracorporeal life support unit of a high-complexity

hospital and ECMO reference enter, affiliated with the Extracorporeal Life Support Organization (ELSO), in Bogotá D.C, Colombia, between January 21, 2020, and December 31, 2021 (Fig. 1). Subjects over 18 years of age were enrolled with an indication for VA-ECMO according to ELSO guidelines, with BiFlow cannulation at the femoral artery level. Patients who died within the first 6 h of cannulation, those cannulated in another configuration, or those requiring a change in cannulation type were excluded. The study examined sociodemographic characteristics, comorbidities using the Charlson Comorbidity Index, clinical variables upon admission including vital signs, laboratory findings, and radiological results. Additionally, calculations were performed for APACHE II score, SOFA score, SAVE score, and oxygen debt (DEOx) within the first 24 h of admission to the intensive care unit (ICU). The DEOx was calculated using the formula proposed by Dunham et al. (4), which relates lactate and base excess through the equation: DEOx = 6.322 (Lactate) − 2.311 (BE) − 9.013 (3). Additionally, the limb intervened with the BiFlow cannula underwent arterial Doppler and NIRS (% oxygen saturation) monitoring, as well as clinical evaluation of signs of limb ischemia. Qualitative variables were reported in frequencies and percentages, while quantitative variables were summarized using medians, interquartile ranges, means, and standard deviations. Bivariate analysis was conducted between patients who experienced complications and those who did not with the use of the BiFlow cannula. Finally, a multivariate logistic regression analysis of mechanical complications was performed.

**Results:** Fifteen patients were included, of whom 93.3% were male, with an average age of 45.5 (SD 14.6) years. The most prevalent comorbidities were hypertension in 46.7% and smoking in 33.3% of cases (Table 1). The mechanical complication rate was 66.6% ($n = 10$), with hypoperfusion being the most frequent mechanical complication at 66.7%, followed by hematoma at 26.7% (Table 2). Despite three patients experiencing critical ischemia, none required limb amputation. Multivariate analysis revealed independent associations related to mechanical complications, such as pre-cannulation hemoglobin (OR 1.71, 95% CI 0.94–3.11; $p$ 0.077), pre-cannulation vasopressin dose (OR 2.72, 95% CI 0.90–8.17; $p$ 0.073), and post-cannulation inotropic use (OR 13.5, 95% CI 0.87–207.6; $p$ 0.062) (Table 3).

**Conclusions:** The use of the BiFlow cannula for critically ill patients under VA ECMO support is an option to avoid critical and irreversible ischemia of the limb, however, complications, especially hypoperfusion, are not uncommon. Anemia and the need for pre-ECMO vasopressin is associated with complications. The correlation of data needs to be further studied with a larger population and other studies to define early interventions in critically ill patients.

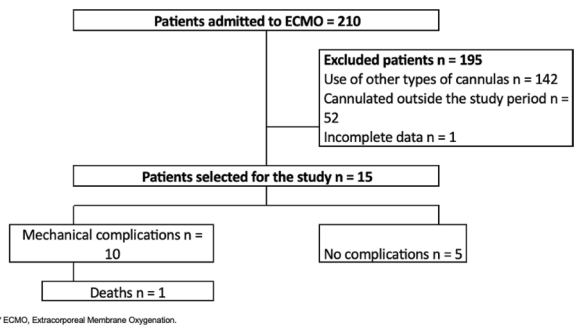


**Fig. 1 (abstract 000847)** Flowchart of subject enrollment in the study

**Table 1 (abstract 000847)** Characteristics of the patients

| Characteristics | Population n = 15 | Complications = 10 | No complications n = 5 | P-value |
|---|---|---|---|---|
| Age in years, mean (SD) | 44,5 (14,6) | 43,9 (13,4) | 45,8 (18,5) | 0,844 |
| Male gender, n (%) | 14 (93,3) | 9 (90) | 5 (100) | 0,464 |
| Body mass index, mean (SD) | 27,7 (4,8) | 29,3 (3,9) | 24,4 (5,1) | 0,105 |
| Days in ICU stay - M (IQR) | 22 (13 - 28) | 19,5 (13 - 25) | 23 (22 - 28) | 0,425 |
| Days on ECMO therapy - M (IQR) | 9 (5 - 15) | 8,5 (5 - 11) | 10 (6 - 21) | 0,424 |
| Days of arterial cannulation - M (IQR) | 6 (3 - 9) | 5,5 (3 - 9) | 6 (6 - 7) | 0,758 |
| Days of hospital stay - M (IQR) | 35 (22 - 52) | 32 (22 - 44) | 43 (22 - 53) | 0,667 |
| **Comorbidities, n (%)** | | | | |
| Hypertension | 7 (46,7) | 4 (40) | 3 (60) | 0,535 |
| Diabetes mellitus | 5 (33,3) | 3 (30) | 2 (40) | 0,15 |
| Renal disease | 2 (13,3) | 1 (10) | 1 (20) | 0,288 |
| Coronary artery disease | 2 (13,3) | | 2 (40) | 0,032* |
| Smoking | 5 (33,3) | 3 (30) | 2 (40) | 0,699 |
| **Pre-cannulation laboratory tests, mean (SD)** | | | | |
| Hemoglobin, g/dL | 13,6 (2,9) | 14,8 (2,3) | 11,4 (3,1) | 0,007* |
| Platelets, mm3 | 234,7 (106,5) | 269,8 (105,3) | 164,4 (74,3) | 0,045* |
| Creatinine, mg/dL | 2,41 (1,2) | 2,77 (1,2) | 1,70 (0,7) | 0,056* |
| **Pre-cannulation severity score - M (IQR)** | | | | |
| APACHE II Score | 18 (15 - 20) | 18 (16 - 20) | 18 (15 - 19) | 0,758 |
| SOFA Score | 12 (11 - 13) | 11,5 (11 - 12) | 13 (11 - 13) | 0,663 |
| SAVE Score | ¨- 4 (-5 a 4) | ¨- 5 (-5 a 3) | ¨- 1 (-3 a 4) | 0,071 |
| DEOx Score | 39,5 (17,6 - 62,7) | 43,5 (35,6 - 65,1) | 17,8 (9,8 - 23.9) | 0,050* |
| **Cannula location, n (%)** | | | | 0,439 |
| Right | 10 (66,7) | 6 (60) | 4 (80) | |
| Left | 5 (33,3) | 4 (40) | 1 (20) | |
| **Pre-cannulation vasopressors** | | | | |
| Inotropes, n (%) | 12 (80) | 10 (100) | 2 (40) | 0,006* |
| Noradrenaline dose, mcg/kg/min, mean (SD) | 0,72 (0,4) | 0,85 (0,4) | 0,47 (0,1) | 0,014* |
| Vasopressin dose, U/l, mean (SD) | 4,3 (2,2) | 5,1 (2,2) | 2,8 (1,1) | 0,019* |
| **Extremity characteristics, mean (SD)** | | | | |
| Capillary refill | 4,2 (2,6) | 5 (2,8) | 2,6 (0,5) | 0,026* |
| Cannula limb saturation | 96,5 (4,7) | 93,2 (5,4) | 99,2 (1,8) | 0,11 |
| Contralateral limb saturation | 97,2 (3,3) | 95 (3,5) | 99,4 (0,9) | 0,044* |
| Cannula NIRS | 72 (63,5 - 83,5) | 67 (60 - 90) | 77 (77 - 78) | 0,654 |
| **ECMO characteristics, mean (SD)** | | | | |
| Pre-cannulation ACT | 160,1 (33,7) | 168,7 (35,3) | 143 (24,8) | 0,13 |
| Post-cannulation ACT | 222,9 (40,9) | 236,9 (39,3) | 195 (30,4) | 0,045* |
| Initial ECMO flow, l/min | 3,62 (1,2) | 3,76 (1,3) | 3,34 (0,9) | 0,49 |
| **Post-cannulation vasopressors** | | | | |
| Inotropes, n (%) | 11 (73,3) | 9 (90) | 2 (40) | 0,039* |
| Noradrenaline dose, mean (SD) | 0,39 (0,33) | 0,48 (0,36) | 0,2 (0,1) | 0,039* |
| Vasopressin dose, mean (SD) | 1,87 (1,45) | 2,4 (1,26) | 0,8 (1,3) | 0,054* |

SD, standard deviation; M, median; IQR, interquartile range; ECMO, Extracorporeal Membrane Oxygenation; SOFA, Sequential Organ Failure Assessment; APACHE, Acute Physiology and Chronic Health Evaluation; DEOx, Oxygen Debt; SAVE, Survival after Veno-Arterial ECMO; ASA, Acetylsalicylic acid; ACT, Activated clotting time; CPK, Creatine phosphokinase. *p < 0.05

**Table 2 (abstract 000847)** Mechanical complications of the BiFlow cannula

| Characteristics | Population n = 15 |
|---|---|
| No complications | 5 (33) |
| Hypoperfusion, n (%) | 10 (66,7) |
| Hematoma, n (%) | 4 (26,67) |
| Critical ischemia, n (%) | 3 (20) |
| Bleeding, n (%) | 1 (6,67) |
| Pseudoaneurysm, n (%) | 1 (6) |
| Amputation, n (%) | 0 (0) |

**Table 3 (abstract 000847)** Factors associated with mechanical complications

| Outcome | OR (CI 95%) | p value |
|---|---|---|
| Pre-cannulation hemoglobin | 1,71 (0,94 – 3,11) | 0,077 |
| DEOx | 1,06 (0,99 - 1,14) | 0,086 |
| Pre-cannulation vasopressin dose | 2,72 (0,90 - 8,17) | 0,073 |
| Post-cannulation inotrope | 13,5 (0,87 - 207,6) | 0,062 |
| Post-cannulation vasopressin dose | 2,73 (0,94 - 7,91) | 0,064 |

OR, Odds Ratio; CI, confidence Interval, DEOx, Oxygen debt

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**Topic:** Cardiovascular issues in ICU

## 000849

### Unlocking the potential of arterial blood pressure waveforms: a new frontier in hemodynamic management

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000849

**Introduction:** Hemodynamic instability is a common occurrence in critically ill patients, primarily caused by a decreased preload, contractility, and/or afterload (Glassford et al., 2014; Sevransky, n.d.). Effectively managing hemodynamic instability necessitates a comprehensive understanding of its causes and associated pathophysiological mechanisms.
**Objectives:** This research aims to assess whether there is a significant variance in the morphology of peripheral arterial blood pressure (ABP) waveforms in critically ill patients before and after the administration of norepinephrine, fluids, and inotropes. We posit that each intervention will manifest clinically relevant alterations in peripheral ABP waveform morphologies, facilitating the discrimination between causes such as preload, afterload, and contractility.
**Methods:** In this observational study, 55 patients receiving a fluid bolus of 500 ml or more were enrolled to represent preload changes, and 73 patients with a norepinephrine infusion of 2 mg/ml or higher were included to signify afterload changes. Both infusions were administered in isolation, with no concurrent administration of other drugs 15 min prior to and 10 min post-intervention. The difference in 18 ABP morphology features pre- and post-hemodynamic intervention was computed. *The analysis will be expanded to also include patients with inotrope infusions.*
**Results:** The preliminary results focusing on norepinephrine and fluid administration indicate that, for the norepinephrine intervention analysis, 4 out of 18 features exhibit statistically significant differences solely pre- and post-noradrenaline intervention (Fig. 1A), while for the fluid intervention, this is to 5 out of 18 features (Fig. 1B). Notably, three features change in both interventions.
**Conclusions:** This study identifies distinct peripheral ABP waveform morphologies that enable the differentiation between deficits in preload and afterload, contributing to the understanding of the etiology of hemodynamic instability.

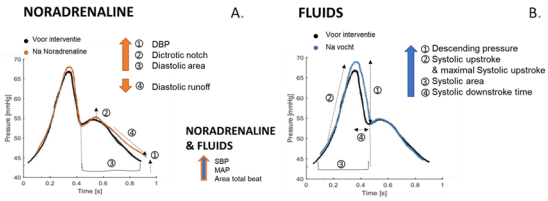


**Fig. 1 (abstract 000849)** Shows the morphology changes of the arterial blood pressure waveform after noradrenaline infusion (A) and a fluid bolus (B)

**Topic:** Cardiovascular issues in ICU

## 000850

### Transcranial Doppler on the general ICU: though the looking (stained) glass of brain perfusion

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000850

**Introduction:** Recent consensus and expert recommendations of the ESICM highlighted that qualitative analysis using transcranial Doppler (TCD) of the middle cerebral artery's (MCA) waveform is one of the basic skills for an Intensivist. Competencies in ultrasound can only be achieved through formal theoretical and hands-on training. Unlike cardiac and lung ultrasound, there is a paucity of evidence and guidelines as to how best to become competent in this skill. There is a perception that neuro ultrasound is 'too difficult' for the general intensivist. Drawing comparisons with cardiac ultrasound, some patients may have difficult windows to obtain adequate images. Studies, mostly in paediatric patients, suggest that between 15 and 30% of the general population do not have adequate temporal windows to perform transcranial Doppler of the MCA.
**Objectives:** To assess the feasibility of obtaining a standard TCD of the MCA in the general ICU population. This would help inform development of training recommendations on appropriate number of scans to achieve competencies.
To assess the interobserver variability of MCA TCD measurements.
**Methods:** Four clinicians autonomous in TCD (formal course and completed more than 100 scans each), performed TCDs of the MCA through the transtemporal window for all general critical care patients. All patients were positioned supine at a 30 degree elevation and the MCA was insonated bilaterally. Identification of MCA required appropriate direction of flow, depth of 40 to 65 mm, and Doppler spectra. All operators were trained using the same approach (identifying the mesencephalon, sphenoid wing, and MCA). A protocol was designed which identified the following metrics: the visualisation of the mesencephalon, sphenoid bone, and MCA, as well as the ability to acquire the peak systolic (PSV) and end diastolic (EDV) MCA velocities. Each scan was repeated by another operator who was blinded to first operator. Exclusion criteria included patients with soft tissue/skull injury in

the temporal region, agitated patients and other patients where the acoustic window was impossible to get to. The relationship between the results of the two operators was assessed using scatterplots and interclass correlation (ICC).

**Results:** 15 patients were scanned by a pair of operators.

In almost all the patients (86.7%), it was possible to visualise the MCA on colour Doppler or obtain a pulse-wave Doppler trace of the vessel. It was not possible to visualise the sphenoid bone with confidence in the majority of patients.

There was excellent level of agreement for PSV and EDV obtained by the operators (ICC for the PSV was 0.8 (95% CI 0.47–0.94) and ICC for EDV was 0.8 (95% CI 0.45–0.93)), unlike for the PI (ICC for the PI was 0.58 (95% CI 0.09–0.85).

**Conclusions:** In our study, it was possible to obtain a TCD of the MCA in the vast majority of patients on our general ICU. We had adequate windows in a higher proportion of patients compared to published literature.

It was also noted that the level of agreement between the operators was excellent. Whilst attempts were made to have the paired scans performed as closely as possible to each other, velocities within the MCA are affected by minor changes to patients' physiology such as coughing or straining. Hence it might be more useful to classify the images, e.g. Suzuki criteria, rather than report the velocities and ratio per se.

The limitations of our studies include the fact that the scans were performed by reasonably experienced operators. It would be expected that less experienced operators would be less successful.

In conclusion, our studies has shown that TCD of the MCA is very feasible in the general ICU population and has an excellent level of agreement between operators. This has implications for the learner when it comes to building up logbook numbers to achieve competency. However, we have also shown that there is significant variation in the obtain velocities despite similar level of expertise in the operators. This highlights the need for a more standardised approach in performing the examination.

**Table 1 (abstract 000850)** Percentage of patients where views/measurements were obtainable

| | Mesencephalon | Bony landmark (Sphenoid) | Bony landmark (Sphenoid) | MCA on Color Doppler | MCA on Color Doppler | MCA PW-Doppler | MCA PW-Doppler |
|---|---|---|---|---|---|---|---|
| R/L | | R | L | R | L | R | L |
| Number of patients where windows/measurements obtained | 9 | 9 | 4 | 13 | 13 | 14 | 10 |
| Total Patients | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| % visible | 60.0 | 60.0 | 26.7 | 86.7 | 86.7 | 93.3 | 66.7 |

| | Median (Q1-Q3) |
|---|---|
| Peak systolic velocity | 76.7 (62.9-93.8) |
| End diastolic velocity | 28.0 (21.8-37.5) |
| Pulsatility index | 1 (0.88-1.24) |

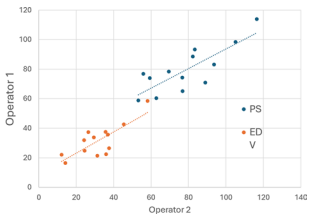


**Fig. 1 (abstract 000850)** Median and interquartile range for peak systolic velocity (PSV), end diastolic velocity (EDV) and pulsatility index (PI). Scatterplot for PSV and EDV for 2 operators

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**Topic:** Imaging in intensive care

## 000851

### Invasive line documentation: scope for Improvement

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**Introduction:** Patients in critical care are subject to many interventions, such as, placement of invasive lines. Documentation of best practice technique is a vital component of clinical governance. A snapshot audit revealed that a "missed documentation episode" occurred every 5 days during the audit period which equates to 35% compliance rate. A quality improvement (QI) team was tasked with improving our procedural documentation. Therefore, this new project focuses not only on ensuring that every invasive line inserted in critical care has associated documentation, but will also assess the quality of completion of the documentation.

**Objectives:** By November 2024, we will demonstrate that > 90% of indwelling central and arterial lines inserted in the critical care unit will have corresponding, fully completed documented evidence of insertion in line with local policy

**Methods:** Data collected weekly from five randomly selected CVC & A-line documentation. Data concerning four aspects of this documentation were collected.

Q1. Does this invasive line have associated documentation?
Q2. Has the procedure documentation been completed fully?
Q3. Is the name of the person who inserted the CVC/Aline documented?
Q4 –All—all elements completed successfully.

Several PDSA cycles were carried out with a change idea associated to each. These were infographics, educational resource at induction, addition to daily handover checklist and regular MDT presentation.

**Results:** On track to achieve the Aim Statement of > 90% of CVC and Arterial Line documentation fully completed by November 2024, our latest median line indicates CVC documentation compliance at 80% and arterial line documentation at 100%.

**Conclusions:** The success of this project is having a mechanism of knowing what we previously did not know. This self-awareness will allow continued unit discussions allowing us to react in real time to current performance. There has been a significant improvement in compliance with fully completing the invasive line documentation. Multiple line documentation episodes fail due to missed procedure documentation and lack of documentation of the operator name. A heavy workload has been highlighted as a common reason

why invasive line documentation is not completed correctly. It is well established that sustainability in QI can be challenging. Continuous data collection and having QI embedded in our unit culture are key to achieving sustainability.

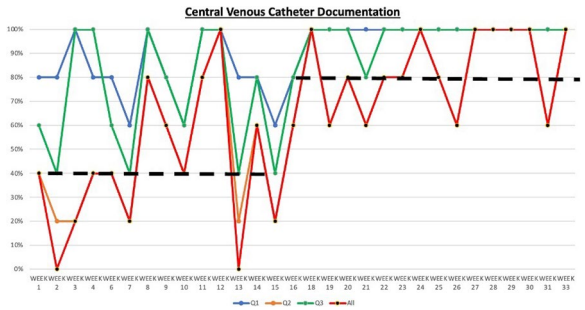


**Fig. 1 (abstract 000851)** Central Venous Catheter Documentation

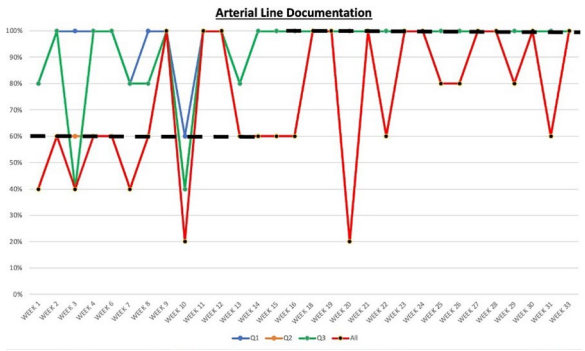


**Fig. 2 (abstract 000851)** Arterial Line Documentation

**Topic:** Information systems and Data Science

## 000852

### Efficient nebulization and pulmonary biodistribution of polymeric nanocarriers in an acute lung injury preclinical model

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000852

**Introduction:** Acute respiratory distress syndrome (ARDS) is a clinical syndrome characterized by an acute hypoxemic respiratory failure related to lung inflammation. Pneumonia and sepsis are the most common causes of this syndrome, turning ARDS into a critical public health problem. Despite recent advances in pharmacological strategies, clinical trials have not demonstrated a reduction in ARDS-associated mortality. This is in part connected to the singularity of the pulmonary physiological barrier which hampers drug delivery, more specifically, at distal areas.
**Objectives:** Here, we aim to demonstrate the suitability of polymeric nanocapsules (NCs) as a platform for the delivery of therapeutics to the lungs by nebulization, evaluating their structural properties and lung biodistribution in a model of acute lung injury (ALI).
**Methods:** Fluorescent (cyanine 5) poly(lactic-co-glycolic acid) (PLGA) NCs were prepared by a double emulsion-solvent evaporation method. Nebulization was conducted with a commercial vibrating mesh nebulizer (Aerogen Solo, Galway). To study the hydrodynamic diameter and morphology of the NCs, a nanoparticle tracking analysis (NTA) and a scanning electron microscopy (SEM) evaluation were performed. Besides, the in vivo biodistribution and uptake of NCs was evaluated in healthy and ALI rats. The lungs were analyzed by flow cytometry, confocal microscopy and IVIS Spectrum In Vivo Imaging System.
**Results:** After nebulization the NCs remained spherical and monodispersed, without significant morphological changes. The in vivo studies proved that nebulized NCs were homogeneously distributed in all lung lobes, even in the ALI animals 16 h after the administration. The cellular uptake of the NCs by epithelial alveolar type II (ATII) cells was significantly higher in healthy animals compared to injured rats (showing a 64% and 43% of retention, respectively). Also, nebulization reduced the macrophage-mediated lung clearance of our PLGA NCs promoting NCs tissue retention and absorption.
**Conclusions:** In conclusion, the nebulization of PLGA NCs does not affect their structure nor their main function, allowing their homogeneous biodistribution in the lungs and efficient cellular uptake in vivo, making them a suitable vehicle for non-invasive pulmonary drug delivery.

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5. Fundación Ramón Areces, Spanish Ministry of Science and Innovation, I3PT and CIBERES

**Topic:** Acute respiratory failure and mechanical ventilation

## 000853

### Improving the End of Life care process in ICU

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000843

**Introduction:** Up to 60% of deaths in ICU occur following an End of Life (EoL) care process, previously known as the withdrawal of life-sustaining treatment. There are many reasons why EoL care is commenced in ICU, for example, if a patient deteriorates despite treatment or if poor functional outcome is likely. The decision for EoL care is difficult and many challenges exist, particularly when communication and guidance are lacking, or there is a relationship breakdown between clinicians and families. This is not to mention the significant emotional impact on staff caring for a patient at the EoL.
Upon decision to commence EoL care for a patient, our local ICU practice recommends documentation of the discussion, completion of a simple, clinical checklist and prescribing of anticipatory medications (not standardised).
**Objectives:** To explore the impact of EoL care on staff and identify areas for improvement of the EoL care process in ICU.

**Methods:** Two surveys were sent, to nurses and clinicians (doctors and critical care practitioners), at 2 district general hospitals in Birmingham, UK. There were 33 responses over a period of 3 weeks between October and November 2023.
**Results:** Half of clinicians felt involved in EoL care decisions and 42% felt comfortable to advise how to perform EoL care processes (such as adjusting ventilator settings or discontinuing inotropic infusions). Just over 57% of clinicians had been asked by nurses to perform these tasks. Qualitative feedback from clinicians demonstrated the need to highlight the EoL checklist, the desire for education on EoL care and to be involved in family discussions more frequently.
Only 47% of nurses found EoL care plans clear, easy to follow and well documented. Most nurses (84%) felt comfortable in adjusting the ventilator and discontinuing vasopressors or inotropes. Feedback from nurses demonstrated the need for improved communication and clearer documentation from clinicians to families, the emotional burden of EoL put on nurses and the desire for a shared approach with clinicians during the process.
The EoL care checklist was improved with clearer instructions, holistic considerations and allocating staff involvement. Prescribing guidelines and a staff wellbeing checklist were created. Feedback and teaching were given to the department.
**Conclusions:** The amendment of the EoL care checklist has made it easier to follow, more holistic and individualised to the patient, and addresses which staff will be involved in the EoL care process. Prescribing guidelines will standardise practice and ensure safe doses will be administered to aid the comfort of patients. The staff wellbeing checklist recognises the emotional impact of EoL care and encourages nursing colleagues to take breaks before and after the process, debrief and signposts who to contact for support. Along with the teaching session and feedback presented, we hope that the EoL care process within our ICU will be improved for our patients.

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5. N/A

**Topic:** Ethics and end of life care

## 000854

### Construction and validation of a machine learning-based risk prediction model for unplanned readmission to the intensive care unit

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000854

**Introduction:** Unplanned readmissions to ICU represent a significant issue within healthcare systems, contributing to increased patient mortality rates, healthcare costs, and reduced efficiency in the utilization of medical resources. The development of an effective predictive model for early identification of high-risk patients is essential for enhancing clinical decision-making and optimizing resource allocation.
**Objectives:** This study aimed to construct and validate a risk prediction model for unplanned readmission to the ICU based on machine learning algorithms, providing clinicians with a tool to timely identify patients who may require additional attention and management.
**Methods:** We conducted a retrospective analysis of 445 patients discharged from the general ICU of a tertiary hospital in Lanzhou, Gansu Province, China, from 2017 to 2022, using a case–control study design. Data preprocessing and univariate analysis were performed, followed by feature selection using Lasso regularization and model-variable scoring based on eXtreme Gradient Boosting (XGBoost). We then developed five predictive models, including logistic regression, support vector machine, decision tree, random forest, and XGBoost. Model parameters were optimized using internal cross-validation and grid search. The models were evaluated using the receiver operating characteristic curve (ROC Curve), calibration curve (Calibration Curve), decision curve analysis (DCA Curve), F1 score, and Kappa coefficient. The random forest model, which demonstrated the best performance, was selected for external validation using 120 patient data records from June 2023 to March 2024.
**Results:** The selection process yielded nine pivotal predictive variables, including physical restraints, reintubation, cough capacity grading, self-funded healthcare payment modality, oxygen concentration, neutrophil count, sepsis presence, daytime transfer timing, and early warning scores. Among the five models developed, the random forest model exhibited the highest discrimination (AUC = 0.889), good calibration (Brier Score = 0.136), and clinical utility in internal validation. External validation indicated that the model had high accuracy (0.786), sensitivity (0.818), specificity (0.881), and negative predictive value (0.831), with an F1 score of 0.72 and a Kappa value of 0.447, demonstrating the model's robust predictive performance. DCA analysis showed that the model outperformed the two extreme curves within a 5% to 60% risk threshold range.
**Conclusions:** This study successfully developed and validated a machine learning-based random forest prediction model that effectively distinguishes patients at risk for unplanned ICU readmissions. The model exhibits good discrimination, calibration, and clinical application value, offering substantial support for clinical decision-making. Future research should encompass validation with larger, multicenter datasets to further improve the model's generalizability and accuracy.

**Topic:** Nursing care and physiotherapy

## 000856

### Assessment of residual sedation in patients with traumatic brain injury after cessation of midazolam infusion: is there a threshold concentration?

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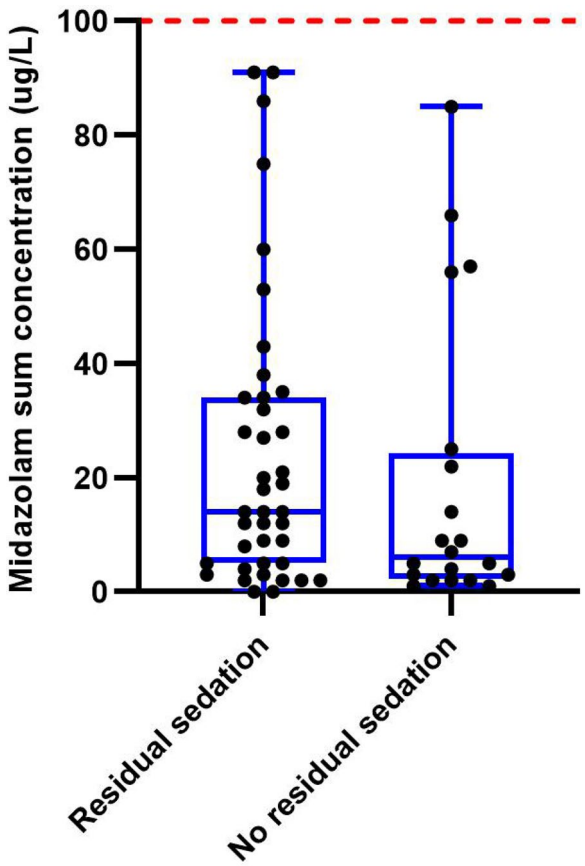
*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000856

**Introduction:** In critically ill patients with traumatic brain injury (TBI) treated with continuous infusion of midazolam for sedation, Therapeutic Drug Monitoring (TDM) of midazolam and its metabolites can help to differentiate between residual sedation and neurological status. A sum concentration of midazolam and metabolites is used, since the metabolites 1-OH-midazolam and 1-OH-midazolam-glucuronide have a sedative potency compared to midazolam of 60–80% and 10%, respectively. Based on previous literature in non-brain injured patients, it is assumed that sum concentrations of < 100 ug/L of midazolam and metabolites no longer have a significant sedative effect (1, 2). We hypothesized that TBI patients are more sensitive to midazolam exposure resulting in a lower threshold value for residual sedation.
**Objectives:** To assess the threshold sum concentration of midazolam and metabolites for residual sedation after cessation of midazolam infusion in critically ill TBI patients.
**Methods:** We performed a retrospective study at the adult intensive care unit of Erasmus MC University Medical Center between 07-2017 and 03-2024. TBI patients were included for analysis if at least one

midazolam plasma concentration < 100 ug/L was available after cessation and sequential Glasgow Coma Scale (GCS) scores were available. The sum of the Eye and Motor scores from the GCS were used to assess the residual sedation threshold, which was defined as the last available serum level that resulted in a decreased GCS of ≥ 2 EM points difference compared to the maximum GCS within the following 7 days.
**Results:** Of the 80 screened TBI patients, 52 were eligible for analysis ($n = 20 > 100$ ug/L and $n = 8$ lack of sequential GCS scores). Of the 52 patients, 65% ($n = 34$) were scored as residual sedation and 35% ($n = 18$) as no residual sedation. The sum midazolam concentration in the residual sedation group and no residual sedation group were 14 ug/L [5–34] and 6 ug/L [3–23], respectively (Fig. 1). In the patients with residual sedation an improved EM score of 3 [IQR 2–5] was observed within 3 days [IQR 1–4].
**Conclusions:** In TBI patients with residual midazolam sedation the threshold concentration is much lower than described in non-brain injured critically ill patients and residual sedation might be present at very low to undetectable plasma concentrations. Therefore, clinicians should be reluctant to make prognostic decisions based on low GCS in the presence of low plasma concentrations of midazolam and active metabolites.

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**Topic:** Neurointensive care

**000857**
**Under the hypercapnic challenge: how macrophages react to pneumonia-causing bacteria**
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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000857

**Introduction:***Streptococcus pneumoniae* is the most frequent cause of community-acquired pneumonia, while *Pseudomonas aeruginosa* leads in nosocomial respiratory infections.
Respiratory diseases are often accompanied by hypercapnia, which can impair macrophage function, hindering infection containment. In lung infections, macrophages shine not only as phagocytes, but also as major immunomodulators and local recruiters of immune cells.
Studying the role of macrophages in bacterial infection under hypercapnia will provide insights into the development of new therapies.
**Objectives:** To evaluate the inflammatory response of macrophage-like THP-1 as a result of infection with *P. aeruginosa* or *S. pneumoniae* under different CO2 concentrations, and determine the impact of macrophage response in bacterial survival.
**Methods:** Cultures of macrophage-like THP-1 cells were separately infected with *P. aeruginosa* (multiplicity of infection (MOI) 1:50) or *S. pneumoniae* (MOI 1:20) for 1 h at 37 °C under normocapnic (5% CO2) or hypercapnic (15% CO2) conditions. Then, extracellular and intracellular bacterial survival post-infection was evaluated through seeding in blood agar plates.
24h after infection, at 37 ºC and 5% or 15% $CO_2$, cell culture supernatant was analysed through ELISA technique for inflammatory (IL-1β), chemoattractant (CCL-2, IL-8) and anti-inflammatory (IL-10) mediators.
**Results:** Macrophages exhibit a higher pro-inflammatory and anti-inflammatory response to *P. aeruginosa* infection compared to *S. pneumoniae* infection. Nevertheless, under hypercapnic conditions, IL-1β secretion is enhanced in both infections 1 h and 24 h post-infection (Fig. 1A-B), while IL-10 decreases only in *P. aeruginosa* infection (Fig. 1C). Regarding phagocyte chemokines, hypercapnia decreases the secretion of CCL-2 and IL-8 chemokines in the both infection models compared to the levels secreted under normocapnia, although they are not significantly different. Although in *P. aeruginosa*-infected macrophages the secretion of chemokines is inhibited, in *S. pneumoniae* infection macrophages could play a pivotal role as recruiters (Fig. 1D-E).
Finally, no differences in post-infection bacterial extracellular survival were determined (Fig. 1F). However, *P. aeruginosa* could be establishing intracellular niches within macrophages since intracellular growth is detected 24h post-infection (Fig. 1G). No intracellular growth was detected 24h post-infection for *S. pneumoniae*.
**Conclusions:** Macrophages perform different defensive responses against *P. aeruginosa* and *S. pneumoniae* infection. Hypercapnic condition on bacterial-infection response could play a detrimental role.

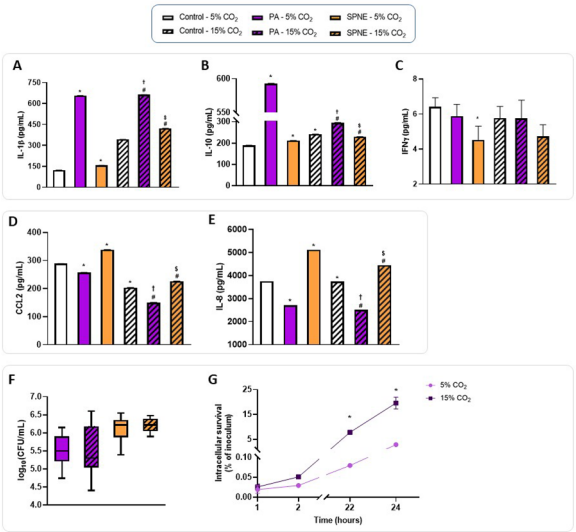


**Fig. 1 (abstract 000857)** Biological response of macrophage-like THP-1 cells after infection and consequent bacterial survival. (A-E) Protein concentration in the cell culture supernatant of inflammatory (A, C), anti-inflammatory (B) and chemoattractant (D, E) mediators 24 h post-infection with P. aeruginosa or S. pneumoniae of the THP-1 cells culture. (F) Extracellular bacterial survival of P. aeruginosa and S. pneumoniae immediately at the end of infection. (G) Intracellular bacterial survival of P. aeruginosa THP-1 cell compared to the initial inoculum administered. $n = 9–12$ in protein analysis; $n = 8–15$ in extracellular and $n = 3–5$ in intracellular bacterial survival assays. Data represented as mean ± SEM. *$p \leq 0.05$ vs Control—5% CO2. #$p \leq 0.05$ vs Control – 15% CO2. †$p \leq 0.05$ vs PA – 5% CO2. $$p \leq 0.05$ vs SPNE – 5% CO2. PA: P. aeruginosa. SPNE: S. pneumoniae. CFU: colony-forming units

**Topic:** Infections and prevention

## 000860

### Survival and functional dependence in patients with ischemic stroke and ASPECTS ≤ 7 treated with mechanical thrombectomy and admitted to ICU

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000860

**Introduction:** Survival and functional dependence in patients with ischemic stroke and ASPECTS ≤ 7 treated with mechanical thrombectomy and admitted to ICU
**Objectives:** To study the differences in survival and outcome of acute ischemic stroke (AIS) patients treated with MT according to the observed value on the Alberta Stroke Program Early Computed Tomographic Score (ASPECTS)
**Methods:** Retrospective study (January 2015- May 2023). All patients admitted to ICU with an AIS treated with MT were included. Patients were classified according to the ASPECTS values in Group A (ASPECTS ≤ 7) and B (ASPECTS > 7). The following variables were recorded: age, gender, NIHSS score on admission, time between symptoms onset and hospital admission and between symptoms onset and recanalization, systemic thrombolysis before MT, TICI score, ICU and hospital length of stay, destination after hospital discharge and ICU, hospital and 6-month survivals. Functional dependence was measured at hospital admission and 6 months after the discharge using the RANKIN scale.
**Results:** 316 patients were included. Group A $n = 98$ and B $n = 218$.
Group A: mean age 70 ± 13 years; 43.6% male ($n = 41$), NIHSS on admission 18 ± 5. Time between symptoms onset-hospital admission: 3 ± 2h and between symptoms onset and recanalization: 4 ± 2h (30% wake-up stroke). Systemic thrombolysis before MT: 27.7% ($n = 26$). TICI score of 3: 82% ($n = 78$). ICU and hospital length of stay: 5 ± 8 days and 19 ± 20 days. Survivals: ICU 84% (n = 79); hospital: 70% ($n = 66$) and 6-month: 60% ($n = 57$). 40.4% ($n = 38$) were admitted to a rehabilitation facility. RANKIN on admission 0 ± 1 vs. 4 ± 2 at 6 months.
Group B: mean age 71 ± 12; 49.5% male ($n = 109$). NIHSS on admission 15 ± 6. Time between symptoms onset-hospital admission: 3 ± 3h and between symptoms onset and recanalization: 5 ± 2h (20% wake-up stroke). Systemic thrombolysis before MT: 34% ($n = 75$). TICI score of 3: 89% ($n = 114$). ICU and hospital length of stay: 2.8 ± 5.6 and 15 ± 13 days. Survivals: ICU 92.7% ($n = 204$); hospital: 82.2% ($n = 181$) and 6-month 78.6% ($n = 173$). 22.2% ($n = 49$) were admitted to a rehabilitation facility. RANKIN on admission 0 ± 1 vs. 2 ± 2 at 6 months.
**Conclusions:** Patients with ASPECTS ≤ 7 and MT had lower ICU and 6-month survivals and worst functional outcome at 6 months.

**Topic:** Neurointensive care

## 000861

### Ultrasound evaluation of expiratory muscle activity during high-flow nasal cannula oxygen therapy in critically ill patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000861

**Introduction:** Respiratory muscle function plays a critical role in maintaining adequate ventilation and gas exchange 1), particularly in critically ill patients 2). While much attention has been devoted to investigating inspiratory muscles, such as the diaphragm 3–4), less attention has been focused on expiratory muscles 5). High-flow nasal cannula (HFNC) oxygen therapy offers heated and humidified oxygen at high flow rates 6), potentially affecting the inspiratory and expiratory muscles. Understanding the effects of HFNC on respiratory muscle activity could provide valuable insights into optimising respiratory support strategies in critically ill patients.
**Objectives:** This study investigated the effects of HFNC on respiratory muscle activity using ultrasound assessment, specifically to assess changes in expiratory muscle thickness during HFNC at different flow rates.
**Methods:** This prospective observational crossover study included 30 adult patients admitted to our mixed intensive care unit. Patients indicated for HFNC after their first extubation (acute respiratory failure, at high risk of reintubation and post-cardiac surgery) were included. End-inspiratory and end-expiratory thicknesses of the diaphragm, rectus abdominis muscle and abdominal muscles (external oblique [EO], internal oblique [IO] and transversus abdominis [TrA] muscles) were measured using ultrasound initially in low-flow oxygen therapy and then during HFNC at flow rates of 30, 40 and 50 L/min. After the HFNC protocols, low-flow oxygen therapy was resumed. The primary endpoint was the thickening fraction (TF) changes in the respiratory muscles with different HFNC flow rates. The thickening fraction of abdominal muscles (TFABD) was used to categorise patients into two groups reflecting expiratory muscle recruitment. Data from each point were analysed by repeated measures analysis of variance with multiple comparisons for effect over time. $P < 0.05$ was considered statistically significant.

**Results:** For the TF of all muscles, only the difference in diaphragm TF at 50 L/min was significant compared to the baseline ($p=0.0022$). Patients with TFABD of < 0% demonstrated a significant decrease in TFABD at 40 and 50 L/min ($p=0.0048$ and 0.0052, respectively). Additionally, in patients with TFABD of < 0%, HFNC at a given flow rate significantly reduced TFIO ($p=0.029$, 0.0009 and 0.0298 at 30, 40 and 50 L/min, respectively) and TFTrA ($p=0.0047$ at 50L/min) compared to patients with TFABD of > 0%. TFIO and TFTrA were strongly correlated with TFABD ($r=0.7764$ and 0.7122, respectively).
**Conclusions:** During HFNC, respiratory muscle activity assessed by ultrasound was widely changed. Furthermore, decreased TFABD was associated with reduced TFIO and TFTrA. These findings underscore the importance of further research exploring the effects of HFNC oxygen therapy on respiratory muscle activity.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000862

### Albumin administration and vasopressor dosage in Burn ICU patients during acute phase shock

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000862

**Introduction:** Vasopressors and albumin are frequently used for the treatment of shock in burn patient to support hemodynamic status, but their use is not well-described in the burn literature.
**Objectives:** This study aimed to investigate the coadministration of noradrenaline and albumin during the resuscitation of postburn shock.
**Methods:** This study was conducted in a specialized burns ICU in 2023. Adult burn patients with postburn shock receiving noradrenaline and albumin during the resuscitation phase were included. Data regarding patient characteristics, burns characteristics, prognostic scores, noradrenaline and albumin use resuscitation fluid volume were recorded.
**Results:** Data of 30 intubated patients admitted to a Burn ICU during 2023 were analyzed retrospectively (for the first 8 months and prospectively thereafter). Mean age of patients was $54.33 \pm 16.51$ years and TBSA (total body surface area) burnt was $34.57 \pm 16.61\%$, ICU mortality rate was 23%. Twenty-four patients (80%) received albumin during the first 24-h period, 27 (90%) during the second and 26 (87%) during the third postburn days. All patients were under continuous noradrenaline administration as a part of shock treatment. Median noradrenaline dosage was 0.19 mcg/kg/min (0.08-0.37) at 24 h, 0.21mcg/kg/min (0.1-0.38) at 48 h and 0.28 mcg/kg/min (0.11-0.38) at 72 h. Using Friedman's test, no statistical significance was found among noradrenaline dosage at admission, 24 h, 48 h, and 72 h ($p=0.13$). No correlation was found between maximum noradrenaline dosage and fluid administration during the first 24 h (Spearman's rho, $p=0.46$). Noradrenaline dosage was higher by 0.09 mcg/kg/min in patients who received albumin in the first 24 h ($p=0.03$) and higher by 0.23 mcg/kg/min in patients who received albumin in the third day ($p=0.038$).
**Conclusions:** Our results show that albumin was frequently used during acute burn resuscitation; albumin supplementation was associated with higher doses of noradrenaline as an adjunct in managing burn shock.

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**Topic:** Cardiovascular issues in ICU

## 000865

### Management of PDR *Klebsiella pneumoniae* blood infections in ICU

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**Introduction:***Klebsiella* spp infections emerge as a particularly critical problem in Greece due to increasing antimicrobial resistance and lack of therapeutic alternatives. It is noteworthy that mortality resulting from Klebsiella infections in the ICU can reach up to 51%. The need for novel therapies has thus become urgent.
**Objectives:** The aim of this preliminary, ongoing study is the investigation of therapeutic efficacy of three antimicrobial combinations of ceftazidime–avibactam in patients with Pandrug Resistant Klebsiella pneumoniae New Delhi Metallo-β-lactamase (NDM). The primary objective was the sterilization of blood cultures in 14 days.
**Methods:** 24 patients were included (17 male, 7 female) with median age of 57, from June 2023 to February 2024.
10 patients had suffered severe traumatic brain injury, 4 patients were major trauma patients, 5 patients presented with intracerebral haemorrhage and 5 patients underwent abdominal surgery. Median length of stay in the ICU was 22 days.
All 24 patients presented with PDR NDM *Klebsiella pneumoniae* blood steam infections. Antimicrobial synergy with ceftazidime–avibactam was tested in the microbiology lab. The combinations that proved to be in vitro effective were: Ceftazidime/avibactam + aztreonam, Ceftazidime/avibactam + colistimethate and Ceftazidime/avibactam + meropenem.
8 patients received ceftazidime/avibactam + aztreonam (Group 1)
10 patients received ceftazidime/avibactam + colistimethate (Group 2)
6 patients received ceftazidime/avibactam + meropenem (Group 3)

**Results:** Group 1: 7 out of 8 patients presented with sterile blood cultures by the 14th day The synergistic effect of ceftazidime/avibactam + aztreonam was effective in 87.5% of the patients. 6 patients were transferred out of the ICU by the 16th day.
Group 2: 6 out of 10 patients presented with sterile blood cultures by the 14th day. The synergistic effect of ceftazidime/avibactam + colistimethate was effective in 60% of the patients. 5 patients were transferred outside the ICU by the 18th day.
Group 3: 2 out of 6 patients presented with sterile blood cultures by the 14th day. The synergistic effect of ceftazidime/avibactam + meropenem was effective in 33.3% of the patients. 3 patients were transferred outside the ICU by the 21th day.
**Conclusions:** The combination of ceftazidime/avibactam + aztreonam seems to be more effective in the treatment of PDR *Klebsiellapneumoniae* NDM. The search for effective antimicrobial treatment of PDR *Klebsiella pneumoniae* NDM is crucial, especially in Greece.

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**Topic:** Infections and prevention

## 000866

### Descriptive analysis of pharmacological and invasive therapy in intermediate-high risk PE at a third-level hospital

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**Introduction:** The high-intermediate risk pulmonary embolism (PE) represents a serious medical condition with a calculated mortality rate around 15%. The primary therapeutic strategy recommended for its management is systemic fibrinolysis. However, catheter-guided mechanical thrombectomy has been yielding satisfactory results in recent published trials.
**Objectives:**

- Identify demographic characteristics in patients with intermediate-high risk PE according to the treatment employed in a multidisciplinary ICU in a tertiary hospital.
- Establish the severity of the clinical situation by analyzing admission scales and risk factors.
- Describe therapies in the study population and their mortality outcomes.

**Methods:** Analytical cross-sectional study including 48 patients diagnosed with intermediate-high risk PE in the unit. Patients treated with invasive techniques and systemic pharmacological therapy were selected. Demographic data as well as severity and mortality predictive scales at admission were collected. Complications associated with admission and mortality rates were evaluated.
**Results:** Out of 48 patients with moderate-to-severe risk PE, 22.9% ($n = 11$) were treated with thrombectomy and/or fibrinolysis. Two cases underwent systemic thrombolysis and nine underwent mechanical thrombectomy.
Most patients were male (82%) with a mean age of 65 years.
The prognostic score at admission, according to the PESI scale, in patients undergoing mechanical thrombectomy was above 141 (high risk) with an estimated mortality according to the APACHE II scale between 24-55%.
Patients undergoing mechanical thrombectomy (81.8%) presented right heart chamber overload in 88.8% of cases, requiring post-procedure amines in two of the described cases.
One patient treated with fibrinolysis died. In mechanical thrombectomy, mortality was 55%, with one case being a consequence of the therapy.
**Conclusions:** Intermediate-high risk PE is more prevalent in males > 65 years old, with high mortality at admission. This was more frequent in the group treated with mechanical thrombectomy.
The sample size does not allow for conclusive results; it will be expanded to improve as a pilot project in which we continue recruiting patients.
In the future, it is possible that guidelines may recommend mechanical thrombectomy as the first-line therapy over fibrinolysis, given the good outcomes and low morbidity and mortality.

**Topic:** Acute respiratory failure and mechanical ventilation

## 000869

### Impact of ambient particulate matter on the outcome after cardiac surgery

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**Introduction:** Air pollution is becoming a major public health issue as it has been proved to be one of the most important risk factors in cardiovascular diseases. Particulate matter (PM) which constitutes part of the air pollution, are the ones most likely to cause health problems. Several studies have focused on the effects of exposure to PM as a contributor factor triggering cardiac failure or myocardial ischemia; however, there are still no studies on the outcomes of patients undergoing major cardiac surgery.
**Objectives:** To study the impact of air particulate matter on outcomes after major cardiac surgery.
**Methods:** A retrospective observational study has been made with data from patients who have undergone major cardiac surgery in Hospital Central Universitario de Asturias (Oviedo, Spain) between 2019 and 2022. Data on PM2.5 and PM10 was obtained from the closest station to each patient address, and values from the last 14 days before surgery averaged. Main outcome measurements were ICU discharge and death, and were modelled using Cox regression to calculate hazard ratios and their 95% confidence interval. Results are expressed as median and interquartile range.
**Results:** PM data were available for 2042 patients out of 3859 operated in the study period. Median age was 70 (62–77) years. 676 (33%) patients were female. Median SAPS3 was 45 (38–53). ICU length of stay was 3 (2–4) days. There were 124 (6%) and 316 (15%) cases of urgent and emergent surgery, respectively. Mortality was 7% (148 patients, 2%, 6% and 24% in scheduled, urgent and emergent surgery, respectively). Median exposure to PM2.5 in the 14 days before surgery was 10.45 (8.40–12.36) mg/m$^3$, whereas median of exposure to PM10 in the same period was 21.30 (17.93–26.37) mg/m$^3$. After adjustment by age, sex and type of surgery, mean PM2.5 before surgery was associated with an increased risk of death (HR 1.10 [1.01–1.18], $p = 0.028$).
**Conclusions:** PM levels before major cardiac surgery are associated with an increased mortality.

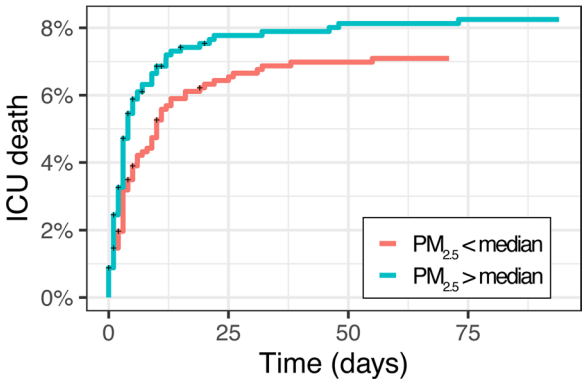


**Fig. 1 (abstract 000869)** Cumulative incidence of death according to the median PM2.5 14 days before surgery (HR 1.10 [1.01–1.18], $p = 0.028$, per unit increase)

**Topic:** Perioperative care

### 000870 Profiling the physical recovery of patients admitted to a general intensive care unit (ICU)

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000870

**Introduction:** Functional impairment and disability impacting on quality of life is common in ICU survivors (Rousseau, et al., 2021). Functional scores performed at ICU discharge can predict discharge location at 3 months (Eggman, et al., 2022).
**Objectives:** The aim of this study is to profile the recovery pathway, rehabilitation interventions and outcomes of a general ICU population.
**Methods:** Ethical approval was granted by the TUH SJH ethics committee. All patients admitted from 1st Sept 2023 until 22nd Dec 2023 were screened for inclusion (received care in ICU > 72 h). Exclusion criteria were death, transition to end of life care, new orthopaedic or neurological injury, multiple admissions to critical care areas, discharge against medical advice and discharged home directly from ICU. Data were obtained from the inpatient hospital databases and included demographic and baseline information, time to achieve functional mobility goals in ICU (Manchester Mobility Score [MMS]; Chelsea physical functioning assessment tool—[CPax]) at ICU discharge and at 3 months' post ICU discharge (hospital discharge information, total length of stay, discharge destination mobility status and onward referrals).
**Results:** 339 patients were screened for participation. 145 patients met the inclusion criteria (64.1% [$n = 93$] were men; average age 61.4yrs (SD 14.88); 52.8% [$n = 76$] were surgical admissions; 41.3% [$n = 60$] were mechanically ventilated; 12.4% [$n = 18$] had a tracheostomy; average length of ICU stay 7.5 days [SD 7.84]; 86.2% were independently mobile pre ICU admission). The median day to achieve MMS 2 = sit over edge of bed was D1 (range 1-20); MMS 4 = standing practice was D1 (range 1–26); MMS 5 = transfers was D1 (range 1–27); MMS 6 = mobilising was D3 (range1–43). 46.9% ($n = 68$) of this cohort achieved MM5 transfer to chair on D1. The average CPax at ICU discharge was 37.4 (SD 8.59). Average length of total hospital stay was 32.8 days (SD 30.08), 79.7% ($n = 117$) patients were discharged home at 3 months' post ICU discharge, at this time point 72.7% ($n = 104$) were independently mobile.
**Conclusions:** Over half of this cohort of patients were surgical admissions to ICU. The study centre is a complex cancer surgery centre with enhanced recovery after surgery protocols which stipulate early mobility targets. This cohort had a high CPax score on ICU discharge reflective of the high volume of surgical patients. Further investigation of the impact of functional measures in ICU on long term recovery is warranted.

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**Topic:** Nursing care and physiotherapy

### 000872 Predictors of mortality in haematology and oncology patients admitted to the intensive care unit: a retrospective analysis

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000872

**Introduction:** Patients with cancer or hematological malignancy are fragile and may experience complications requiring unplanned intensive care hospitalization, which can be associated with significant morbidity and mortality. Defining adequate therapy goals and intensive care unit (ICU) admission criteria for these patients presents a constant challenge. This study aimed to assess the mortality rate among haematologic-oncologic patients admitted to the ICU and the predictive factors associated with high ICU mortality.
**Methods:** This retrospective cohort study was conducted in the intensive care unit (ICU) of Intercommunal Hospital Group Le Raincy Montfermeil from January 2017 to March 2024. Factors related to mortality were assessed through univariate and multivariate analysis.
**Results:** In total, 80 patients were admitted to the ICU during the study period. The mean age was 66 ± 10 years. The mean SAPS II was 53 ± 21. Fifty-eight patients (72%) had cancer, and 22 (28%) had hematological malignancy. Pulmonary cancer was the most prevalent solid tumor (43%), and lymphoma was the most prevalent hematological malignancy (40%). Most of the patients (68%) were transferred from the haematologic-oncologic unit. Of the 80 admitted patients, 32 (40%) were admitted for sepsis and 24 (30%) for acute respiratory failure. Other less prevalent diagnoses were pancytopenia, coma, hydroelectrolytic disorders, and cardiac arrest. Thirty patients (38%) underwent mechanical ventilation, and 43 (54%) patients required vasopressor support. The mean length of stay in the ICU was 6 days, similar between deceased and surviving patients. In this cohort, 46 patients died, and 34 were discharged. A limitation of therapeutic efforts was decided for 35 patients (44%). Univariate analysis found that sepsis was more prevalent in the group of deceased patients. Multivariate analysis demonstrated that serum lactate at admission was significantly associated with increased mortality in the ICU, with an odds ratio of 1.35 [1.12–1.72]. The use of mechanical ventilation also significantly increased ICU mortality, with an odds ratio of 5 [1.48–20]. However, sepsis was not independently associated with ICU mortality in haematology and oncology patients.
**Conclusions:** The main finding of this study is the high mortality rate of patients with cancer or hematological malignancy admitted to the ICU. Hyperlactatemia and the need for mechanical ventilation were significantly associated with higher ICU mortality. The establishment of clear goals and approaches for the admission and treatment of haematology and oncology patients in the ICU is urgently needed.

**Topic:** Haematologic-oncologic issues in the ICU

## 000873 Elucidating the origins of circulating DNA in adults during extracorporeal membrane oxygenation

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**Introduction:** Circulating DNA and nucleosomes are a new class of biomarkers for severe respiratory infection and sepsis. The most serious of these cases undergo extracorporeal membrane oxygenation (ECMO), but the effects on circulating DNA and chromatin biomarkers are unknown. To understand the changes and origins of circulating DNA in patients with severe infection-related respiratory failure, we performed next-generation sequencing to profile plasma cell-free DNA (cfDNA) in patients before, during, and after ECMO treatment. We used Oxford Nanopore Technologies (ONT) because it does not require amplification, enables both long and short DNA sequencing and is most suitable for near-patient rapid analysis in the hospital setting. Our previous work showed that shallow whole-genome ONT sequencing with 0.5 × genomic coverage could determine changes in cell of origin and cfDNA fragmentation patterns using this approach [1].
**Methods:** We analyzed plasma cfDNA from more than 60 timepoints from 8 patients, with one timepoint collected before ECMO, multiple timepoints during ECMO, and one or more timepoints up to 2 days after decannulation. All patients were referred to the Guy's and St. Thomas' Severe Respiratory Failure Service and were placed on ECMO in accordance with national guidelines [2]. We measured global chromatin levels for each sample using an antibody-based assay for H3.1 nucleosomes (Nu.Q®) and sequenced cfDNA using ONT long-read, amplification-free sequencing. We determined Cell of Origin of circulating DNA using computational deconvolution of genome-wide DNA methylation levels from ONT sequencing reads.
**Results:** We obtained a median of 16.9 million reads per timepoint (lowest = 9.3 M, highest = 26.4 M), corresponding to 1.3 × genomic coverage. Using unsupervised clustering, we identified significant differences between fragmentation patterns before and during ECMO. We used DNA methylation Cell of Origin analysis to understand the relative contribution of cells from the infected tissue vs. cells from the immune system overall and with respect to the fragmentomic changes observed. We also investigated the sensitivity of shallow ONT sequencing to detect pathogenic DNA in 6 of 8 patients with confirmed bacterial infection.
**Conclusions:** ONT sequencing can reveal key molecular markers from circulating cell-free DNA patients with severe infections. The ability of ONT to profile both fragmentomic properties as well as DNA methylation allowed us to identify changes associated with severe respiratory failure and ECMO. The suitability of ONT sequencing for near-patient, rapid sequencing makes it a promising technology in the critical care setting.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000875 High-dose vitamin D supplementation in patients with SARS-CoV2 pneumonia: a retrospective cohort study

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**Introduction:** Vitamin D is involved in both innate and adaptative immune responses, with virtually all immune cells expressing vitamin D receptors and some having the ability to hydroxylate vitamin D to its active form [1]. Vitamin D supplementation in respiratory infections has been a research topic for many decades, but its role is still controversial. With the start of the COVID-19 pandemic, new research emerged on the topic. Lower levels of 25-hydroxyvitamin D have been associated with worst severity of SARS-CoV2 infection [2]. Moreover, multiple observational studies and randomized-controlled trials (RCT) have been published regarding the effects of vitamin D supplementation. A recent systematic review and meta-analysis [3] showed no benefit on mortality, intensive care unit (ICU) admissions and rate of mechanical ventilation in COVID-19 patients. When pooling only observational studies, there was a statistically significant decrease in mortality (with a higher GRADE of recommendation than the pooled RCTs). Only 2 of 16 included studies focused on patients admitted to the ICU.
**Objectives:** We performed a retrospective cohort study in patients hospitalized in a single-center ICU to further study the prognostic impact of vitamin D supplementation in critical patients with SARS-CoV2 infection.
**Methods:** We included 126 COVID-19 patients hospitalized in the ICU between April and October 2020. 72 patients received 250,000 UI of cholecalciferol *per os*, at 24 h and 48 h after admission. 54 patients admitted in the same period that did not receive supplementation were included in the control group. For initial statistical analysis we used the two-samples unpaired Wilcoxon test, and Chi-squared or Fisher's exact test.
**Results:** Baseline characteristics were similar between groups, including APACHE-II and SAPS scores. Median vitamin D levels at admission were 76 ng/mL, and similar between groups ($p = 0.683$), with higher levels in the supplemented group at day 3 ($p = 0.009$). 87% required ventilatory support for a median duration of 10.5 days, with no significant difference between groups ($p = 0.847$). The need for vasopressors ($p = 0.650$) and renal replacement therapy ($p = 0.499$) was also similar. Patients that received vitamin D had a lower ICU mortality (OR 0.103 with 95%CI [0.02–0.42]), intra-hospital mortality (OR 0.26 with 95%CI [0.08–0.8]) and 60 days after discharge mortality (OR 0.196 with 95%CI [0.05–0.62]), according to a multivariate logistic regression adjusting for age, chronic kidney disease, creatinine at admission, APACHE-II and SAPS scores. In a survival analysis, all-cause mortality was reduced in the supplemented group (HR 0.34 with 95%CI [0.15-0.76])—view Fig. 1.
**Conclusions:** High-dose vitamin D supplementation was associated with lower all-cause mortality in critically ill COVID-19 patients admitted to the ICU.

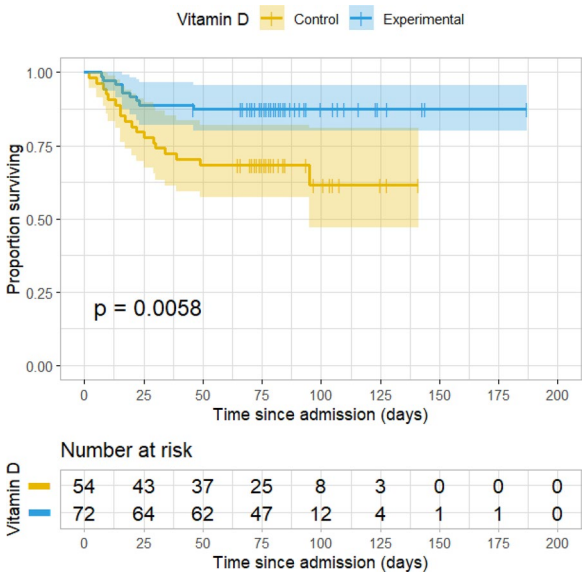


**Fig. 1 (abstract 000875)** Kaplan–Meier curve showing survival analysis of patients that received vitamin D supplementation vs. control group

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**Topic:** Infections and prevention

## 000876

## Feasibility of multi-domain data acquisition in patients at risk for hypoxic–ischemic brain injury following cardiac arrest: a cohort study (ACQUIRE)

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000876

**Introduction:** Hypoxic–ischemic brain injury (HIBI) is a major determinant of both long-term neurologic injury and death in patients who survive cardiac arrest [1, 2]. While small studies have examined early neurophysiologic changes in HIBI, none have characterized patients from acute injury to long-term neurologic outcomes. Additionally, invasive monitoring excluded patients requiring anticoagulation; new Transcranial Doppler (TCD) neuromonitoring will allow us to characterize all patients with HIBI.
**Objectives:** This study aims to demonstrate feasibility of (1) patient recruitment, (2) acquiring multi-domain variables (neurophysiology, biomarkers of neurologic injury, and imaging), and (3) determining six-month post-discharge neurocognitive outcomes in a cohort of patients with HIBI after cardiac arrest.
**Methods:** This was a prospective cohort study conducted in the critical care unit of a tertiary academic hospital in Vancouver, Canada. We obtained approval from the University of British Columbia Clinical Research Ethics Board (H22-00208) and the study was registered in Open Science Forum (https://doi.org/10.17605/OSF.IO/QBW5K). We included patients 16 years of age or older admitted to critical care who remained comatosed (GCS $\leq$ 8) following a cardiac arrest. Informed consent was obtained from the Legal Authorized Representative. We measured flow-velocity in the middle cerebral artery using transcranial Doppler (TCD). We also collected biomarkers of neurologic injury daily for the first 3 days, and on day 7, as well as any imaging (CT or MRI) or electroencephalography performed while in hospital. Post-discharge outcomes assessment were assessed at 6 months for survivors (either in-person or remotely), and included patient outcome assessments, blood biomarkers, and an MRI brain.
**Results:** Thirty patients were enrolled between June 2022 and May 2023, with a mean age of 59 years (SD 17) and 7 (23%) females. Eighteen (60%) presented with a shockable rhythm. The median time to ROSC was 18 min [IQI 10 to 34], and 12 (40%) survived to hospital discharge. We obtained a TCD in 23 (77%) patients, 3 had no insonation window, and there were technical failures in 4. All patients had a CT scan, 21 (70%) had EEG, and 10 (33%) had an MRI. Biomarkers were collected in 29 of 30 (97%) on day-1, 28 of 30 (93%) on day-2, 21 of 26 (81%) on day-3, and 12 of 17 (71%) on day-7. Outcome assessments were completed in 9 of 12 (75%) survivors: 2 declined to participate and 1 was lost to follow-up. Four had in-person assessments, and 5 were completed remotely. Only 1/4 in-person participants had an MRI. Approximately 20% of survivors had reported higher levels of disability.
**Conclusions:** We demonstrated feasibility in recruitment, obtaining neurologic biomarkers, TCD, and 6-month neurologic outcomes for a remote battery. In-person assessments, including MRI and biomarkers, were not feasible. We expect approximately 20% of participants to have higher disability at time of follow-up.

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3. We gratefully acknowledge the support from the Zoll Foundation which provided grant funding for this study recruitment, patient renumeration, and conference presentation. We also received funding from the Jenkins Memorial Fund to assist with future publication costs.

**Topic:** Cardiac arrest

## 000877

### Inhibiting CXCR2-mediated cytokine sensing to target neutrophil dysfunction in sepsis

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**Introduction:** Neutrophils are pivotal in defending the host against pathogens during sepsis, but their functions, including migration, antimicrobial activity, and immunosuppression, are compromised. Restoring neutrophil function improves sepsis outcomes, suggesting targeting neutrophils as a promising therapeutic strategy. Specifically, dysregulation of CXCR2, a chemokine receptor critical for neutrophil maturation and recruitment, correlates with sepsis severity. Inhibiting CXCR2 has shown efficacy in clinical trials and animal models, but the interaction between CXCR2 treatment and its ligand during sepsis remains incompletely understood.
**Objectives:** Our study evaluated the therapeutic potential of CXCR2 inhibition with Danirixin in sepsis, investigated the relationship between CXCR2 inhibition and blood IL-6 levels, examined the expression profiles of Cxcr2 and its ligands in immune cells, and characterized the immune response to Danirixin treatment in septic mice.
**Methods:** Low and high severity sepsis was induced in C57BL/6J mice using a fluid, analgesic and antibiotic resuscitated Peritoneal Contamination and Infection (PCI) model with pathogen loads resulting in 50% and 10% 7-day mortality. Cohorts received three doses of the Cxcr2 antagonist Danirixin or a vehicle solution at 6, 30 and 54 h post-infection. Inflammation was accessed repeatedly from venous blood samples at 6, 24, 48 h and 7 days after infection. Blood IL-6 level was used in a logistic regression model to stratify septic mice at risk of death. CIBERSORTx deconvolution was applied to microarray analysis of septic mice to decipher Cxcr2 expression profiles in immune cells 6 h and 24 h after infection. In addition, we investigated pathogen load and histopathological changes and tissue immune infiltration using microbiology and histology.
**Results:** Notably, only the high-severity sepsis model showed a significant reduction in mortality rate (87% vs. 52% in the control group). However, blood IL-6 levels did not correlate with CXCR2 inhibition. Survivors in the low-severity group, after 48 h of Danirixin treatment, had lower IL-6 levels compared to the control group. Genes that are major ligands for Cxcr2 (Cxcl1, Cxcl2, Ifit2, and Ifit3) were predominantly expressed in macrophages and Th cells. Conversely, survivors in the high-severity group treated with Danirixin exhibited elevated IL-6 levels 24 h post-PCI. The IL-6 level at 24 h emerged as a significant predictor of septic survival, with a cut-off of 2327 pg/mL. The group predicted to survive treated with Danirixin had no deaths, while most deaths occurred in the group predicted to die. Bulk sequencing data revealed systemic inflammation and immunosuppression. Blood and lungs exhibited a high neutrophil to lymphocyte ratio at 6 and 24 h post-sepsis, while the liver and spleen showed increased macrophages and lymphocytes.
**Conclusions:** Our study highlights the potential of CXCR2 inhibition as a therapeutic strategy in sepsis, particularly in high-severity cases. While Danirixin treatment led to a significant decrease in mortality rates in high-severity sepsis, its impact on blood IL-6 levels varied across severity groups. Gene expression analysis revealed distinct expression patterns of Cxcr2 and its ligands in immune cells, indicating the complexity of their interactions during sepsis. Overall, these findings contribute to our understanding of modulation of neutrophil function and immunomodulation in sepsis, suggesting CXCR2 as a promising target for future therapeutic intervention.

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**Topic:** Sepsis

## 000880

### Nutritional requirements in critically ill patients with subarachnoid hemorrhage, intracerebral hemorrhage, and traumatic brain injury: a prospective observational study

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**Introduction:** Adequate nutrition of critically ill patients remains challenging, because factors such as pathophysiology of the life-threatening disease, chronic diseases, and status of nutrition at admission impede the estimation of the individual energy expenditure (EE) (Kamel et al., 2022, Israfilov and Kir, 2021, Preiser et al., 2014). In patients with aneurysmal subarachnoid hemorrhage (SAH), activation of the sympathetic nervous system could increase EE and few data exist for traumatic brain injury (TBI), and intracerebral hemorrhage (ICH) (Dilrai et al., 1992, Touhu et al., 1990, Tatucu-Babet OA et al. 2020).
**Objectives:** We aimed to compare EE in patients with SAH with endovascular securing of the (SAHi), SAH with microsurgical securing of the aneurysm (SAHs), TBI, and ICH. Critically ill patients suffering from sepsis served as controls.
**Methods:** This single-center prospective study included patients suffering from SAH, TBI, ICH and sepsis. We performed indirect calorimetry (IC; QNRG +, COSMED, Rome, Italy) at 3 timepoints (TP; TP1: day 1-3; TP2: day 5-7 and TP3: day 12–15). IC was performed twice per timepoint and the mean values used for further analysis. Exclusion criteria were spontaneously breathing patients requiring oxygen supplementation, ventilated patients with an inspiratory oxygen fraction > 70%, a positive end-expiratory pressure > 12 mbar, leakage from the airway system, and patients requiring non-invasive ventilation. The results of IC were used for the adjustment of nutritional therapy according to hospitals standards. The individual EE at all three timepoints was compared using a generalized mixed model analysis with sequential Bonferroni correction.
**Results:** From June 1, 2021 to February 28, 2023, 110 Patients were included (SAHi: 30, SAHs: 13, TBI: 22, ICH: 23 sepsis: 22). At TP1, EE for SAHi was (mean ± standard deviation) 1633 ± 404 kcal, 1504 ± 459 for SAH, 1470 ± 473 for TBI, 1403 ± 409 for ICH, and 1557 ± 461 for sepsis (ICH vs. SAHi: $p < 0.01$, ICH vs. sepsis: $p < 0,01$, all other: n.s.). At TP2, EE

for SAHi patients was 1723 ± 386, SAHs 1755 ± 374, TBI 1579 ± 362, ICH 1534 ± 326, and sepsis 1416 ± 256 (ICH vs. SAHi: $p < 0{,}01$, ICH vs. SAHs: $p < 0{,}05$, all other: n.s.). At TP3, EE was 1458 ± 246 for SAHi, 1653 ± 167 for SAHs, 1856 ± 200 for TBI, 1644 ± 564 for ICH, and 1514 ± 282 for sepsis (all n.s.).
**Conclusions:** During the first week after ictus, EE in ICH patients was lower than in SAH and sepsis patients. Further data are required to confirm our results and to elucidate the mechanisms for a decreased EE in ICH patients. Until further data are available and due to a high interindividual variability, we suggest using IC for the estimation of caloric needs in neurocritically ill patients.

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7. none


**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000881

### Plasma renin kinetics in comparison with lactates in assessing shock reversal in septic shock: a prospective study

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**Introduction:** Septic shock is defined as a subset of sepsis in which particularly profound circulatory, cellular and metabolic abnormalities are associated with a greater risk of mortality than with sepsis alone. (1) The conventional biomarker for hypoperfusion in septic shock is elevated lactate levels and though it predicts mortality, its specificity is low. (2) As a part of pathophysiological mechanism of septic shock, there is deregulation of renin angiotensin aldosterone pathway3 and as a surrogate we studied plasma renin activity (PRA) and its performance weighing lactate kinetics in shock reversal in patients with septic shock.
**Objectives:** Primary outcome:
1. Predictor of icu survival
Secondary outcome:
1. Number of vasopressor days
2. Incidence of acute kidney injury
3. ICU length of stay
**Methods:** Our study design is single centered, prospective and observational. Ethical committee approval and CTRI enrolment were done prior to recruitment. As an interim analysis, we enrolled 30 adult patients with septic shock as per sepsis-3 definition (1) within 48 h of diagnosis. Blood samples of PRA and lactates were sent for analysis at admission and at 6 h. Rest management were uninterrupted by the investigator and lies within the discretion of the treating intensivist. Statistical analysis was done using SPSS software version 27.
**Results:** The demographic profile is comparable between both groups. Mean PRA levels among non-survivors were 15.05 ± 9.3 pg/ml and 39.01 ± 8.5 pg/ml at admission and at 6 h, respectively, whereas there is no change in the absolute values of lactate at both time frames (3.8 ± 2.7 mmol/L and 3.4 ± 1.92 mmol/L at admission and at 6 h, respectively). Among survivors mean PRA were 1.61 ± 2.35 pg/ml and 8.15 ± 11.4 pg/ml at admission and at 6 h, respectively, and lactate levels were 1.74 ± 0.56 mmol/L and 1.95 ± 1.29 mmol/L at admission and at 6 h, respectively. Both PRA and blood lactates at two different time points, at admission and 6 h predicted survival, but the statistical significance of renin outperformed lactates at both time points ($p$ value < 0.01 for PRA at 0 and 6 h versus p value of 0.002 and 0.016 at admission and at 6 h for lactate). Receiver operating curve analysis could not be performed for the limitations in sample size being an interim analysis. Secondary analysis showed, though both predicted mortality, length of ICU stay is uninfluenced by these biomarkers. Moreover, acute kidney injury at day 2 as per KDIGO definition (4) predicts mortality in our study population ($p$ value 0.035). Days spent on vasopressors did not correlate to outcomes.
**Conclusions:** Although both PRA and lactates predicts mortality, PRA independently is a better outcome predictor than lactates when assessing in-hospital mortality in patients with septic shock.

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**Topic:** Sepsis

## 000882

### Evaluation of limitation of the therapeutic effort in form of non-admission in the intensive care unit in a third-level hospital

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**Introduction:** Discussion of Limitation of the Therapeutic Effort (LTE) is an important part of the ethical aspect in the Intensive Care Unit (ICU). Admission to ICU and whether or not to initiate invasive treatments with a patient is sometimes a difficult choice that must be guided by the consideration of potential benefits versus risk of unreasonable obstinacy. A form of LTE would be the non-admission of a patient to the ICU by this principle. Regarding the recent national study ADENI-UCI, our unit made an observational prospective study in order to evaluate the cases classified by our unit as Limitation of the Therapeutic Effort in form of Non-admission in the Intensive Care Unit (LTE-NO-ICU) in order to better understand the decision-making process and improve quality of care.
**Objectives:** To describe the most relevant variables of the cases which were classified as LTE-NO-ICU by our unit in order to evaluate our decisions about this type of LTE.
**Methods:** An observational prospective study was elaborated by our unit with the information transmitted in the morning rounds about the cases classified as LTE-NO-ICU. The data were collected during 10 months (from June 2023 to March 2024, both included) and a

follow-up until hospital discharge was made. Patients variables (age, sex, comorbidities, functional capacity, reason of admission to hospital and previous admissions to ICU), consult to Critical Care variables (time of consult, unit that consults, reason of consult, severity according to APACHE II and SOFA scales), decision of LTE-NO-ICU variables (reason of LTE, changes in the decision, recording of the decision in the patient's medical history) and evolutional variables (death/discharge, hospital stay, sedation, analgesia) were considered. A descriptive analysis of the sample was elaborated. The results are presented in the form of percentage for categorical variables and in terms of mean and standard deviation for continuous quantitative variables.

**Results:** Our unit was consulted in 896 cases, of which 803 were admitted to ICU (89,6%) and 93 (10,4%) of the patients were classified as LTE-NO-ICU. A total of 63 patients were included in this study, with 30 cases being excluded due to insufficient follow-up. The mean age was 70 years, with a standard deviation (SD) of 14 years. Of all of them, 39 (61,9%) were male. In APACHE II scale the mean score was 23 with a SD of 8. In the SOFA scale the mean score was 8 with a SD of 4. Image 1 shows the patients' clinical variables and Image 2 shows the variables concerning the consult to ICU.

The most common reason for LTE-NO-ICU was futility of the treatment (50,8%). This decision was registered in patients' clinical history in 76,2% of the cases. There were 2 cases in which this decision was revoked. There was 1 case of refusal of admission by the patient.

During that hospital stay, 40 patients (63,5%) died. Sedation was needed in 34 patients (54%) and analgesia in 24 patients (38,1). Mean hospital stay was 13 days.

**Conclusions:** Our results were similar to those published in the ADENI-UCI study, although an improvement in data collecting and follow-up of the patients classified as LTE-NO-ICU is needed in order to guarantee quality of care.

| Variables | N | % |
|---|---|---|
| **Comorbidities** | | |
| COPD | 10 | 15,9 |
| Heart failure | 24 | 38,1 |
| Cirrosis | 6 | 9,5 |
| Immunosuppression | 17 | 27 |
| Neoplasia | 28 | 44,4 |
| Diabetes | 26 | 41,3 |
| Neurodegenerative | 4 | 6,3 |
| **Previous functional status** | | |
| Karnofsky <50 | 30 | 47,6 |
| **Reason to hospital admission** | | |
| Medical | 56 | 88,9 |
| Surgical | 5 | 7,9 |
| ICU previous admission | 3 | 4,8 |

**Image 1 (abstract 000882)** Patients' clinical variables

| Variables | N | % |
|---|---|---|
| **Time of consult to ICU** | | |
| Morning | 21 | 33,3 |
| Afternoon | 23 | 36,5 |
| Night | 18 | 28,6 |
| **Location** | | |
| ER Critical | 13 | 20,6 |
| ER General | 10 | 15,9 |
| Internal Medicine | 14 | 22,2 |
| General Surgery | 5 | 7,9 |
| Oncology | 2 | 3,2 |
| Haematology | 3 | 4,8 |
| Respiratory | 2 | 3,2 |
| Infectious Diseases | 5 | 7,9 |
| GI | 2 | 3,2 |
| **Reason of consult to ICU** | | |
| Respiratory failure | 27 | 42,9 |
| Multi-organ failure | 22 | 34,9 |
| Cardiogenic shock | 6 | 9,5 |
| Hemorrhage | 2 | 3,2 |
| Impairment of conscious | 5 | 7,9 |

**Image 2 (abstract 000882)** Variables concerning the consult to ICU

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**Topic:** Ethics and end of life care

## 000883

### Assessment of lung overdistension using computed tomography (CT) in invasively mechanically ventilated patients: a systematic review

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**Introduction:** Inflation of alveoli beyond their physiological limits during mechanical ventilation, known as lung overdistension, causes injury [1]. Precise tools for assessment and quantification of this overdistension are crucial for personalized ventilation strategies and improving patient outcomes. Computed tomography (CT) is often described as the gold standard to evaluate lung volumes [2]. However, there is no clear definition in terms of cut-off values and assessment of the CT images which best reflects overdistension. This systematic review aims to describe the different cut-off values and description to assess lung overdistension in mechanically ventilated patients using CT.
**Methods:** This systematic review was designed in accordance with PRISMA guidelines. We searched PubMed, Embase, Web of Science and Cochrane databases. Studies were eligible for inclusion if adult patients, either in the intensive care unit or the operating room, were invasively mechanically ventilated and underwent CT-measurements to assess overdistension of the lung. Cut-off values to define overdistension during mechanical ventilation as well as amount of overdistension measured are reported. If applicable, the modality used to evaluate the accuracy of the index test (i.e. the reference test) was also reported.
**Results:** Out of 4426 studies, a total of 11 studies were included, including a total of 211 patients, Table 1. All studies were conducted in acute hypoxemic patients. Three studies used a reference test: two used pressure–volume curve (P–V curve) and one used electrical impedance tomography (EIT). Cut-off values used in the studies to define overdistended lung tissue were similar with Hounsfield unit (HU) below − 900. Studies described overdistension either as volume, percentage of fraction of the lung. One study did not use HU to define overdistension but rather the change in air content between end-inspiration and end-expiration, expressed as strain. Limitation of the included studies are that sample sizes were small (n between 6 and 32) and often no reference test was used.
**Conclusions:** This systematic review shows that studies using CT as a tool to assess lung overdistension use nearly the same definition based on the air content of the lung. However, there is a variety between studies regarding defining overdistended regions as volume or percentage of the total lung. In addition, one study showed that the thickness of slices of the CT greatly influence the amount of overdistension, thereby emphasizing the need for protocolized assessment of lung overdistension in patients. Further research is needed to assess the relation between overdistension assessed by CT and patient outcomes.

**Table 1 (abstract 000883)** Studies included in the systematic review. If applicable, the reference test to compare CT measurements is reported

| Author | Population | N | Definition | Amount of overdistension | Reference test |
|---|---|---|---|---|---|
| Borges et al., 2006 | ARDS patients | 26 | -1000 to −850 HU | Fraction of hyperinflation of non-dependent lung between 0 and 0.5.<br>Decrease in hyperinflation after maximum recruitment strategy | NA |
| Bruhn et al., 2011 | ARDS patients | 9 | -1000 to -901 HU | Fraction of hyperinflation lung between 0.1 (0.1-0.3) and 0.5 (0.2-1.1).<br>Tidal hyperinflation increased in patients ventilated with VT 12 mL/kg compared to Vt 6 mL/kg. | NA |
| Bugedo et al., 2003 | ARDS patients | 10 | −1000 to −901 HU | Percentage of hyperinflated lung was 1.1 (±1.8) % with PEEP 10 cm $H_2O$.<br>Percentage of hyperinflated lung increased up to 1.9 (±2.8) % and 2.9 (±4.0) % with PEEP 20 $cmH_2O$ and 30 $cmH_2O$, respectively. | NA |
| Cornejo et al., 2020 | ARDS patients | 13 | Volumetric strain > 0.2 | Strain was 0.232 (0.112-0.273) at PEEP 5 cmH2O.<br>Strain was 0.139 (0.109-0.177) at best PEEP. | EIT |
| Cressoni et al., 2014 | ARDS patients | 51 | −1000 to −900 HU | Percentage of overinflated tissue 0% (±1) and 4% (±4) for PEEP 5 and 45 $cmH_2O$, respectively. | NA |
| Dambrosia et al., 1997 | ARDS patients | 9 | −1000 to −800 HU | Percentage of hyperinflated lung end-expiration was 8.1 (±5.9) %, 15.6 (±11.0) % with ZEEP and PEEP respectively.<br>Percentage of hyperinflated lung end-inspiration was 22.2 (±13.9) % and 26.8 (13.8) % with reduced tidal volume and tidal volume of 10 mL/kg respectively. | NA |
| Malbouisson et al., 2000 | ARDS patients | 16 | −1000 to −900 HU | Volume of hyperinflated lung 1 (±2) mL and 24 (±64) mL for ZEEP and PEEP, respectively. | NA |
| Nieszkowska et al., 2004 | ARDS patients | 32 | −1000 to −900 HU | Overinflation of the lung was found in 14 patients (44%).<br>Volume of overinflated lung in non-COPD patients was 25 (IQR: 19-28) mL. Volume of overinflated lung in COPD patients was 31 (IQR: 14-41) mL and 180 (IQR: 93-363) mL with ZEEP and PEEP respectively. | P-V curve |
| Retamal et al., 2015 | ARDS patients | 9 | −1000 to −900 HU | Percentage of hyperinflated lung tissue weight was 0.1 (IQR 0.04-0.2) and 0.2 (IQR: 0.1-0.4) with PEEP 9 and PEEP 15 cm $H_2O$ respectively. | NA |
| Vieira et al., 2005 | ARDS patients | 30 | −1000 to −900 HU | Percentage of overinflated lung tissue was 0.4% (±1.6) vs. 3.0% (±4.0) with ZEEP and 1.9% (±4) vs. 6.8% (±7.3) in PEEP for thick and thin slices respectively.<br><br>Volume of overinflated lung tissue was 0.6(±0.8) mL vs. 16 (±10) mL in ZEEP and 8(±9) mL vs. 73 (± 62) mL in PEEP for thick and thin slices, respectively, for patients with diffuse loss of aeration. | NA |
| Vieira et al., 1998 | ARDS patients | 6 | < −900 HU | Lung overdistension in >70% of patients.<br>Volume of overdistended lung tissue: 238 (±320) mL. | P-V curve |

**Reference(s)**
1. [1] Gattinoni L, Carlesso E, Caironi P. Stress and strain within the lung. Curr Opin Crit Care. 2012 Feb;18(1):42–7. https://doi.org/10.1097/MCC.0b013e32834f17d9. PMID: 22157254.
2. [2] Pelosi, P., Ball, L., Barbas, C.S.V. et al. Personalized mechanical ventilation in acute respiratory distress syndrome. Crit Care 25, 250 (2021). https://doi.org/10.1186/s13054-021-03686-3

**Topic:** Acute respiratory failure and mechanical ventilation

## 000884

### Assessment of lung overdistension using electrical impedance tomography (EIT) in invasively mechanically ventilated patients: a systematic review

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**Introduction:** Lung overdistension (i.e. excessive inflation of alveoli) is known to cause injury during mechanical ventilation [1]. Electrical impedance tomography (EIT) is a promising non-invasive imaging tool allowing for bedside assessment of the distribution of ventilation and thus overdistension [2]. However, there is no clear method for how to define overdistension with EIT. This systematic review aims to describe the different methods to assess overdistension in mechanically ventilated patients using EIT.

**Methods:** We followed PRISMA guidelines and searched PubMed, Embase, Web of Science and Cochrane databases. Studies were eligible for inclusion if adult patients, either in the intensive care unit or the operating room, were invasively ventilated and underwent EIT-measurements. Studies were excluded if there were no cut-offs values described for assessment of lung overdistension. Primary outcomes were cut-off values to define overdistension and the amount of measured overdistension. If applicable, the modality used to evaluate the accuracy of the index test (i.e. reference test) was also reported.
**Results:** Of the 4426 studies screened, nine with a total of 253 patients were included, Table 1. All patients had acute hypoxemic failure patients. Three studies used a reference test: two used pressure–volume curve (P–V curve) and one used computed tomography (CT). Three studies used cut-off values to classify pixels in region-of-interest as overdistended. All other studied defined pixels as overdistended if compliance decreased with increasing pressure. Four studies used the same method to define overdistension.
**Conclusions:** Studies using EIT to assess lung overdistension report different methods to define overdistension. While popularity of EIT is increasing, our study emphasizes the need for standardized methods to describe overdistension in order to compare study results and translate the results to clinical practice. Further research is needed to assess the relation between overdistension assessed by EIT and patient outcomes.

**Table 1 (abstract 000884)** Studies included in the systematic review. If applicable, the reference test to compare EIT measurements is reported

| Author | Population | N | Definition | Amount of overdistension | Reference test |
|---|---|---|---|---|---|
| Becher et al., 2021 | ARDS patients | 20 | An increase in compliance in any ROI by more than 3% (normalized to global compliance) with lower ΔP | Global lung stress remained below 27 mbar in all patients and global strain below 2.0 in 19 out of 20 patients. | NA |
| Cornejo et al., 2020 | ARDS patients | 13 | Tidal change in impedance distribution.<br>Overdistension cut-off: $Strain_{CT}$ > 0.2 | Change in tidal impedance 30.456 (24.182-33.278) (arbitrary units) and 26.768 (20.745-34.372) for 5 PEEP and best PEEP, respectively.<br>$Strain_{CT}$: 0.232 (0.112-0.273) and 0.139 (0.109-0.177) for 5 PEEP and best PEEP, respectively. | CT |
| Gómez-Laberge et al., 2012 | ARDS patients | 9 | Pressure above PEEP level of maximum compliance. | Amount of lung overdistension increased from 21 (±11)% to 73 (±12)% with plateau pressures climbing from 30 to 50 cm $H_2O$. During PEEP titration: amount of overdistension maintained within ±20% of the lung. | NA |
| He et al., 2020 | ARDS patients | 30 | Ventilation loss of more than 20%. | Number of overdistended pixels in ventral and dorsal regions were 48 (IQR: 0-115) and 0 (IQR: 0-0.25) for ZEEP and high PEEP, respectively. | NA |
| Heines et al., 2022 | ARDS patients + patients undergoing surgery | 45 | Percentage of cumulated overdistension = change in compliance in relation to the best compliance. | Percentage of overdistension increased when PEEP was increased from ±0% to ± 15% | NA |
| Hsu et al., 2021 | ARDS patients | 87 | Percentage of cumulated overdistension = change in compliance in relation to the best compliance. | No amount of overdistension reported.<br>No barotrauma in EIT group or PV group. | PV curve |
| Karsten et al., 2018 | ICU patients | 15 | Percentage of cumulated overdistension = change in compliance in relation to the best compliance. | Amount of overdistension was 19 (IQR: 17) and 0 (IQR: 0) at highest and lowest PEEP, respectively. | NA |
| Otáhal et al., 2022 | ARDS patients | 10 | Decrease of compliance while aeration increased. | Larger percentage of overdistension along the PEEP titration in prone than supine position. | NA |
| Zhao et al., 2019 | ARDS patients | 24 | Percentage of cumulated overdistension = change in compliance in relation to the best compliance. | Not further specified. | PV curve |

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000886

## The mechanism of macrophage SAPs promoting the high expression of PD-L1 on the surface of endothelial cells mediating sepsis-induced immunosuppression

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**Introduction:** Sepsis refers to a life-threatening organ dysfunction caused by the host's dysregulation of the immune response to infection [1]. According to the latest data from the Global Burden of Disease study, nearly 50 million people worldwide develop sepsis annually, with approximately 11 million deaths [2]. Immunosuppression is a crucial factor affecting the prognosis of sepsis patients, and T cell exhaustion is a significant marker of sepsis-induced immunosuppression. Our team has previously discovered that abnormal activation of the T cell surface receptor 2B4 is one of the key indicators of immunosuppression [3]. It was previously believed that sepsis-induced immunosuppression occurred in the middle to late stages of the disease, but our preliminary research and recent reports have shown that immune suppression caused by sepsis is already evident in the early stages of the disease [4]. Abnormal activation of PD-1/PD-L1 is a significant cause of immunosuppression in sepsis patients. Blocking PD-1/PD-L1 can effectively reverse T cell dysfunction and improve bacterial clearance [5]. However, due to factors such as patient heterogeneity, the prognosis of patients has not been significantly improved. Currently, there is still a lack of precise therapeutic options targeting immunosuppression.
**Objectives:** Immunosuppression is a crucial factor influencing the prognosis of sepsis patients, yet the underlying mechanisms of sepsis-related immunosuppression remain elusive. PD-L1, a common immune checkpoint, has been recently implicated in the development of sepsis-induced immunosuppression through its expression on endothelial cells. SAPs, a novel form of intercellular communication, may regulate PD-L1 expression. This study aimed to investigate whether macrophage-derived SAPs mediate sepsis-induced immunosuppression by modulating PD-L1 expression in endothelial cells.
**Methods:** Spatial transcriptomic analysis and model construction were used to confirm the overexpression of PD-L1 in endothelial cells in sepsis models and its role in mediating T cell exhaustion. Cellular experiments were conducted to demonstrate that macrophage-derived SAPs stimulate the overexpression of PD-L1 on the surface of mouse lung microvascular endothelial cells, and proteomic analysis was performed to investigate the potential regulatory mechanisms.
**Results:** Spatial transcriptomic analysis of lung tissue revealed that PD-L1 (CD274) was most highly co-expressed with endothelial cell markers (PECAM-1) in sepsis model mice compared to controls, and this phenomenon was confirmed in mice with CLP-induced sepsis. A significant positive correlation was observed between PD-L1 expression and lung T cell exhaustion. The levels of SAPs were significantly elevated in sepsis patients and animal models with immunosuppression, and drive analysis traced their origin primarily to macrophages. In vitro experiments showed that SAPs collected from LPS-stimulated macrophages could induce overexpression of PD-L1 on the surface of mouse lung microvascular endothelial cells when co-cultured together, and this effect was significantly inhibited by the addition of

a SAPs blocker. In vivo experiments confirmed that LPS-SAPs also promote the overexpression of PD-L1 in mouse lung endothelial cells. Proteomic analysis of in vitro collected LPS-SAPs and Con-SAPs revealed significant differences in proteins related to ubiquitination modification pathways. Co-IP experiments targeting the overexpressed proteins indicated a strong protein interaction between TRIM25 and endothelial cell PD-L1 in LPS-SAPs, suggesting that SAPs may mediate sepsis-induced T cell exhaustion and immunosuppression through the ubiquitination modification of endothelial cell PD-L1 by TRIM25.
**Conclusions:** Macrophage-derived SAPs in sepsis may promote the overexpression of PD-L1 in endothelial cells through ubiquitination modification, leading to T cell exhaustion and subsequent immunosuppression.

**Reference(s)**


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**Topic:** Sepsis

## 000888

### Prospective evaluation of lung ultrasound score (LUSS) and oxygenation parameters in pediatric patients with febrile neutropenia


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**Introduction:** The poor sensitivity of X-rays compared to CT scans for the diagnosis of lung pathologies is well established in patients with febrile neutropenia. The utility of bedside lung ultrasound in neutropenic children has not been extensively studied. The present study was designed to investigate the correlation of lung ultrasound (LUSS) score with P/F ratio (ratio of arterial oxygen partial pressure (PaO2 in mmHg) to fractional inspired oxygen (FiO2)) in paediatrics neutropenic patients admitted to the ICU
**Objectives:** The primary objective of the study was to investigate the correlation between lung ultrasound score (LUSS) and P/F ratio [ratio of arterial oxygen partial pressure (PaO2 in mmHg) to fractional inspired oxygen (FiO2)].
**Methods:** Neutropenic patients aged less than 16 years admitted to the ICU and on fixed FIO2 devices like invasive mechanical ventilation (IMV), non-invasive ventilation (NIV), high-flow nasal cannula (HFNC), or room air were included after written informed consent from the patient and/or parent. The LUS score was calculated at the time of admission by scanning all six zones of the lung bilaterally by the person trained in lung ultrasound. LUS was calculated based on the previously described method (Mojoli et al.). The correlation between LUS and PF ratio was tested using Spearman's rank correlation coefficient. The study was approved by the institutional ethics committee.
**Results:** A total of 25 patients were enrolled. The median age was 6 years. The median sofa score was 6 and the APACHE II score was 19. The median total leukocyte count (TLC) was $0.73 \times 109$/L and the absolute neutrophil count (ANC) was $0.11 \times 109$/L. Six patients were receiving vasopressors at the time of enrolment. 10 patients were on mechanical ventilation, and eight patients received HFNC. Midian LUS score was 28. We noted a moderate negative correlation between the LUS score and PF ratio ($r = -0.5724$ $p = 0.003$).
**Conclusions:** LUS score has a moderate negative correlation with PF ratio in febrile neutropenic children. The role of LUS in the prediction of survival and ventilator outcomes needs further evaluation in a prospective study.


**Fig. 1 (abstract 000888)** Correlation between lung ultrasound score (LUSS) and P/F ratio

**Reference(s)**


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**Topic:** Haematologic-oncologic issues in the ICU

## 000889

### Self-reported fatigue 6th months after ICU discharge: a preliminary results of the FICUF study


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**Introduction:** Mortality rates in intensive care units (ICUs) have recently decreased, leading to a rise in survivors who face physical, psychological, and cognitive sequelae after ICU discharge [1]. In 2012, the Society of Critical Care Medicine (SCCM) gathered these symptoms into a new syndrome called Post-Intensive Care Syndrome (PICS) [2]. The definition of PICS has been updated in 2021 to broaden the spectrum of post-ICU sequelae, with a particular focus on fatigue [3]. Fatigue can be defined as "an overwhelming and persistent subjective sense of physical, emotional, and/or cognitive exhaustion unrelated to recent physical activity". Morel et al. highlighted a high prevalence of fatigue, affecting more than half of survivors (57%), 6 months to 5 years after hospital discharge [4].
**Objectives:** The aim of this study was to assess the prevalence and risk factors of fatigue in ICU survivors at 6 months after ICU discharge.
**Methods:** This prospective cohort was conducted between 2 July 2022 and 2 April 2024 in a single one university hospital centre. Consecutive patients over 18 years old, admitted to the intensive care unit (ICU) who required a mechanical ventilation for more than 5 days or an ICU length of stay more than 10 days, were invited to be evaluated in the post-intensive care unit 6th month after ICU discharge. Scheduled postoperative ICU admission patients were excluded. We defined fatigue using a 13-item scale: the Functional Assessment of Chronic Illness Therapy Fatigue (FACIT-F). We used a cut-off score of

34 to define fatigue [4]. The study was approved by the local ethics committee (IRBN962022/CHUSTE) and registered at clinicaltrials.gov (NCT05984069).

**Results:** In this preliminary study, a total of 199 patients were eligible between 2 July 2022 and 2 April 2024. Of these, 108 patients died and 17 patients had a post-ICU telephone evaluation, so only 74 patients were included in the analysis. The prevalence of fatigue was 51.4% (38/74). There was no statistical difference in baseline characteristics between the two groups (Table 1). The Medical Research Council (MRC) score was lower in the fatigue group (40.5 ± 10.8 vs 51 ± 11.8, $p = 0.08$). Patients with self-reported fatigue had more ICU-acquired weakness at ICU discharge (87.5% vs 42.9%, $p = 0.07$) (Table 2). In the fatigue group, quality of life was worse (62.9% vs 22.2%, $p < 0.001$), depressive disorder using HAD-D was higher (48.6% vs 11.1%, $p < 0.001$), autonomy impairment using IADL was more important (83.3% vs 58.6%, $p = 0.04$) and physical activity time using Godin-Leisure time score was lower (8 ± 21 vs 21 ± 37, $p = 0.01$) (Table 3).

**Conclusions:** In this preliminary study, self-reported fatigue at 6 months after ICU discharge is a major symptom present in more than half of ICU survivors. Early prevention of fatigue after ICU discharge and physical activity prescription should be systematic to reduce psychologic disorder and improve quality of life.

**Table 1 (abstract 000889)** Baseline characteristics before admission to ICU

| Variables | Total cohort (n = 74) | Fatigue (n = 38) | No Fatigue (n = 36) | P-value |
|---|---|---|---|---|
| Gender (male), n (%) | 58 (78.4) | 29 (76.3) | 29 (80.6) | 0.66 |
| Age (years) | 54.5 ± 29.8 | 55.5 ± 29.0 | 47.5 ± 37.8 | 0.39 |
| BMI (m/kg2) | 25.0 ± 4.6 | 25 ± 7.2 | 24.9 ± 3.7 | 0.31 |
| Clinical Frailty Scale score* | 2 ± 1 | 1.5 ± 2 | 2.0 ± 1 | 0.66 |
| Frailty (CFS ≥ 4), n(%)* | 2 (3.9) | 0 (0.0) | 2 (8.7) | 0.19 |
| IADL* | 8 ± 0 | 8 ± 0 | 8 ± 0 | 0.97 |
| Autonomy (IADL = 8), n(%)* | 40 (80.0) | 21 (77.8) | 19 (82.6) | 0.74 |
| Cardiovascular comorbidity, n(%) | 29 (39.2) | 17 (44.7) | 12 (33.3) | 0.32 |
| Respiratory comorbidity, n(%) | 10 (13.5) | 5 (13.2) | 5 (13.9) | 0.93 |
| Neuromuscular comorbidty, n(%) | 1 (1.4) | 0 (0.0) | 1 (2.8) | 0.49 |
| Neurologic trouble n(%) | 8 (10.8) | 3 (7.9) | 5 (13.9) | 0.47 |
| Neoplasia, n(%) | 6 (8.1) | 2 (5.3) | 4 (11.1) | 0.42 |

*Missing data : 24 for IADL, 23 for CFS

**Table 2 (abstract 000889)** ICU data

| Variables | Total cohort (n = 74) | Fatigue (n = 38) | No Fatigue (n = 36) | P-value |
|---|---|---|---|---|
| Type of admission | | | | 0.64 |
| Medical, n(%) | 37 (50) | 18 (47.4) | 19 (52.8) | |
| Surgical, n(%) | 37 (50) | 20 (52.6) | 17 (47.2) | |
| Major diagnostic | | | | 0.35 |
| Cardiovascular, n(%) | 18 (24.3) | 11 (28.9) | 7 (19.4) | |
| Respiratory, n(%) | 6 (8.1) | 5 (13.2) | 1 (2.8) | |
| Neurological (no traumatic), n(%) | 17 (23.0) | 8 (21.1) | 9 (25.0) | |
| Gastrointestinal, n(%) | 0 (0) | 0 (0) | 0 (0) | |
| Sepsis, n(%) | 3 (4.1) | 1 (2.6) | 2 (5.6) | |
| Traumatic, n(%) | 30 (40.5) | 13 (34.2) | 17 (47.2) | |
| IGSII | 47.2 ± 15.1 | 46.3 ± 16.9 | 48.1 ± 12.9 | 0.62 |
| Mechanical ventilation, n(%) | 73 (98.6) | 38 (100) | 35 (97.2) | 0.47 |
| Time of mechanical ventilation (days) | 11 ± 13 | 11.5 ± 13 | 11.0 ± 13.5 | 0.77 |
| Non invasive mechanical ventilation, n(%) | 26 (35.1) | 16 (42.1) | 10 (27.8) | 0.19 |
| Vasoactive drugs, n(%) | 69 (93.2) | 35 (92.1) | 34 (94.4) | 1 |
| ECLS, n(%) | 12 (16.2) | 8 (21.1) | 4 (11.1) | 0.35 |
| RRT, n(%) | 6 (8.1) | 5 (13.2) | 1 (2.8) | 0.20 |
| EDV, n(%) | 15 (20.3) | 7 (18.4) | 8 (22.2) | 0.78 |
| EDL, n(%) | 9 (12.2) | 2 (5.3) | 7 (19.4) | 0.08 |
| Craniectomy, n(%) | 13 (17.6) | 6 (15.8) | 7 (19.4) | 0.68 |
| MRC score* | 45.5 ± 16.5 | 40.5 ± 10.8 | 51 ± 11.8 | 0.08 |
| ICU-AW, n(%)* | 13 (59.1) | 7 (87.5) | 6 (42.9) | 0.07 |
| ICU LOS (days) | 22.5 ± 14.8 | 23.5 ± 10.8 | 21 ± 19.5 | 0.89 |

*Missing data : 52 for MRC and ICU-AW

**Table 3 (abstract 000889)** Post-ICU data

| Variables | Total cohort (n = 74) | Fatigue (n = 38) | No Fatigue (n = 36) | P-value |
|---|---|---|---|---|
| FACIT-F | 34.5±18.8 | 24±14.5 | 43±7 | <0.001 |
| Hospital LOS (days) | 45±44 | 41±52 | 47.5±42.5 | 0.62 |
| QoL (VAS) | 7±3 | 6±2 | 8±1 | 0.002 |
| Poor QoL (VAS < 7), n(%)* | 30 (42.3) | 22 (62.9) | 8 (22.2) | < 0.001 |
| Handgrip test (kg)* | 32.7±23.1 | 28.7±19.4 | 34.9±17.7 | 0.39 |
| Good motricity force, n(%)* | 48 (77.4) | 25 (75.8) | 23 (79.3) | 0.74 |
| HAD-A* | 5±7 | 6±6 | 5±5 | 0.21 |
| Anxiety, n(%)* | 27 (36.9) | 16 (43.2) | 11 (30.6) | 0.26 |
| HAD-D* | 5±5 | 7±6 | 3±4 | < 0.001 |
| Depression, n(%)* | 22 (30.1) | 18 (48.6) | 4 (11.1) | < 0.001 |
| Post-traumatic stress, n(%)* | 9 (12.9) | 7 (20.0) | 2 (5.7) | 0.15 |
| IES-R* | 11±21 | 19±26 | 9±11.5 | 0.01 |
| Godin-Leisure time* | 15±25 | 8±21 | 21±37 | 0.01 |
| GOSE* | 6±4 | 5±3 | 7±2.5 | 0.01 |
| Clinical Frailty Scale score | 3±2.8 | 4±2 | 3±1.5 | 0.02 |
| Frailty (CFS ≥ 4), n(%) | 14 (23.7) | 8 (26.7) | 6 (20.7) | 0.59 |
| IADL | 6±4.8 | 6±4 | 7±3.3 | 0.004 |
| Autonomy impairment (IADL<8), n(%) | 42 (71.2) | 25 (83.3) | 17 (58.6) | 0.04 |

*Missing data : 2 for GOSE and Godin, 3 for QoL VAS, 12 for handgrip test and motricity force, 1 for HAD-D and HAD-D, 15 for IADL and autonomy, 4 for IES-R.


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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000890

### Incidence, sequence, and prognostic value of multiple organ failure in intensive care unit


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**Introduction:** The incidence of multi-organ failure presents a significant diagnostic and therapeutic challenge in sepsis [1]. Still lacking research about the incidence, coexistence, first-episode situation, and prognosis of various organ failures [2].

**Objectives:** To explore the incidence, coexistence, and first-episode situation of organ failure in patients concerning prognosis.

**Methods:** We performed a single-centre retrospective cohort study conducted in the ICU of a large hospital in China from January 2020 to June 2022. Organ dysfunction was assessed and quantified based on organ-specific SOFA scores ≥ 3 points.

**Results:** Among 2,255 included patients, the incidence of cardiovascular failure was the highest ($N = 1683$, 74.63%), while liver failure was the lowest (N = 167, 7.41%). The most common multi-organ failure combination was cardiovascular and respiratory failure ($N = 279$, 14.33%). The average onset times of organ failure in order, were cardiovascular, neurological, respiratory, coagulation, renal, and liver (10.5 h, 14.5 h, 14.8 h, 19.4 h, 28.2 h, and 53.8 h, $P < 0.001$). Respiratory (HR: 1.31, $P = 0.006$ vs HR: 1.19, $P = 0.009$), cardiovascular (HR: 3.48, $P < 0.01$ vs HR: 2.02, $P < 0.01$), neurological (HR: 3.4, $P < 0.01$ vs HR: 2.7, $P < 0.01$), and renal (HR: 1.86, $P < 0.01$ vs HR: 2.07, $P < 0.01$) failures were related to increased in-hospital and one-year mortality rates. The 30-day and one-year survival rates for liver failure were the lowest compared to others (66.7%, $P < 0.0001$ vs 20%, $P < 0.0001$).

**Conclusions:** In septic patients, cardiovascular failure was predominant, often paired with respiratory failure. The sequence of initial organ failure was cardiovascular, neurological, respiratory, coagulative, renal, and hepatic in order. Liver failure indicates the poorest short and long-term prognosis compared to other organs.


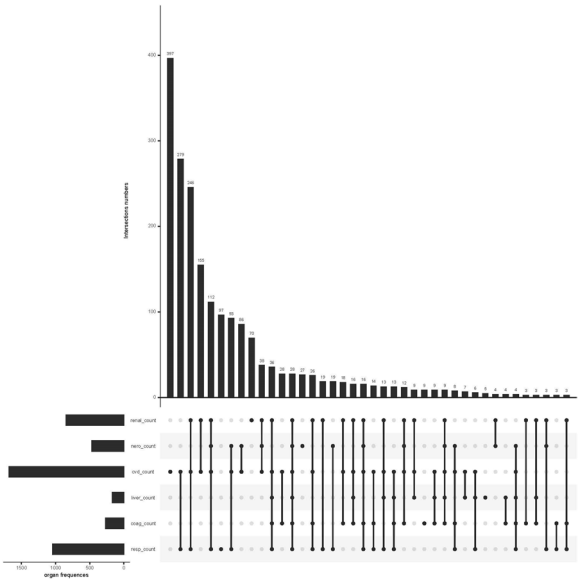

**Fig. 1 (abstract 00890)** Distribution of unique combinations of organ dysfunction sorted by occurrence frequency

The single most common organ dysfunction was cardiac (displayed in the horizontal bar graph in the lower left panel), whereas the least frequent was liver. The main panel shows each unique combination of organ dysfunctions (as indicated by the corresponding pattern of dots) along with their occurrence frequency in the cohort (vertical bar graph above each unique combination).

| | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Respiratory | 18.6% / 97 | 41.3% / 320 | 73.2% / 365 | 82.8% / 174 | 87.9% / 58 | 96.4% / 28 |
| Coagulation | 33.3% / 9 | 30.8% / 39 | 56% / 50 | 78.9% / 76 | 87.7% / 65 | 96.4% / 28 |
| Liver | 60% / 5 | 58.3% / 12 | 55.6% / 27 | 84.1% / 44 | 88.2% / 51 | 96.4% / 28 |
| Cardiac | 30% / 397 | 49.2% / 555 | 74.5% / 435 | 84.1% / 201 | 88.1% / 67 | 96.4% / 28 |
| Nervous | 22.2% / 27 | 70% / 110 | 83.2% / 137 | 88.1% / 135 | 87.1% / 31 | 96.4% / 28 |
| Renal | 34.3% / 70 | 53.3% / 182 | 76.3% / 321 | 85.2% / 182 | 88.9% / 63 | 96.4% / 28 |

**Fig. 2 (abstract 00890)** Mortality associated with different types and numbers of organ failures
Each organ failure is represented by a line. In each box, the number below the diagonal line presents the number of patients with the column title-presented number of additional failing organ systems in addition to the organ failure of that line. The percentage above the diagonal line presents the annual mortality of these patients. For example, the one-year mortality rate is 34.3% when there is solely renal failure. However, when renal failure is combined with failures in four other organs, this rate escalates to 88.9%.

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**Topic:** Sepsis

## 000891

### The antimicrobial peptide LL-37 disturbs mitochondrial membrane integrity in cytotoxic T-lymphocytes during sterile inflammation and induces immunometabolic paralysis


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000891


**Introduction:** Sterile inflammation in response to major surgery leads to immunosuppression of human cytotoxic T-lymphocytes (CTL) [1]. The precise mechanism underlying this phenomenon is only incompletely understood. Antimicrobial peptides (AMP) represent a highly conserved and powerful defense mechanism against bacteria. Cathelicidins are one major form of AMP; by charge-dependent incorporation into the highly negatively charged membranes of bacteria, cathelicidins puncture the bacterial cell wall, compromise bacterial membrane integrity and eventually lead to bacterial lysis. The CAMP gene (mature peptide: LL-37) represents the only cathelicidin expressed in humans. [2]
**Objectives:** During bacterial septic shock, low LL-37 blood concentrations have been reported [3]. We detected strongly elevated levels of serum LL-37 during sterile inflammation post major surgery. We thus hypothesized that—during sterile inflammation and absence from bacterial burden—an erroneous reaction occurs: LL-37 incorporates into mitochondrial membranes due to their charged organelle membrane, resulting in perforation of the mitochondrial membrane instead of bacteria. This might compromise CTL metabolism, thereby inducing immunosuppression.
**Methods:** Patients undergoing elective major surgery (e.g. cardiopulmonary bypass surgery or off-pump cardiac surgery, orthopedic surgery) and healthy volunteers were included after written informed consent (Ethics approval 17-241, LMU Munich). Magnetic cell separation was used to isolate CTL. Isolation of mitochondria was performed via Microbead-separation. Protein expression was determined by Western Blot and ELISA. Confocal microscopy was performed using MitoTracker green. Mitochondrial membrane potential and oxidative phosphorylation were quantified via JC1 and Seahorse, respectively. Fluorescence of calcein-labeled K562 co-incubated with CTL was used to evaluate cytotoxicity. Cell proliferation was measured via EdU assay on a flow cytometer.
**Results:** After major surgery, we detected high intracellular levels of LL-37 in human CTL, whereas preoperative CTL showed no expression of LL-37 (Figure A). Isolated CTL mitochondria of patients post major surgery exhibited a significantly reduced mitochondrial membrane potential ΔΨm ($-32.5\% \pm 19\%$, $p = 0.0299$, $n = 5$). To determine whether LL-37 co-localizes with the charged mitochondrial membrane of CTL, we co-incubated human CTL of healthy donors with LL-37. Indeed, Fam-labeled LL-37 co-localized with CTL mitochondria as indicated by co-staining with Mitotracker, which was further corroborated by Western Blot of isolated CTL mitochondria, detecting LL-37 within the organelle fraction (Figure B/C). LL-37 led to a severe deterioration of mitochondrial integrity as depicted by a collapse of ΔΨm (Figure D). Mitochondrial function was also impaired due to LL-37: CTL depicted a continuous decline of oxidative respiration after injection of LL-37 (Figure E). Considering the pivotal role of mitochondrial metabolism for CTL immunology, we assessed the immune effector function of CTL after LL-37 treatment and detected a significant reduction of cell lysis capacity and cell proliferation (Figure F/G).
**Conclusions:** Sterile inflammation after major surgery results in elevated LL-37 serum concentrations. Due to the absence of bacteria, LL-37 erroneously incorporates into CTL mitochondria, thus disturbing their organelle function and compromising immune cell effector function. We here report a dichotomous role of LL-37: whereas increased LL-37 provides beneficial antibacterial support during sepsis, it may have detrimental impact on CTL immunometabolism during sterile inflammation induced by major surgery. Targeting these adverse off-target effects may offer a base for future treatment approaches.

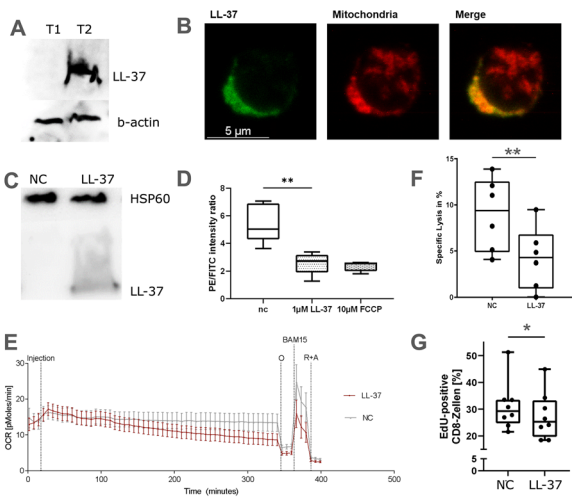


**Fig. 1 (abstract 000891)** **A** Protein expression of LL-37 and b-actin in human CTL prior to (T1) and at the end (T2) of major surgery.

**B** Confocal microscopy of human CTL from healthy donors incubated with1µM Fam-labeled LL-37 for 1 h, subsequently stained with MitoTrackerTM Deep Red and fixed with methanol. **C** Protein expression of LL-37 and HSP60 in isolated mitochondria of CTL from healthy donors incubated with LL-37. **D** Mitochondrial membrane potential ΔΨm was measured via JC1. CTL from healthy donors were stimulated overnight (anti-CD3/CD28). Mitochondria were isolated and incubated with vehicle control (nc), 1µM LL-37 or the protonophore FCCP(positive control). $n=4$. **E** Mitochondrial respiration as measured via Seahorse HS mini analyzer. CTL were incubated overnight using CD3/CD28 beads, "Injection": administration of eitherLL-37 or vehicle control (PBS), O: Injection of Oligomycin, BAM15: injection of BAM15, R + A: injection of Rotenone/Antimycin A, experiment was performed in triplicates. **F** Relative cell lysis capacity of human CTL as measured by calcein-fluorescence, $n=6$. **G** CTL proliferation was determined via EdU assay staining assessed on a FACS Canto II flow cytometer, $n=8$. *$p<0.0.5$, **$p<0.01$.Paired t-test or Wilcoxon matched-pairs signed rank test, as appropriate

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**Topic:** Translational biology

## 000892

### Factors associated with women authors and evolution over the last 25 years in critical care randomized controlled trials

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**Introduction:** Studies have shown an underrepresentation of women in the authorship of research articles, and critical care was the only field in medicine experiencing a negative annual change rate in 2018 (1, 2). A recent article found that the percentage of women either as first or senior author has plateaued in the recent years (2). But no study has assessed the independent factors associated with the proportion of women in the authors.

**Objectives:** This study aimed to identify independent factors associated with the proportion of women in the authors of critical care randomized controlled trials (RCTs) published in high-impact journals. We also evaluated the women authors evolution over the last 25 years.

**Methods:** We conducted a meta-epidemiological study of critical care RCTs between 1999 and 2023, published in the NEJM, the Lancet, the JAMA, AJRCMM, ICM or CCM, retrieved through MEDLINE, CENTRAL, and Web of Science databases, and a previously published study (3). Gender was assessed based on names, online biographies, or publicly available photographs, as previously performed (2). Analyses were performed using univariate and multivariate generalized linear mixed models. Adjusted odds ratios (OR) were calculated with corresponding 95% confidence intervals.

**Results:** Over the 25-year period, 1203 critical care RCTs published in the studied journals were retrieved. Gender of all authors was assessed in 1199 RCTs (99.7%), which were included in the analysis. Overall, 4,335 out of 16,057 authors (27%) were women. Women were less frequently first authors (246/1,199 [21%], $p<0.001$), and less frequently senior authors (174/1,199 [15%], $p<0.001$). Women represented at least 50% of the authors in 137(11%) RCTs.

The proportion of women in critical care RCTs increased significantly over time (Fig. 1, $p<0.001$). In univariate analysis, the proportion of women increased significantly with year of publication ($p<0.001$) and higher sample size ($p<0.01$), and decreased significantly in European RCTs ($p<0.001$), sepsis and ventilation topics ($p=0.01$), RCTs with mortality as primary outcome ($p<0.01$), and RCTs endorsed by study groups ($p=0.01$). In multivariate analysis, the proportion of women increased significantly with the year of publication (OR = 1.05 [1.02–1.09], $p<0.01$) and the sample size (OR = 1.01 [1.00–1.01] per 100 patients, $p=0.01$), and decreased significantly in European RCTs (Fig. 2., OR = 0.53 [0.33–0.85], $p<0.01$), ventilation topic (OR = 0.50 [0.25–0.97], $p=0.04$), and RCTs with mortality as primary outcome (OR = 0.36 [0.14–0.92], $p=0.03$).

**Conclusions:** The proportion of women in the authors of critical care RCTs published in high-impact journals has increased over time, from 18% in 1998 to reach 32% in 2023. However, behind this finding lie disparities. Women are less frequently first and senior authors. Geographic discrepancies were found, as less women are included in European RCTs, when compared to North American countries or to the rest of the world.

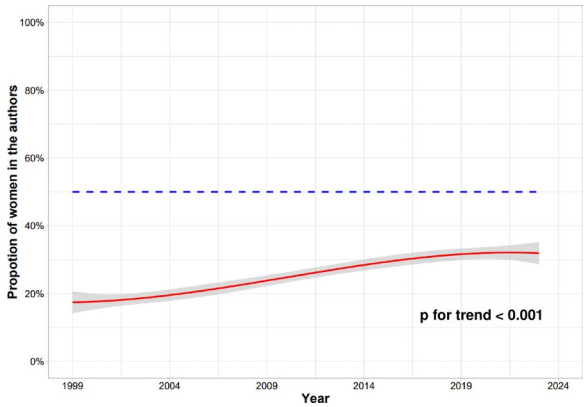


**Fig. 1 (abstract 000892)** The proportion of women in the authors over time in critical care RCTs

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4. This study is investigator-initiated and no funding source was involved.

**Topic:** Health services research and outcome

## 000893

### Epidemiological changes and in-ICU and 1-year outcomes of people living with HIV admitted to the intensive care unit

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000893

**Introduction:** Since 2016, the World Health Organization has recommended universal antiretroviral therapy (ART) to all people living with Human immunodeficiency Virus (PLHIV). The impact of this recommendation in PLHIV admitted to ICU is unknown
**Objectives:** The aim of this study is to know the changes in the characteristics and outcomes of PLHIV admitted to the Intensive Care Unit (ICU) before and after this recommendation
**Methods:** Retrospective study of consecutive PLHIV admitted to the ICU of a University Hospital in Barcelona between 2006 and 2019, comparing the characteristics and outcomes between 2006 and 2015 (first period) and 2016–2019 (second period).
**Results:** A total of 505 admissions were included, mostly men (75%) with a median (P25–P75) age of 47.3 years (39.7–53.9). Ninety-one percent were diagnosed with HIV before admission and 83% of them were under ART. Most of the admissions came from the emergency department (59%) and the most frequent cause of admission was an infectious condition (54%). Mortality was lower in the second period compared to the first one, both in-ICU (7% vs. 14% (OR 0.44 [0.22–0.86]; $p=0.016$) and one year after ICU discharge (albeit this difference did not reach statistical significance, 13% vs. 17%, OR 0.61 [0.35–1.06], $p=0.081$). However, after adjusting for variables in the multivariable analysis, these differences disappeared due to differences between periods (in the second period, there were more patients receiving ART before admission (OR 2.11 [1.04–4.29]; $p=0.039$), less patients who were current or former IVDU (OR 0.41 [0.23–0.71]; $p=0.001$), less admissions for surgery (OR 0,54 [0.31–0.93]; $p=0.028$), lower need for IMV (OR 0.41 [0.25–0.66]; $p<0.001$), and less complications in the ICU such as surgical wound infection (OR 0.04 [0.00–0.27]; $p=0.001$) or non-catheter-related bacteremia (OR 0.13 [0.03–0.55]; $p=0.005$). Having higher SOFA score at admission (OR 1.11 [1.01–1.22]; $p=0.034$), need for IMV (OR 10.33 [3.61–29.59]; $p<0.001$) and presenting any complication in the ICU (OR 2.19 [1.1–4.36]; $p=0.026$) were predictors of in-ICU mortality, whereas having higher number of comorbidities (OR 1.60 [1.25–2.05]; $p<0.001$), higher SOFA score at ICU admission (OR 1.10 [1.02–1.19]; $p=0.019$), ICU admission from hospital ward vs. from emergency department (OR 2.95 [1.45–6.01]; $p=0.007$) and not continuing ART at ICU discharge (OR 13.86 [5.65–34.02]; $p<0.001$) were found as predictors of one-year mortality.
**Conclusions:** In-ICU mortality of critically ill PLHIV has decreased in the recent years. This reduction is attributable to changes in patients' characteristics, including the universal use of ART at ICU discharge.

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**Topic:** Infections and prevention

## 000894

### Admission or refusal? Analysis of characteristics of patients with oncological pathology evaluated by an intensive care unit

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000894

**Introduction:** Nowadays, associated with improved vital prognosis of oncological diseases, there has been an increase in the number of patients with this pathology admitted to intensive care units (ICUs). Numerous factors influence the decision of whether an oncological critical patient benefits from ICU admission, with emphasis on quality of life and disease prognosis.
**Objectives:** To describe the characteristics and differences of patients with oncological diseases who are admitted or refused admission ICU and their prognosis at 6 months.
**Methods:** Descriptive study based on a prospective registry, including patients with oncological diseases evaluated by an ICU during the period of January-October 2023. Patients were classified into admitted and refused groups. Demographic data, comorbidities, oncological disease characteristics, functional class at admission (ECOG, performance status scale; and FRAIL, Clinical frailty index), reason for admission and refusal, ECOG and mortality at 6 months were collected. Median and interquartile range were calculated and compared using the Mann–Whitney U test.
**Results:** Ninety-nine patients were included, of whom 67 were admitted to the unit (67.7%) and 32 were refused admission. There were no statistically significant differences in gender (56.7% vs 71.9% males, $p$ 0.14), age (64 vs 66 years, $p$ 0.43) or body mass index (25.1 vs 23.7 kg/m$^2$, $p$ 0.65). A higher presence of pulmonary disease was observed in the refused group (40.6% vs 12%, $p$ 0.01). Regarding prognostic scales, differences were found in ECOG (score $\leq 2$ 92.5% vs 59.4%, $p<0.01$) and FRAIL (score $\leq 5$ 94% vs 65.6%, $p<0.01$). There were no differences in the location of the primary tumor, although more patients with localized oncological pathology were admitted (32.8% vs 3.1%, $p$ 0.01) or in remission (26.9% vs 3.1%, $p$ 0.05). However, the prevalence of needing other lines of treatment (28.1% vs 6%, $p$ 0.002), immunotherapy (37.5% vs 11.9%, $p$ 0.003) and metastatic extension (53.1% vs 35.8%, $p$ 0.1) was higher in the dismissed group. In admitted patients, the most frequent reasons for admission were shock (35.8%), respiratory failure (26.9%) and altered level of consciousness (19.4%). In dismissed patients, the main reasons for dismissal were tumoral disease (65.6%) and baseline condition (59.3%). At 6 months, higher mortality was observed in the refused group (68.8% vs 25.4%, $p<0.01$), as well as worse ECOG (score $\leq 2$ 44.4% refused group vs 92.3% admitted group, $p$ 0.001) in the survival group.
**Conclusions:** Sixty-seven point seven percent (67.7%) of patients with oncological pathology evaluated were admitted to our unit. Lower scores in FRAIL and ECOG were observed in admitted patients, as well as lesser extent and better response to oncological disease treatment. At 6 months, higher mortality and functional class were observed in the refused patient group.

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**Topic:** Haematologic-oncologic issues in the ICU

## 000895

### Influence of perioperative low-flow vs. high-flow extracorporeal membrane oxygenation for severe COPD patients undergoing lung volume reduction surgery on clinical outcome parameters

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000843

**Introduction:** Lung volume reduction surgery (LVRS) represents an effective treatment option for patients with chronic obstructive pulmonary disease (COPD) and severe emphysema [1]. Patients with compromised lung function are at elevated risk of perioperative mortality. Venovenous extracorporeal membrane oxygenation (vv-ECMO) can potentially ensure lung-protective ventilation strategies and support the prompt postoperative recovery of spontaneous breathing. Animal studies have demonstrated the superiority of high-flow ECMO over low-flow ECMO; however, clinical data in patients are currently lacking [2].
**Objectives:** Aim of the study was to investigate the influence of perioperative low-flow versus high-flow ECMO on clinical outcome parameters in severe COPD patients undergoing LVRS.
**Methods:** This retrospective analysis included patients undergoing LVRS with elective perioperative ECMO between July 2019 and February 2023 at Charité—Universitätsmedizin Berlin. The impact of low-flow versus high-flow ECMO on clinical outcome parameters was assessed. The Chi-square test or Fisher's exact test was applied for categorical data as appropriate. The Mann–Whitney U test was utilised for ordinal data. The significance level was set at $p < 0.05$.
**Results:** Data from 29 patients were used for analysis. Eleven patients received low-flow ECMO, while 18 received high-flow ECMO. Their ages were 70 [IQR 66–72] years and 64 [IQR 59–70] years, with 64% and 61% being male, respectively. The Charlson Comorbidity Index was 4 [IQR 4–6] and 4 [3–5], and the BMI was 22.7 [IQR 17.5–24.7] kg/cm$^2$ and 22.8 [IQR 20.1–25.8] kg/cm$^2$ in the low-flow and high-flow ECMO groups, respectively.
No significant differences were observed in terms of ECMO duration, intensive care unit length or hospital length of stay, hospital mortality and discharge to home between the low- and high-flow ECMO groups, respectively (see Table 1).
**Conclusions:** High-flow compared to low-flow ECMO for LVRS in severe COPD patients did not demonstrate significant advantages in clinical outcomes.

**Table 1 (abstract 000895)** Outcomes of perioperative low-flow versus high-flow ECMO

| Outcome | All patients | Low-flow ECMO | High-flow ECMO | p-value |
|---|---|---|---|---|
| ECMO duration (hours) | 25.9 [22.4-50.1] | 25.9 [14.2-42.0] | 26.1 [23.5-49.9] | 0.8 |
| ICU LOS (days) | 14 [7-26] | 14 [8-28] | 12 [7-26] | 0.9 |
| Hospital LOS (days) | 27 [17-44] | 31 [16-37] | 22 [17-50] | 0.7 |
| Hospital mortality (n) | 2 (7%) | 1 (9%) | 1 (6%) | 1.0 |
| Discharge to home (n) | 26 (90%) | 9 (82%) | 17 (94%) | 0.7 |

Data are presented as median [interquartile range] or n (%). *ECMO* Extracorporeal membrane oxygenation; *ICU* intensive care unit; *LOS* length of stay

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**Topic:** Perioperative care

## 000897

### Use of isavuconazole in critically ill patients with continuous renal replacement therapy

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000894

**Introduction:** Isavuconazole (ISV) as an antifungal treatment in critically ill patients has become a widely used option given its safety profile, the lack of monitoring of its levels and the action spectrum. In critically ill patients with bad clinical course, it is common to begin empirical antifungal treatment throughout their evolution as well as requiring continuous renal replacement therapy (CRRT).
**Objectives:** To describe the evolution of patients admitted to our ICU treated with isavuconazole during continuous renal replacement therapy.
**Methods:** A retrospective descriptive observational study of patients admitted to a 12-bed multipurpose ICU (extended to 24 during the COVID period). Patients admitted from 02/24/2019 to 08/12/2023 who received ISV treatment during continuous renal replacement therapy are included. Patient demographic variables, reason for admission, reason for ISV use, duration of treatment, and mortality of patients with confirmed aspergillosis treated with ISV during continuous renal replacement therapy are analyzed.
**Results:** A total of 25 patients received ISV treatment during continuous renal replacement therapy. The dose of the drug was not modified according to the technical information sheet. The mean age was 61.44 years (95% CI 56.83–66.04). 72% were men. The most frequent medical history was: high blood pressure followed by diabetes, dyslipidemia, chronic kidney failure and obesity. The mean APACHE II score was 19.32 (95% CI 16.40–22.23). The most frequent reasons for admission were: 9 (36%) community-acquired COVID19-pneumonia, 5 (20%) abdominal sepsis, 3 (12%) polytrauma and 2 (8%) community-acquired

bacterial pneumonia. 24 patients (96%) required invasive mechanical ventilation. The types of infection for which isavuconazole is started were: 19 (76%) ventilator-associated pneumonia, 3 (12%) sepsis without focus, 2 (8%) bacteremia. The mean SOFA score at the beginning of treatment with ISV was 9.32 (95% CI 8.03–10.60). Aspergillosis was confirmed by bronchoalveolar lavage culture or galactomannan in 8 (32%) patients. The mean duration of treatment was 11.76 (95% CI 8.33–15.19) days. 13 (52%) patients received combined treatment with liposomal amphotericin B, anidulafungin and caspofungin. The mortality of patients with pulmonary aspergillosis confirmed was 64% (16 patients).

**Conclusions:** Patients treated with isavuconazole and renal replacement therapy have high morbidity and mortality scores. The main reason for admission of these patients was infectious followed by polytrauma. The reason for starting isavuconazole was mostly VAP. Suspicion of aspergillosis was confirmed in 32% of patients treated with empirical isavuconazole. More than 50% of patients received combined treatment. Mortality in these patients was 62.5%.

**Topic:** Sepsis

### 000898

### Accuracy of non-invasive inspiratory effort measurement during non-invasive ventilation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000898

**Introduction:** The excessive inspiratory effort causes lung and diaphragm injury, and monitoring of inspiratory effort is important in respiratory management. The gold standard for the assessment has been the measurement of esophageal pressure swings (ΔPes), which is applicable to both intubated and non-intubated patients. For patients on mechanical ventilation, non-invasive measures such as P0.1 and ΔPocc have been investigated and used as indicators of inspiratory effort. However, there are few studies investigating whether these non-invasive parameters measured during non-invasive ventilation (NIV) can be reliable indicators of inspiratory effort.

**Objectives:** The aim of this study is to investigate the accuracy of P0.1 and ΔPocc during NIV.

**Methods:** Mechanically ventilated patients for more than 24 h were enrolled in this study, and the patients without tolerance of NIV or those with contraindication of esophageal catheterization (recent upper gastrointestinal surgery, bleeding varices) were excluded. Patients underwent measurements of P0.1, Pes0.1, ΔPocc and ΔPes during spontaneous breathing trial (SBT) on pressure support ventilation (PSV) mode with PS at 5 cmH2O and PEEP at 5 cmH2O followed by extubation. P0.1, Pes0.1, ΔPocc and ΔPes were again measured using the non-invasive ventilation (NIV) device at 5 min and at 1 h after extubation. An analysis was performed to evaluate the correlations between P0.1 and Pes0.1, as well as that between ΔPocc and ΔPes at each of these time points.

**Results:** A total of 23 patients were included for the analysis. The median age was 71.0 [IQR 54.5–77.5] and a median BMI of 23.4 [IQR 21.4–25.2] with 20 male patients (87%). During the SBT, P0.1 and Pes0.1 ($p<0.01$, $r=0.78$) as well as ΔPocc and ΔPes ($p<0.01$, $r=0.89$) showed strong correlations. P0.1 and ΔPocc measured using the NIV device after extubation also showed strong correlations with Pes0.1 and ΔPess both at 5 min and 1 h (P0.1 and Pes0.1 $p<0.01$, $r=0.77$; ΔPocc and ΔPes $p<0.01$, $r=0.75$ and P0.1 and Pes0.1 $p<0.01$, $r=0.69$; ΔPocc and ΔPes $p<0.01$, r = 0.74, respectively).

**Conclusions:** Our study indicates that non-invasive measurement of inspiratory effort during NIV accurately reflects inspiratory effort.

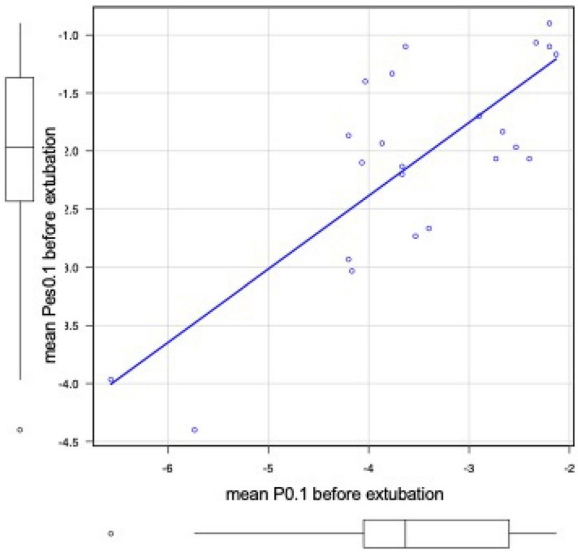


**Fig. 1 (abstract 000898)** Correlation between P0.1 and Pes0.1 before extubation

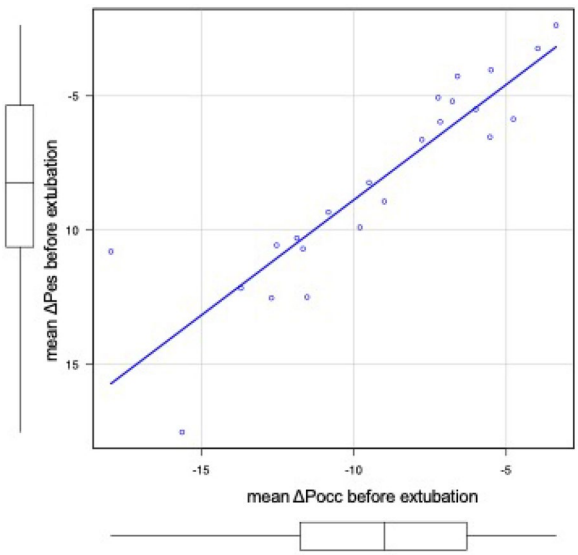


**Fig. 2 (abstract 000898)** Correlation between ΔPocc and ΔPes before extubation

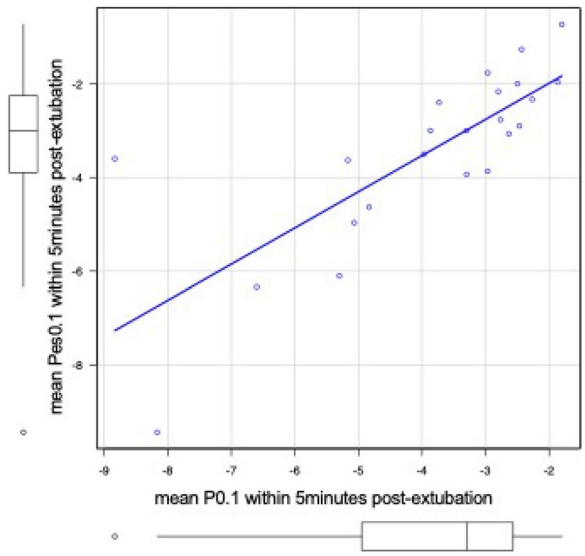


**Fig. 3 (abstract 000898)** Correlation between P0.1 and Pes0.1 within 5 min post-extubation

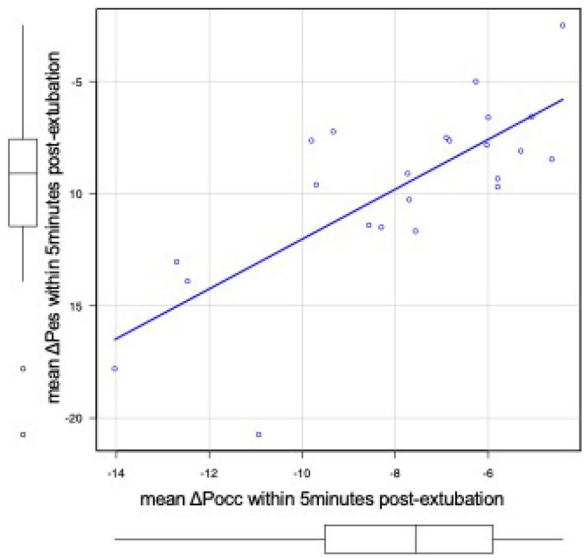


**Fig. 4 (abstract 000898)** Correlation between ΔPocc and ΔPes within 5 min post-extubation

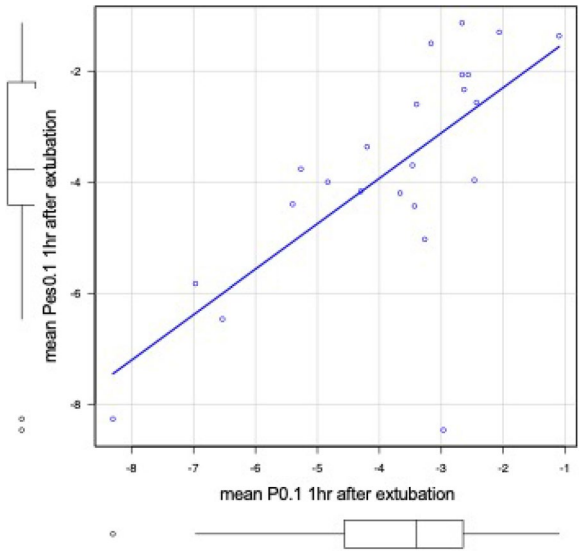


**Fig. 5 (abstract 000898)** Correlation between P0.1 and Pes0.1 1 h after extubation

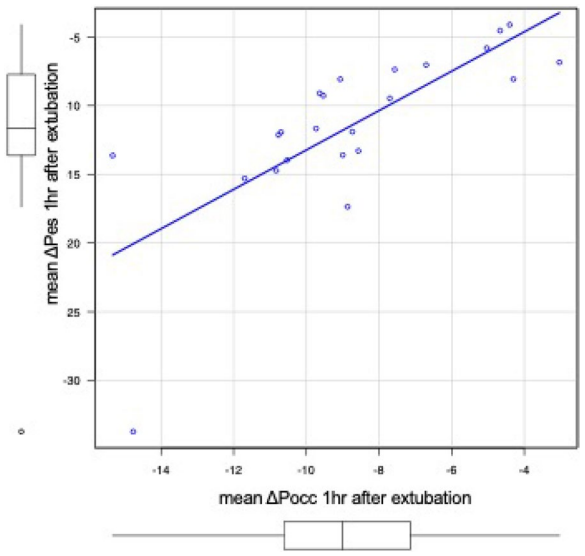


**Fig. 6 (abstract 000898)** Correlation between ΔPocc and ΔPes 1 h after extubation

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000899

### Effectiveness of pharyngeal and rectal swab cultures for detection of multidrug-resistant Gram-negative bacteria in patients admitted to intensive care unit: an observational study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000899

**Introduction:** Active surveillance for colonization by multidrug-resistant Gram-negative bacteria (MDR-GNB) in patients admitted to the Intensive Care Unit (ICU) is one of the most commonly employed measures for reducing infection/colonization. The Spanish Society of Intensive and Coronary Care Medicine (SEMIYUC) recommends, among other measures, the performance of rectal and oropharyngeal swabs. However, the effectiveness of nasopharyngeal swabs for detecting MDR-GNB may be limited depending on the local and epidemiological context.
**Objectives:** The main objective was to evaluate the effectiveness of pharyngeal swab in MDR-GNB (Enterobacterales, Pseudomonas aeruginosa and carbapenem-resistant Acinetobacter) in the context of rectal swab testing.
**Methods:** This is an observational and retrospective study conducted at a tertiary-level hospital within the context of the multicentre study MURAN-UCI. Over a period of 45 days, all patients admitted to the ICU underwent pharyngeal and rectal swab culturing for the detection of MDR-GNB (cephalosporin and/or carbapenem resistant Enterobacterales, *Pseudomonas aeruginosa* and Acinetobacter spp.) upon admission, at $7 \pm 2$ days, and at $14 \pm 2$ days. Demographic variables, comorbidities, severity of illness upon ICU admission (APACHE II), risk factors for multidrug resistance, MDR-GNB-associated infections, and the need for contact isolation measures were evaluated. Samples were cultured on commercial chromogenic media (CHROMID® CARBA SMART and ESBL; BioMérieux) and MacConkey agar with meropenem (2 mg/L) for detection of carbapenem resistant *Pseudomonas aeruginosa*, carbapenemase-producing Enterobacterales (CPE) and extended spectrum beta-lactamase producing Enterobacterales (ESBL). The identification was performed by MALDI-TOF MS (Bruker Daltonics, Bremen, Germany). Antibiotic sensitivity was determined using broth microdilution and interpreted according to EUCAST criteria. Carbapenemase production was detected using NG-Test® CARBA-5 immunochromatography and confirmed by the mCIM test (EUCAST). The prevalence and incidence of rectal and/or pharyngeal colonization by MDR-GNB during hospitalization were studied.
**Results:** A total of 186 patients were included, with males being more frequent at 117 (62%), and a median age and APACHE II severity score at admission of 60.5 years and 12.5 points, respectively. Two patients had a positive pharyngeal exudate culture for MDR-GNB (1%), while 16 (8%) were positive in rectal exudate cultures. The prevalence of colonization by MDR-GNB (rectal and/or pharyngeal) at admission was 6.9% (13 patients), with an incidence of colonization of 0.6 patients and 0.64 per 100 ICU days during the first and second weeks, respectively. Of the 21 positive isolations (19 rectal and 2 pharyngeal), the most frequent isolated species was *Escherichia coli* producing ESBL (8/21; 38%).
Pharyngeal exudate cultures for detecting MDR-GNB were only positive in patients with positive rectal exudate cultures, with no positive samples in those with negative rectal exudates (12 vs 0%; $p = 0.007$).
Patients colonized by MDR-GNB (rectal and/or pharyngeal), compared to non-colonized patients, had a higher risk of MDR-GNB infection (18 vs 2%; $p = 0.01$), in all cases the species involved in colonization and infection was the same (3/3; 100%), and more frequently required contact isolation measures (75% vs 0.6%; $p < 0.001$).
Lastly, risk factors associated with a higher risk of MDR-GNB colonization included COPD (25 vs 12%; $p = 0.04$), previous antibiotic treatment for more than 7 days (50 vs 9%; $p < 0.001$), longer ICU stay (median 5.5 vs 4 days; $p = 0.04$), and receipt of invasive ventilatory (87 vs 51%; $p = 0.01$) and vasopressor support (81 vs 54%; $p = 0.03$) during ICU stay
**Conclusions:** The frequency of detecting colonization by MDR-GNB through pharyngeal exudates was low, occurring only in patients with positive rectal exudates and not aiding in the detection of MDR-GNB colonization in patients with negative rectal exudates. Patients colonized rectally and/or pharyngeally by MDR-GNB are at a higher risk of developing infections caused by these organisms; their detection allows for the implementation of contact precautions.

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5. This research was developed in the context of MURAN-UCI project funded by the Intramural Call for Research Projects CIBERINFEC-2022 (Centro de Investigación Biomédica En Red, CIBER in Infectious Diseases).

**Topic:** Infections and prevention

## 000900

### Estimating blood volume loss with wireless, wearable ultrasound: a pilot investigation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000900

**Introduction:** Detecting and estimating blood volume loss are important for the diagnosis and management of life-threatening hemorrhage. During hemorrhage, percent blood volume loss (BVL%) can be estimated as approximately one-half the percent fall in stroke volume (SV). Furthermore, using wireless, wearable Doppler ultrasound technology, we have shown that a 10% fall in SV correlates with a 7-to-10 ms (ms) reduction in the corrected flow time of the common carotid artery (ccFT). We therefore hypothesized that change in ccFT (ccFTΔ) would show a similar relationship with BVL% in a blood draw paradigm.
**Objectives:** Describe the relationship between falling percent blood volume loss and corrected flow time of the carotid artery in a blood draw paradigm.

**Methods:** The Research Ethics Board of the Mayo Clinic approved this study. A convenience sample of adult patients recruited by a physiology laboratory comprise this analysis. Exclusion criteria were: blood donation within 112 days, hemoglobin < 13.0 g/dL for men and < 12.0 g/dL for women, under the age of 18 or over 50, systolic blood pressure < 90 mmHg or > 180 mmHg, diastolic blood pressure > 100 mmHg, current smokers, BMI > 38 kg/m$^2$, known or planned pregnancy.
Subjects remained in the sitting position in a blood donation chair. A wearable Doppler ultrasound system (Flosonics Medical, Sudbury, Canada) was placed on the neck over the common carotid artery; as well, other non-invasive hemodynamic monitors were placed to measure vital signs throughout.
Subjects underwent phlebotomy over 8-to-12 min (approximately 50 mL/min) via a 16 or 18-gauge intravenous catheter. The blood volume withdrawn was not to exceed 13% of whole blood volume with a maximum withdrawal of 450 mL ± 10%. The subject's whole blood volume was estimated by the equation of Nadler. Vital signs and carotid Doppler were recorded continuously. The ccFT was determined by Wodey's equation.
Change in corrected flow time (ccFTΔ), and mean arterial pressure (MAPΔ) using Nexfin were compared to BVL% using two mixed linear regression models. The regression coefficient and slope were calculated to assess the strength of the relationship and the rate of change.
**Results:** We enrolled 21 subjects, 1 subject was excluded for low hemoglobin levels; data from 20 subjects and blood donations comprising 46,123 cardiac cycles are included. Table 1 shows the baseline subject characteristics and Fig. 1 presents regression results. On average 413.5 ± 39 mL of blood were drawn representing 8.6 ± 1.6% blood volume.
**Conclusions:** There was a significant and strong linear relationship between BVL% and ccFTΔ during blood draw, and the rate of change was similar to that of previous studies. Conversely, BVL% and MAPΔ showed a much lower rate of change and a weaker relationship. When blood loss is the sole mechanism for falling stroke volume, we estimate that for every 1 ms reduction in ccFT, there is an approximate 0.4 percent blood volume loss. Further validation in patients with hemorrhage is planned.

| Table 1: Subject characteristics (n = 20) | |
|---|---|
| Absolute value ± standard deviation | |
| Age (yr) | 31.9 ± 6.1 |
| Sex (female) | 9 |
| Weight (kg) | 80.8 ± 17.0 |
| Height (cm) | 173.9 ± 9.4 |
| BMI (kg/m²) | 26.6 ± 4.3 |
| Estimated blood volume (L) | 4.9 ± 0.9 |
| Systolic blood pressure (mmHg) | 122.4 ± 10.0 |
| Diastolic blood pressure | 78.1 ± 7.9 |
| Mean arterial pressure | 95.4± 5.3 |
| Oxygen saturation (%) | 97.4 ± 1.2 |
| Heart rate (bpm) | 80.8 ± 11.5 |
| Corrected flow time (ms) | 319.7 ± 8.4 |

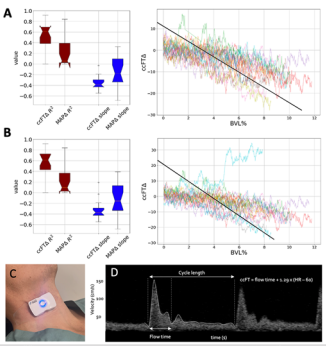


**Table 1 (left) and Fig. 1 (right) (abstract 000900)** A. Mixed linear regression modelling is summarized for the relationship between ccFT change vs BVL% (median $R^2 = 61\%$, slope = − 0.39, $p$-value < 0.05) and MAP vs BVL% (median $R^2 = 6\%$, slope = − 0.18, $p$-value < 0.05), left panel. Regression of ccFT change vs BVL% is plotted. Colors represent individual subjects, right panel. B. Results including outlier subject with large increases of ccFT change in response to BVL. C. The wireless, wearable Doppler D. the calculation of ccFT by Wodey's equation

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5. Joshua Donkor, Jessica Johnston, Briana Ziegler for patient consent, enrollment and study protocol
6. This work was supported by the Office of the Assistant Secretary of Defense for Health Affairs, through the Congressionally Directed Medical Research Program under Award No. W81XWH1910591.
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**Topic:** Trauma

## 000901

## Role of mechanical support in patients with congenital heart disease in intensive care units

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000901

**Introduction:** Congenital heart diseases are rare pathologies but highly complex in their management in the ICU. The majority enter our service in the postoperative period of cardiac surgery, so we must know their prognosis and evolution, as well as the need for mechanical assistance as support during the postoperative period.
**Objectives:** Describe the clinical course and characteristics of adult patients with congenital heart disease in need of mechanical circulatory support admitted to the intensive care unit (ICU).
**Methods:** Retrospective observational study in an ICU of a tertiary hospital from 2011 to 2023. Patients with congenital heart disease with ventricular assistance for any reason are included. Demographic variables, history, reason for assistance implantation, device configuration, length of stay in ICU and days on mechanical support, complications and evolution are collected. Statistical analysis of qualitative variables through frequencies and quantitative variables with median and interquartile range.
**Results:** We analyzed 16 (8.7%) patients with a history of congenital heart disease out of a total of 191 patients in need of ventricular assistance device (VAD). Among the 16 patients with congenital disease, the majority were women (62.5%) with a median age of 30 years (24.5–52.7). The majority were admitted to the ICU in the immediate postoperative of cardiac surgery. The postcardiotomy syndrome (31.2%) and primary graft failure in the immediate post-transplant (25%) were the most frequent mechanical circulatory support causes.
The most frequently implemented type of assistance is VA ECMO (venoarterial extracorporeal membrane oxygenation) (87.5%). In our cohort, 3 patients (18.7%) required heart transplantation during their stay at ICU. Variables for study are collected in Table 1.
In the statistical analysis we compared the subgroup of patients with congenital disease requiring VAD versus the total VAD population admitted to the ICU. In this study, we observed significant differences when we compared by sex (p0.01) and reason of assistance implant in both groups (p 0.003). Rest of the comparisons are in Table 2.

**Conclusions:** Patients with a history of congenital heart disease represent a rare group of patients in our units and are highly complex, requiring support with more than one mechanical assistance more frequently in the immediate postoperative period of cardiac surgery

**Table 1 (abstract 000901)** Clinical features

| VARIABLE | N=16 |
|---|---|
| Age (IR) | 30,50 (24,50;52,75) |
| Female n (%) | 10 (62,5%) |
| **VAD reason** | |
| Postcardiotomy shock n (%) | 5 (31,25%) |
| Primary graft failure in the immediate post-transplant n (%) | 4 (25%) |
| Rigth ventricule failure n (%) | 2 (12,5%) |
| dilated cardiomyopathy n (%) | 2 (12,5%) |
| Cardiorespiratory arrest n (%) | 1 (6,25%) |
| Others n (%) | 1 (6,25%) |
| **Type of VAD** | |
| VA ECMO n (%) | 14 (87,5%) |
| Levitronix n (%) | 1 (6,25%) |
| EXCOR n (%) | 1 (6,25%) |
| **Clinical features** | |
| APACHE II mediaan (IR) | 17(8,25;26) |
| Cardshock median (RI) | 2 (1;4) |
| SAVE score median (IR) | -0,5 (-7,75;2) |
| Continuous renal replacement n (%) | 3 (18,75%) |
| Tracheostomy n (%) | 6(37,5%) |
| 2 LVAD n (%) | 3 (18,75%) |
| Trasplant post LVAD n (%) | 3 (18,75%) |
| Polyneuropathy n (%) | 9 (56,3%) |
| Day son LVAD (IR) | 7,50 (4,25;13) |
| Length of stay in ICU (IR) | 12 (8; 40,50) |
| Death n (%) | 7 (43,7%) |

**Table 2 (abstract 000901)** Statistical significance

| Variable n (%) | General group VAD N=191 (%) | Congenital heart disease N=16 (%) | P Value |
|---|---|---|---|
| Male | 120 (62) | 6 (37,5) | 0,01* |
| **VAD reason** | | | |
| post myocardial infarction shock | 61 (32) | 0 (0) | 0,003* |
| Postcardiotomy shock | 47(24,6) | 5 (31,2) | |
| Trasplant | 46 (24) | 3 (18,7) | 0,47 |
| 2 LVAD | 34 (17,8) | 5 (31,2) | 0,2 |
| Cannula infection | 6 (3,1) | 1 (6,2) | 0,57 |
| Death | 81 (42) | 7 (43,7) | 0,84 |

**Topic:** Cardiovascular issues in ICU

## 000905

### Edema score in ischemic cerebrovascular disease as an early predictor of intracranial hypertension in patient admitted to the Mexican National Institute of Neurology and Neurosurgery "Manuel Velasco Suárez"

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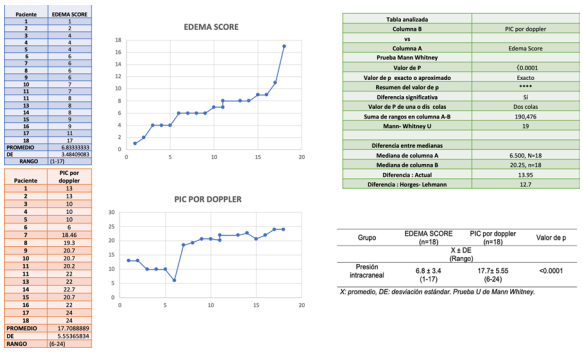
*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000905

**Introduction:** The Enhanced Detection of Edema in Malignant Anterior Circulation Stroke (EDEMA) score was developed in the USA to predict potentially fatal malignant edema in patients with moderate to severe large hemispheric stroke. This simple score incorporated three clinical variables (glucose, stroke history, and reperfusion therapy) and two radiological variables (midline shift and cisternal effacement) that are readily available within 24 h of stroke onset. The EDEMA score for each patient was calculated by assigning points corresponding to the five predictors: basal cistern effacement (=3); midline shift > 0 to 3 (=1), 3 to 6 (=2) and 6 to 9 (=4), > 9 (=7); glucose ≥ 150 mg/dL (=2); no previous stroke (=1); and no acute intervention (no thrombolysis or thrombectomy) (=1). Therefore, the EDEMA score could range between 0 and 14.According to the American Society of Neuroimaging, a total of 169 CT investigations in 60 patients were analyzed: edema formation was classified as 0: no edema, 1: focal edema limited to 1 lobe, 2: unilateral edema > 1 lobe, 3: bilateral edema, 4: global edema with disappearance of sulcus relief, and 5: global edema with basal cisterns. Erasure. The mean ICP values were 12.0, 14.0, 14.9, 18.2, and 25.9 mm Hg in grades 1 to 5, respectively.
**Objectives:** General objective: To demonstrate the usefulness of the cerebral edema score as an early predictor of intracranial hypertension in patients with ischemic cerebrovascular disease
**Methods:** Study design: Observational, descriptive, prospective, cross-sectional study.
Study population: Patients admitted to the Neurological Intensive Care area from June to November with ischemic cerebrovascular disease. Sample size: A study was carried out with a total of 18 electronic records that have the necessary information. Sampling type: Sequential non-probabilistic.
**Results:** The value obtained from IP by transcranial Doppler performed at this institute was taken into consideration and from the following validated formula of $10.927 \times \text{IP} - 1.284$ the ICP was calculated, subsequently a relationship of the Edema score with the ICP was made, which could indicate that values from 1 to 6, 7.8 to 10 and more than 11 are related to a pic of 10, 20, 22, 24, respectively. On average, the patients spent between 3 and 14 days in the hospital and of the total sample, 5 patients died. With the data obtained, the statistical analysis was carried out in GraphPad Prism 9.5 software because they were unpaired qualitative variables, with a non-normal distribution according to the Shapiro–Wilk test and because the analysis was carried out between 2 groups, the statistical test was carried out. Mann–Whitney U to obtain $p$ value < 0.0001 considering the proposed score as statistically significant.
**Conclusions:** In the present investigation, the records of 18 patients who were admitted to the Intensive Care service, secondary to ischemic stroke, were analyzed, who already had a simple skull CT scan, which was analyzed individually in order to obtain the Edema score and determine an estimate of intracranial pressure through a proposed scale, the statistical analysis showed said scale is statistically significant. Therefore, this scale could be useful to predict intracranial hypertension and thus make medical decisions that will have a significant impact on the evolution and outcome of patients admitted to intensive care for low-income patients


**Fig. 1 (abstract 000905)** VARIABLES ESTADISTICAS




| Paciente | EDEMA SCORE |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 4 |
| 4 | 4 |
| 5 | 4 |
| 6 | 6 |
| 7 | 6 |
| 8 | 6 |
| 9 | 6 |
| 10 | 7 |
| 11 | 7 |
| 11 | 8 |
| 13 | 8 |
| 14 | 8 |
| 15 | 9 |
| 16 | 9 |
| 17 | 11 |
| 18 | 17 |
| PROMEDIO | 6.83333333 |
| DE | 3.48409083 |
| RANGO | (1-17) |

| Paciente | PIC por doppler |
|---|---|
| 1 | 13 |
| 2 | 13 |
| 3 | 10 |
| 4 | 10 |
| 5 | 10 |
| 6 | 6 |
| 7 | 18.46 |
| 8 | 19.3 |
| 9 | 20.7 |
| 10 | 20.7 |
| 11 | 20.2 |
| 11 | 22 |
| 13 | 22 |
| 14 | 22.7 |
| 15 | 20.7 |
| 16 | 22 |
| 17 | 24 |
| 18 | 24 |
| PROMEDIO | 17.7088889 |
| DE | 5.55365834 |
| RANGO | (6-24) |

| Tabla analizada | |
|---|---|
| Columna B | PIC por doppler |
| vs | |
| Columna A | Edema Score |
| Prueba Mann Whitney | |
| Valor de P | <0.0001 |
| Valor de p exacto o aproximado | Exacto |
| Resumen del valor de p | **** |
| Diferencia significativa | Si |
| Valor de P de una o dis colas | Dos colas |
| Suma de rangos en columna A-B | 190,476 |
| Mann- Whitney U | 19 |
| | |
| Diferencia entre medianas | |
| Mediana de columna A | 6.500, N=18 |
| Mediana de columna B | 20.25, n=18 |
| Diferencia : Actual | 13.95 |
| Diferencia : Horges- Lehmann | 12.7 |

| Grupo | EDEMA SCORE (n=18) | PIC por doppler (n=18) | Valor de p |
|---|---|---|---|
| | X ± DE (Rango) | | |
| Presión Intracraneal | 6.8 ± 3.4 (1-17) | 17.7± 5.55 (6-24) | <0.0001 |

*X: promedio, DE: desviación estándar. Prueba U de Mann Whitney.*

**Fig. 2 (abstract 000905)** INTRACRANEAL PRESSURE EDEMA SCORE VS PIC DOPPLER

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**Topic:** Neurointensive care

## 000906

## Association between early onset signs and symptoms in patients with sepsis and the need for intensive care unit admission or mortality in a tertiary level hospital in Colombia


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000906



**Introduction:** Sepsis is a potentially fatal organ dysfunction caused by a dysregulated host response to infection (1). Early diagnosis of sepsis and correct and timely antimicrobial treatment is associated with better clinical outcomes (2) (3); there are multiple scores that estimate the probability of presenting sepsis (4) (5) (6), Mortality remains high despite the fact that knowledge about the pathophysiology and treatment of sepsis has changed considerably in the last decade since it has been identified that early diagnosis and having care packages implemented in emergency departments improves short and long term outcomes (3), a possible solution is the construction of scales or identification of signs and symptoms that suggest early diagnosis of sepsis and that can be performed at primary care or even pre-hospital levels. It is important to have specific data to identify patients with sepsis at the local level. Objective: To identify the earliest signs and symptoms in a patient with sepsis that may be associated with the need for ICU admission or hospital mortality.

**Objectives:** To identify the earliest signs and symptoms that a patient with sepsis presents and that may be associated with the need for ICU admission or hospital mortality.

**Methods:** Prospective cohort study, using data from the clinical history of patients hospitalized in a tertiary level for suspected infection and a form filled out by the researchers when the patient was hospitalized and before 24 h of admission to the emergency department, included patients over 18 years of age, with suspected infection, during the period between 2021 and 2022. Patients with immunodeficiency, pregnancy, infections with prolonged treatment such as tuberculosis or deep mycosis, oral or parenteral antibiotic treatment for at least 3 days in the last 15 days, and terminal diseases such as metastatic cancer, neurodegenerative diseases in late stages or severe sequelae of cranioencephalic or spinal cord trauma were excluded.
The main outcome was mortality and the need for ICU, other variables were age, sex and race, Charlson index variables, SOFA and drugs affecting exposure variables. Vital signs, altered mental status, capillary refill and malaise, headache, nausea, chills, subjective fever, productive cough, dyspnea, dysuria, myalgia and arthralgias were recorded. Patients were recruited for 12 months, exposure variables were analyzed independently with respect to death or admission to ICU and then univariable logistic regression models were performed to estimate potential risk, then a multivariable logistic regression model was fitted to estimate the independent effect on mortality or admission to ICU.

**Results:** Of 1135 patients with suspected infection, 540 patients who did not meet the inclusion criteria were excluded, leaving 595 patients as shown in Fig. 1. 53.8% were men, the most prevalent comorbidities were diabetes (13.8%), chronic acquired pulmonary disease (16.5%) and congestive heart failure (11.4%). Antibiotics were administered on admission in 60.9% of patients. The most frequent foci were urinary (20.8%), respiratory (21.0%) and gastrointestinal (29.8%). Admission to the ICU was 11.4% and overall mortality was 8.2%. The most frequent symptoms were general malaise (87.7%), nausea (42.2%), subjective fever (29.7%), headache (28%) and dyspnea (25.8%). No differences were found between patients' signs. Among 85 (14.3%) patients who died in ICU due to sepsis, a crude association with mortality was found for: dyspnea OR: 2.29; (1.28–4.10), altered mental status OR: 3.50 (95% CI 1.64–7.48) and heart rate OR: 1.02 (1.00–1.03), but after adjustment for confounding variables age, SOFA score and Charlson index no statistically significant difference was found for any variable as shown in Table 1.

**Conclusions:** Sepsis is a complex syndrome with a high burden of morbidity and mortality in our population and worldwide. In-hospital mortality rates remain high. Male sex and age are variables associated with increased incidence of sepsis. No association with ICU admission or mortality was found for any of the signs and symptoms studied when adjusting for confounding variables, which seems to make early suspicion of sepsis in its initial stages difficult based on questioning and physical examination.

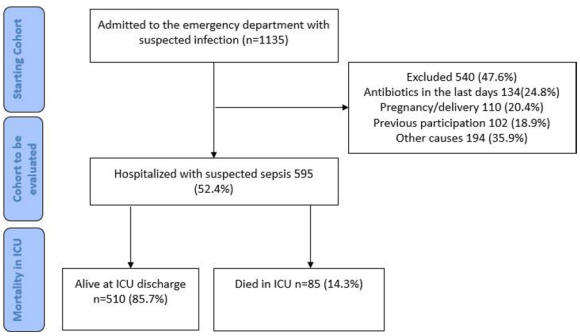


**Fig. 1 (abstract 000906)** Patient flowchart

**Table 1 (abstract 000906)** Multivariate logistic regression model for mortality or admission to the ICU

| Variable | No adjustment OR (IC95%) | With adjustment OR (IC95%) |
|---|---|---|
| Symptoms | | |
| General malaise | 0,99 (0,48 - 1,98) | 0,82 (0,36 - 1,85) |
| Headache | 0,61 (0,34 - 1,12) | 0,61 (0,30 - 1,21) |
| Nausea | 0,89 (0,52 - 1,53) | 0,89 (0,47 - 1,67) |
| Chills | 0,90 (0,43 - 1,89) | 0,50 (0,19 - 1,29) |
| Subjective fever | 0,66 (0,33 - 1,33) | 0,77 (0,33 - 1,78) |
| Productive cough | 1,23 (0,66 - 2,47) | 1,56 (0,72 - 3,33) |
| Myalgia/arthralgia | 0,56 (0,24 - 1,29) | 0,50 (0,18 - 1,35) |
| Dyspnea | 2,29 (1,28 - 4,10) | 1,24 (0,61 - 2,50) |
| Dysuria | 0,65 (0,28 - 1,49) | 0,37 (0,13 - 1,06) |
| Altered mental status | 3,50 (1,64 - 7,48) | 1,46 (0,57 - 3,71) |
| Signs | | |
| Temperature | 0,73 (0,47 - 1,13) | 0,75 (0,47 - 1,22) |
| Systolic blood pressure | 0,99 (0,98 - 1,01) | 0,99 (0,97 - 1,01) |
| Diastolic blood pressure | 0,98 (0,95 - 1,00) | 0,99 (0,96 - 1,02) |
| Heart rate | 1,02 (1,00 - 1,03) | 1,01 (0,99 - 1,03) |
| Respiratory rate | 1,02 (0,98 - 1,06) | 1,02 (0,97 - 1,06) |
| Glasgow Coma Scale | 0,48 (0,35 - 0,64) | 0,64 (0,47 - 0,86) |
| CAM – ICU | 0,82 (0,28 - 2,41) | 0,67 (0,21 - 2,15) |
| Capillary refill | 1,61 (0,96 - 2,69) | 1,57 (0,89 - 2,76) |

Confusion Assessment Method for the Intensive Care Unit

**Reference(s)**

1. None

**Topic:** Sepsis

## 000907

## Estimating the stabilization time of PaO2/FiO2 ratio in ventilated ICU patients after FiO2 intervention: a prospective study (Preliminary Data)

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000907

**Introduction:** Routine arterial blood gas sampling in ICU patients may result in iatrogenic anemia and consequent complications. There is no scientific consensus regarding the optimal sampling time after FiO2 interventions in mechanically ventilated patients. This knowledge gap results additionally to increased time wasting and costs.
**Objectives:** To address the lack of publications regarding the optimal sampling time of arterial blood gas after FiO2 interventions by estimating the time to stabilization of the PaO2/FiO2 ratio in mechanically ventilated ICU patients after receiving FiO2 interventions. Additionally, the potential heterogeneity in times for a few patient characteristics was examined.
**Methods:** The Kaplan–Meier method, was used initially to estimate an initial time, to event after sampling 50 ventilated ICU patients for six consecutive 5-min intervals. Time of stabilization was defined as the time after which the patient had two consecutive measurements within a 15% margin.
**Results:** Preliminary results suggested that 90% of the patient had a stable ratio at the 15 min measurement while 70% of the patients were stable at the first measurement (5 min). Time to stabilization was moderated by vasoconstrictor drug use but not respiratory failure status. Figure 1 presents the preliminary results for the full sample. All patients who were not using vasoconstrictor drugs were stable from the first measurement (5 min), as shown in Fig. 2. The two curves are significantly different ($p=0.01$) according to both the log-rank and Peto & Peto (1972) test.
**Conclusions:** Most patients were stable 15 min after intervention. A larger sample and more frequent measurements will help identify the true times and potential heterogeneity, as well as whether the amount and the type of vasoconstrictor drugs plays a significant role in the stabilization time.

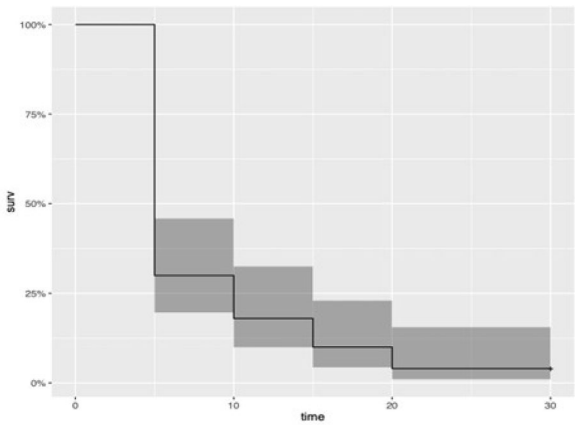


**Fig. 1 (abstract 000907)** Kaplan–Meier survival curve for full sample

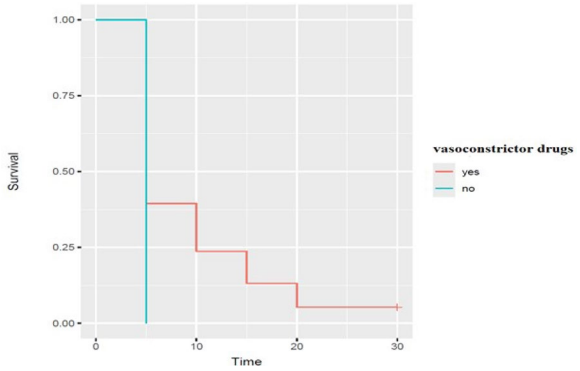


**Fig. 2 (abstract 000907)** Kaplan–Meier survival curves by vasoconstrictor drug use

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000909

### Analysis of the factors associated with a positive culture of the ECMO cannula: a retrospective descriptive study including 198 samples

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000909

**Introduction:** Critically ill patients needing extracorporeal membrane oxygenation (ECMO) support are at high risk of developing nosocomial infections, including those events associated with the extracorporeal system. There is no gold standard definition for infections related with the ECMO cannula. Furthermore, there is a lack or solid data about the factors related with cannula colonization/infection.
**Objectives:** The primary objective of the study was to identify the factors associated with a positive culture of the ECMO cannula.
**Methods:** Retrospective analysis of prospectively collected data including the information of all the adult patients who received veno-venous (V-V) or venoarterial (V-A) ECMO support for a minimum of 24 h, at the Vall d'Hebron University Hospital (Barcelona, Spain) during August 2021 to December 2022. By protocol patients received prophylaxis with daptomycin or vancomycin except specific contraindication. After decannulation the ECMO cannulae were aseptically retrieved, and the tip was sent to microbiological laboratory for culture using the Maki technique. We recorded clinical parameters of the patients and registered all the positive blood cultures 7 days prior and 7 days after decannulation. We compared the cohort of patients with positive cultures against the rest of the population. We finally retrieved the information of the microorganism identified in cultures. The analysis utilized Chi-square or Fisher's exact test for categorical variables and ANOVA for comparing means, while the Kruskal–Wallis test was employed for comparing medians in continuous variables.
**Results:** A total of 121 patients (mean age 51.8; 26.5% female; 65.3% V-V) were supported with ECMO. 198 cannulae were cultured [44 (18.2%) missing]. A positive result was identified in 33 (27.3%) patients (13.2% one positive cannula, 14.1% both), being *Staphylococcus epidermidis* the pathogen most frequently identified (34.4%), followed by *Candida parapsilosis* (20.3%). In comparison with the cohort with negative cultures, the duration of ECMO support was longer in patients with one cannula with a positive culture and even longer in those with two cannulae with positive cultures (11.5 vs 24.5 vs 49 median days, respectively, $P < 0.001$). Patients with positive cultures were more frequently cannulated at other center and transported to our ICU than patients with no positive cultures (38% vs 20.8%, P 0.08). Among the patients with positive cannula cultures, only in 4 (12.1%, 3% of the total) a positive blood culture for the same microorganism was identified; 2 for Staphylococcus epidermidis and 2 for Candida parapsilosis. In the 10 patients not receiving prophylaxis, the incidence of a positive cannula culture was the same than patients receiving daptomycin.
**Conclusions:** A long ECMO run and cannulation in other center are factors associated with increased risk of cannula colonization. Further studies are needed to study the clinical impact of these microbiological findings.

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**Topic:** Infections and prevention

## 000910

### A temporal analysis of disparities in the treatment of acute myocardial infarction (AMI) in the ICU and associated patient outcomes

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000910

**Introduction:** Considerable effort has been put into improving care for patients with AMI in the ICU, with health equity as a key goal. Simultaneously, standards of care have changed to match the prevailing public health culture. This study examines how disparities in treatment of AMI in the ICU have morphed between 2001 and 2019 to showcase improvements and highlight gaps.
**Objectives:** Examine whether there are changes in prescribing patterns for analgesia and AMI-related drugs, patient outcomes; in-hospital mortality (IHM) and discharge location (DL), and disparities in treatment by sex and race.

**Methods:** This is a retrospective study of patients with AMI hospitalized in an urban academic tertiary care hospital in MA, USA, extracted from MIMIC-III [1] (2001–2012) and MIMIC-IV [2] (2008–2019) datasets. Based on the standard of care for MI, orders for ACE inhibitors, beta-blockers, statins and antiplatelets are extracted for each patient. Additionally, orders for analgesics are extracted and examined as five categories; any analgesia, any opioids, opioids-only, non-opioids-only, and multimodal. To limit the effect of confounders on the differences in treatment, only patients with a primary diagnosis of AMI with no recorded comorbidities are included. To eliminate overlap, only patients admitted in 2014–2019 are selected from MIMIC-IV. Barnard exact and Chi-square tests are used to obtain statistically significant differences ($p$-values $\leq 0.05$) in drug orders and outcomes. Outcomes are dichotomized; survival (favorable) vs mortality for IHM, and home (favorable) vs elsewhere for DL. Henceforth, MIMIC-III and MIMIC-IV are referenced as M3 and M4, respectively.

**Results:** There were 2521 and 2057 patients from M3 and M4, respectively, who met the inclusion criteria. Patients in M3 had longer LOS, higher incidence of shock and lower rate of favorable discharge, including higher IHM, but fewer of them had a STEMI diagnosis; Fig. 1. The prescribing patterns for analgesics changed with fewer opioid prescriptions and a substantial increase in non-opioid-only therapies, Fig. 2. Moreover, there was a significant decrease in ACE inhibitor orders, while orders for beta-blockers and statins significantly increased, Fig. 3. Regarding sex differences, more men received ACE-inhibitors, aspirin, beta-blockers and statins in M3, while in M4 more of them received analgesia, ACE-inhibitors, antiplatelets and statins. Racially, more Hispanic Americans received opioids in M4 while in M3 more White Americans received all treatments.

**Conclusions:** Temporally, this data suggests that following the opioid crisis, caregivers have restrained from ordering opioids; however, further work is required to determine whether opiates were overprescribed in the past or pain is currently undertreated, especially across racial groups where disparities in opioid orders still exist. Concerningly, disparities by sex are still extensive, more effort is required to eliminate them. Despite more patients in M4 having severe MI, they had better outcomes compared to M3, suggesting the treatment of MI has greatly improved.

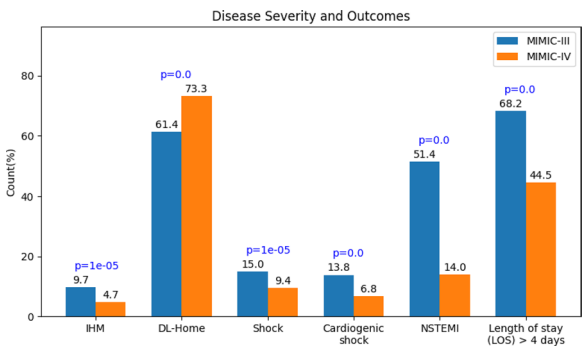


**Fig. 1 (abstract 000910)** Disease severity markers—the percentage (value above each bar in black) of patients in the study cohort who; died in hospital (IHM), were discharged to home (DL-Home), experienced shock (Shock), and separately, cardiogenic shock (Cardiogenic shock), had a NSTEMI diagnosis (NSTEMI), and were hospitalized longer than 4 days (LOS > 4 days). The p-values (rounded to 5 decimal places) are indicated above each M3/M4 pair of bars in blue)

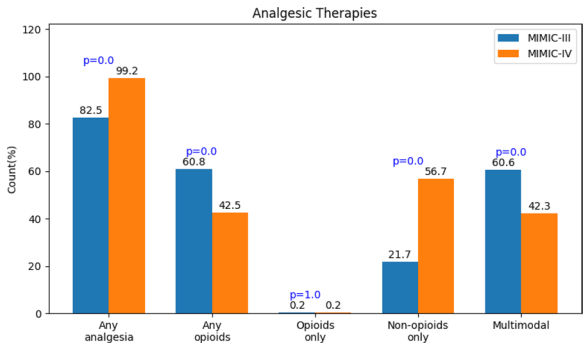


**Fig. 2 (abstract 000910)** Analgesic prescribing patterns—the percentage (value above each bar in black) of patients in the study cohort for whom an order was placed for each of the analgesic therapies. The $p$-values (rounded to 5 decimal places) are indicated above each M3/M4 pair of bars in blue)

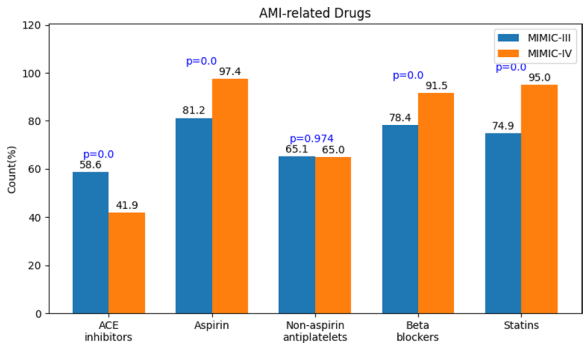


**Fig. 3 (abstract 000910)** AMI-related drugs prescribing patterns—the percentage (value above each bar in black) of patients in the study cohort for whom an order was placed for each of the AMI-related drugs. The $p$-values (rounded to 5 decimal places) are indicated above each M3/M4 pair of bars in blue)

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3. Spaulding Smith Fellowship, University of Massachusetts, Amherst, Graduate School
4. STEM for Social Justice Seed Grant, Institute of Diversity Sciences (IDS), University of Massachusetts, Amherst.

**Topic:** Cardiovascular issues in ICU

## 000911

### Veno-arterial extracorporeal membrane oxygenation in infarct-related cardiogenic shock: a Bayesian hierarchical model of randomized controlled trials

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000911

**Introduction:** Approximately 10% of hospitalized individuals with acute myocardial infarction (AMI) develop cardiogenic shock (CS), with mortality rates exceeding 40% (1). While the early use of mechanical circulatory support (MCS), including veno-arterial extracorporeal membrane oxygenation (VA-ECMO), may hold potential benefits (2), current guidelines only provide Class IIb recommendation based on a level C of evidence, indicating a high level of uncertainty concerning MCS in patients with AMI related CS (3).
In this context, accurately quantifying uncertainty regarding the use of VA-ECMO in infarct-related CS is crucial to facilitate well-informed treatment decisions.
**Objectives:** The objective of this study was to utilize a Bayesian framework to estimate the probability of benefit associated with VA-ECMO in patients with AMI-related CS by analyzing pooled data from existing randomized controlled trials (RCTs) that compare VA-ECMO to optimal medical therapy
**Methods:** All so far published RCTs comparing VA-ECMO to optimal medical therapy in patients with infarct-related CS were included for analysis (4–7). The primary outcome was 30-day all-cause death on a Risk-ratio scale.
To synthesize results from RCTs and account for between-study heterogeneity, we employed a Bayesian hierarchical model, using the 'bmrs' package in R version 4.3.3. Within a Bayesian framework, prior beliefs are integrated and updated based on emerging evidence (8).
Markov Chain Monte Carlo methods with 4 chains and 4000 iterations were employed for model parameter estimation.
We incorporated weakly informative neutral priors to reflect uncertainty about the effect of VA-ECMO on mortality in infarct-related CS patients. We used a normal distribution N(0,1) for the pooled effect size (μ) and a Half-Cauchy distribution HC(0,0.5) for between-study heterogeneity (τ2), ensuring that τ2 remained non-negative.
Results are depicted as posterior distributions, summarized by using the median of the posterior values for point estimates along with percentile-based 95% credibility intervals (CrI). Additionally, we calculated the posterior probabilities of benefit, presented as density plot.
**Results:** Four randomized controlled trials comprising a total of 565 patients were included in the pooled analysis (9). Utilizing the weakly informative neutral prior, our Bayesian hierarchical model determined that there was a 59.3% probability of VA-ECMO reducing 30-day mortality (RR 0.96, 95% CrI 0.65–1.38) (Fig. 1).
**Conclusions:** Prior frequentist meta-analyses concluded that VA-ECMO does not improve survival in patients with CS (9). In contrast, our analysis—by pooling data from all currently available RCTs and applying a neutral prior, wherein equal probability is assigned to harm and benefit—revealed a potential advantage of VA-ECMO regarding 30-day mortality among patients experiencing CS from AMI. The evidence concerning the efficacy of VA-ECMO should therefore be considered as indeterminate instead of negative (10).

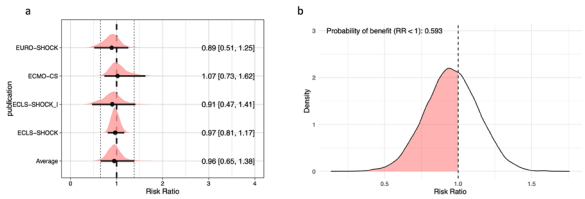


**Fig. 1 (abstract 000911)** a. Forest plot of the median estimated posterior Risk Ratios (black dots) with corresponding posterior distributions in red and 95% CrIs (black horizontal lines). The RR of 1 is depicted with a dashed vertical black line. The margins of the 95% CrI of the pooled average effect are depicted as fine dashed vertical lines. b. Posterior probability distribution of the median estimated pooled RR. The RR of 1 is depicted as dashed vertical black line. The probability of benefit (RR < 1) is depicted as red shaded area

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**Topic:** Cardiovascular issues in ICU

## 000912

### Patients with hematological malignancies in the intensive care unit, a ten years single-center experience

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**Introduction:** In 1989 when considering whether to admit oncohematological patients to intensive care units (ICU) Dr Graziano Carlo Carlon wrote "Just say no" in an editorial published on Critical Care Medicine (1). Thirteen years later Groeger answered, on the same journal, "Consider saying yes" (2). It was 2003.
In 2013 Elie Azoulay suggested to "Think differently" (3) and that's what we have been trying to do in the last ten years.
The aim of this paper is to describe our population of critically ill patients with hematological diseases and their outcomes.

**Methods:** From 2012 to 2024, we prospectively collected clinical data upon admission and during ICU stay. Patients < 18 years were excluded. Clinical data included baseline characteristics, hematological disease, status, treatment (HSCT, CART), prognostic scores, reason for ICU admission. We also collected laboratory results, organ failures: need for mechanical ventilation (MV), vasoactive support, renal replacement therapy (RRT), documented infection. Outcomes included ICU, hospital, six and twelve months mortality.
**Results:** Results: Results are shown in Tables 1 and 2.
**Conclusions:** Oncohematological patients are still challenging for ICU physicians, patients often immunocompromised and thus exposed to different risks. Side effects of chemo or immunotherapies can be difficult to recognize and to treat. Cooperation with hematologist is essential. ICU physicians have to know outcomes and prognostic factors to provide these patients the best treatment, being aware that both withholding intensive care when justified, or to grant it when futile, is inappropriate (4).

**Table 1 (abstract 000912)** Admission and ICU course

| | |
|---|---|
| Age, median (IQR) | 57 (51–67) |
| Female, *N* (%) | 63 (41) |
| Lymphoma | 54 (35) |
| Acute leukemia | 58 (42) |
| Multiple myeloma | 12 (8) |
| Myelodysplastic syndrome | 7 (4) |
| New diagnosis | 57 (37) |
| Remission | 52 (34) |
| Relapse | 33 (22) |
| BMT allogenic, *N* (%) | 54 (35) |
| CART, N (%) | 5 (3) |
| Respiratory failure | 53 (35) |
| Septic shock | 56 (37) |
| Cardiogenic shock | 6 (4) |
| Neurologic cause (ICANS, coma) | 8 (5) |
| SAPS II, N (IQR) | 56 (40–70) |
| SOFA, N (IQR) | 12 (8–15) |
| Platelets, × 10*9/L median (IQR) | 20 (12–43) |
| Neutropenia, *N* (%) | 80 (53) |
| PCT, ng/ml median (IQR) | 6 (1–32) |
| Length of stay (days) median (IQR) | 6 (3–11) |
| Vasopressor use, *N* (%) | 112 (74%) |
| Mechanical ventilation, *N* (%) | 108 (71) |
| CRRT use, *N* (%) | 44 (29) |

**Table 2 (abstract 000912)** Outcome

| | |
|---|---|
| ICU mortality, *N* (%) | 68 (45) |
| Hospital mortality, *N* (%) | 26 (31) |
| Six months mortality, *N* (%) | 26 (45) |
| One year mortality, *N* (%) | 6(20) |

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**Topic:** Haematologic-oncologic issues in the ICU

## 000914

### Ventriculitis in patients with external ventricular drainage in a neurointensive care unit

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000900

**Introduction:** Healthcare associated ventriculitis and meningitis in patients with external ventricular drainage (EVD) is diagnosed in a variable percentage of up to 20%. Different risk factors and increased mortality and loss of neurological outcome have been identified.
**Objectives:** To identify the incidence of ventriculitis in patients with EVD in our Unit and the associated risk factors.
**Methods:** Longitudinal, retrospective study in a neurocritical ICU for adult patients performed from January 2020 to January 2023. Demographic data, Apache II score, diagnosis on admission [stroke, subarachnoid hemorrhage (SAH), traumatic brain injury (TBI), polytrauma]. Glasgow Coma Score (GCS) on admission and at discharge from ICU and hospital, Fisher scale grade, presence of intraparenchymal hematoma, intracranial surgery, site of EVD settings (ICU or operating room), days of external ventricular drainage until infection and total days of EVD, number of EVD, microorganism isolated in cerebrospinal fluid, systemic and intraventricular antibiotic used, length of stay in ICU and hospital, and hospital mortality were collected. Categorical variables are expressed as frequencies and percentages and continuous variables as mean and standard deviation (SD) when the data followed a normal distribution, or as median and interquartile range (IQR = 25th–75th percentile) when the distribution deviated from normality. Percentages were compared, as appropriate, by the Chi-square test or Fisher's exact test, means by the t-test and medians by the Wilcoxon test for independent data. Statistical significance was set at $p < 0.05$. Data were analyzed with the R package, version 4.2.1 (R Development Core Team, 2022).
**Results:** A total of 16 of the 110 patients with EVD suffered ventriculitis (14%) and 94 did not. The median (IQR) Apache II score scale was 18 (11.2; 24), the median (IQR) GCS was 8 (5; 11.8) at hospital admission and at hospital discharge 14 (13-15), and overall mortality was 35.5%, with no statistically significant differences between the two groups. In the univariate analysis we found statistically significant differences between the number of days with catheter in the group without ventriculitis 11.5 (5;19) and the number of days with catheter until the event 22 (11;30.5). Furthermore, in the 35 patients with TBI, we found statistically significant differences between the 34 who did not have ventriculitis compared with the only one who had ventriculitis.
The multivariate logistic analysis is shown in Table 1.

**Table 1 (abstract 000914)** Multivariate logistic regression for ventriculitis

| | ***P*-value** | **Odds-ratio (95% CI)** |
|---|---|---|
| TBI | 0.008 | 0.096 (0.010 to 0.945) |
| Catheter days *****, per day | 0.021 | 1.043 (1.007 to 1.079) |

(*) For patients who developed ventriculitis, the time until the event

**Conclusions:** EVD days, per day, to diagnosis of ventriculitis is a significant independent risk factor in our Unit. TBI and EVD was also a significantly lower independent risk of ventriculitis.

**Topic:** Neurointensive care

## 000915

### Neuroprotective effect of argon inhalation on a model of photoinduced ischemic stroke

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000915

**Introduction:** According to a number of experimental studies, both in vivo and ex vivo, argon is able to demonstrate certain neuroprotective effects in brain damage. In the case of an ischemic type of cerebral infarction, such an inert gas as xenon has performed well, but the effects of argon remain the subject of lively discussions.
**Objectives:** To determine the effect of three-time two-hour inhalation of an argon–oxygen mixture (Ar 70%/O2 30%) in comparison with an oxygen–nitrogen mixture (N2 70%/O2 30%) after a photochemically induced stroke on the severity of brain damage.
**Methods:** The experiments were carried out on male Wistar rats weighing 250-350 g ($n=35$). Vascular thrombosis was simulated in the prefrontal cortex of the rat brain using the following technique: after the introduction of a photosensitive dye, the head was fixed in a stereotactic frame, the skull was exposed and cleared of the periosteum. The hemispheres of the brain were irradiated with cold light at $\lambda=560$ nm for 15 min. After inducing a stroke, the animals were placed in a chamber with a constant supply of a gas mixture (N2 70%/O2 30%—group I, Ar 70%/O2 30%—group II) with a flow of 3 l/min. The exposure time in the camera was 2 h. The effectiveness was assessed by testing animals to determine neurological deficits (on the 3rd, 7th and 14th days after stroke) and performing an MRI scan of the brain on the 14th day.
**Results:** When performing an MRI scan of the brain on day 14 after modeling cerebral ischemia, there was a decrease in the average lesion volume in the argon application group, amounting to $0.8\pm0.2$ mm$^3$ versus $1.5\pm0.3$ mm3 in the control group ($p=0{,}01$). When evaluating the images, there was a decrease in the lesion when using argon, including in the motor neuronal region of the brain, compared with the control group. These changes corresponded to a decrease in the severity of neurological disorders and were a favorable predictor. Neurological deficits in the group of control animals on day 3 amounted to $7.1\pm1.5$ points versus $9.9\pm1.2$ in the group with argon ($p=0{,}049$). On day 7 in the control group, this indicator was $7.9\pm1.2$ points versus $9.8\pm1.1$ in the argon group ($p=0{,}029$). By the 14th day, the indicators of neurological deficit regressed in both groups, however, in the case of control, the values still corresponded to residual neurological disorders and amounted to $4.9\pm1.2$ points versus $7.3\pm1.2$ points in the argon group ($p=0{,}046$).
**Conclusions:** When modeling photochemically induced vascular thrombosis with the development of a focus of ischemic stroke of the brain, inhalation of oxygen–argon sweep daily once for 2 h for 3 days led to a significant decrease in both neurological deficit on days 4, 7 and 14, and the volume of ischemic stroke.

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**Topic:** Neurointensive care

## 000916

### Functional outcomes after COVID-19 ARDS: insight from the CONFIDENT trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000916

**Introduction:** In the multicenter randomized trial CONFIDENT (1), administration of plasma collected from convalescent donors with neutralizing antibody titer of at least 1/320 to patients with COVID-19 ARDS requiring mechanical ventilation (MV) significantly reduced mortality. Secondary outcomes included functional status and quality of life (QOL) in survivors by day 90 (D90) and 365 (Y1).
**Objectives:** The aim of this post hoc analysis is to describe the functional evolution of these survivors during the year following intensive care unit (ICU) discharge and to search for predicting factors of functional outcomes.
**Methods:** Pre-admission (T0) functional status has been described by relatives, using the Clinical Frailty Scale (CFS), the Katz index of Independence in activities of daily living (score from 0 to 6, highest score reflecting independency) and the EuroQol 5-Dimension 5-Level (EQ5D) including an index value (ranging from − 0.6 to 1, where 1 is the best possible health state) and a visual analogic scale (VAS). Patients estimated their status using the same tools at D90 and Y1 after inclusion. The analyzed predictive factors included functional scores at T0, comorbidities, employment status and inflammation status during the first week after inclusion in the study. Results are expressed as median (IQR) or n (%).
**Results:** A total of 225 patients (151 (67.1%) men, aged 61(51–68) years) survived an ICU stay of 25 (14–43) days including 16 (10–27.5) days of mechanical ventilation. At T0, 69/225 (43.9%) patients had a professional activity. Evolution of the different parameters are described in the table below:

| Parameters | T0 | D90 | *p* value D90 vs T0 | Y1 | *p* value Y1 vs T0 |
|---|---|---|---|---|---|
| CFS | 3 (2–3) | – | – | – | – |
| Katz | 6 (6–6) | 6 (4–6) | < 0.001 | 6 (6–6) | 0.002 |

| Parameters | T0 | D90 | *p* value D90 vs T0 | Y1 | *p* value Y1 vs T0 |
|---|---|---|---|---|---|
| EQ5D | 0.9 (0.8–1) | 0.78 (0.5–0.9) | < 0.001 | 0.83 (0.68–0.93) | < 0.001 |
| VAS | 80 (70–90) | 70 (60–80) | 0.01 | 70 (60–85) | 0.012 |

At Y1, 19/119 (16%) did not recover in term of autonomy according to Katz index. Perceived quality of life at Y1 was inferior to that estimated by relatives at T0 in 45/80 (56.2%) patients according to EQ5D and in 45/72 (62.5%) patients according to VAS.
In multivariate analysis, CFS was associated with Katz index at D90 ($p < 0.001$) and EQ5D at Y1 ($p = 0.009$). ICU length of stay was associated with Katz index at D90 ($p < 0.001$), EQ5D at D90 ($p = 0.004$) and VAS at D90 ($p = 0.038$). C-reactive protein measured 7 days after inclusion was associated VAS at both D90 and Y1 ($p = 0.031$ and $p = 0.003$, respectively). Employment status, diabetes, or prior ongoing treatment with steroids were not associated with the studied functional outcomes.
**Conclusions:** In this homogenous cohort of COVID-19 ARDS survivors, autonomy and perceived QOL remained altered one year after inclusion. CFS, duration of ICU stay and inflammation parameters were associated with some autonomy and QOL related outcomes.

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2. Supported by the Belgian Health Care Knowledge Center (KCE) through the KCE Trials Program

**Topic:** Health services research and outcome

## 000917

### Multi-centre variations in the use of human albumin solution across a region: a comparison of populations and trends

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000917

**Introduction:** Use of HAS is contentious, with uncertain efficacy and cost-effectiveness. There are unclear mortality benefits, as shown by the SAFE and ALBIOS trials1, 2, albeit with a trend for improved hemodynamic stability2. HAS is recommended in surviving sepsis guidelines after use of large volumes of crystalloid3, but costs > 8 times more than 0.9% NaCl, posing a significant cost burden4. Evidence supports use of HAS in cirrhotic patients with ascites and in the management of hepatorenal syndrome5.
**Objectives:** Our study aims to provide an evaluation of HAS use patterns in four distinct intensive care units (ICUs) in southern England. By examining patient characteristics and the quantity of HAS administration, we seek to elucidate potential inter-unit variations in administration practice.
**Methods:** This retrospective study analysed HAS administration across four ICUs between March 2022 and April 2023. Data from electronic medical records, blood bank data, and the Intensive Care National Audit & Research Centre (ICNARC) were used to examine admission characteristics, primary diagnoses, APACHE II scores, and HAS administration and conduct comparative analysis.
**Results:** In this multi-centre retrospective observational study, 3037 pts were included. Notably, RSCH stands out as a tertiary surgical centre, with elective surgical patients constituting 45% of its admissions. Conversely, in Worthing Hospital, merely 14% of patients undergo elective procedures, while a majority were medical admissions.
The use of HAS in all hospitals closely corresponds to the distribution of medical and surgical admissions, save for one exception—St. Richards, which shows a markedly lower overall use. RSCH and ESH are frontrunners in giving HAS. RSCH particularly notable, as 16.5% of its admissions receive HAS, compared to the 2.7% observed at St. Richard's. Despite St. Richard's having higher APACHE II score, it administered the least HAS. Furthermore, there exists some variation in the type of HAS. RSCH favours a higher proportion of 5% HAS usage (43.4%), compared to < 5% in other units.
**Conclusions:** This contemporary snapshot of large cohort, multi-centre practice uncovers differences in HAS use, without any discernible specialty preference.
Even considering differences in case mix between units, there were significant differences in the use of HAS. The differences were in the type of HAS (5% vs 20%) and the proportion of patients receiving HAS and in the quantity of HAS administered. Variation often reflects clinical uncertainty. Further work should include further analysis of specific indications for HAS on a per patient basis.

**Table 1 (abstract 000917)** Breakdown of HAS administration in four ICUs

| - | Royal Surrey (RSCH) | East Surrey (ESH) | St. Richards | Worthing |
|---|---|---|---|---|
| **Demographics** | | | | |
| Total no. of pts | 1145 | 734 | 559 | 599 |
| Medical pts *(% of total pts)* | 403 *(35.2%)* | *254 (34.6%)* | 353 *(63.2%)* | 389 *(64.9%)* |
| Surgical pts *(% fo total pts)* | 742 *(64.8%)* | 480 *(65.4%)* | 206 *(36.8%)* | 210 *(35.1%)* |
| **HAS administration** | | | | |
| Total HAS recipients *(% of total pts)* | 189 *(16.5%)* | 94 (12.8%) | 16 (2.7%) | 46 (7.7%) |
| HAS Medical pts *(% of all HAS pts)* | 59 *(31.2%)* | 35 *(37.2%)* | 7 *(43.7%)* | 32 *(69.6%)* |
| HAS Surgical pts *(% of all HAS pts)* | 130 *(68.8%)* | 59 *(62.8%)* | 9 *(56.3%)* | 14 *(30.4%)* |
| Total HAS (kg) | 13.2 | 83.6 | 0.98 | 4.6 |
| 5% HAS used in kg *(%)* | 5.78 *(43.4%)* | 0 *(0%)* | 0.045 *(4.6%)* | 0.155 *(3.4%)* |
| 20% HAS used in kg *(%)* | 7.48 *(56.6%)* | 83.6 *(100%)* | 0.94 *(95.4%)* | 4.44 *(96.6%)* |
| **Severity of illness & outcome** | | | | |
| Median APACHE II score | 14 | 19 | 23 | 21 |
| **Overall unit mortality** (%) | 7% | 21.7% | 13.6% | 15.6% |

*Table 1: Breakdown of HAS administration in four ICUs*

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**Topic:** Health services research and outcome

## 000919

### Post-traumatic amnesia on the critical care unit (CCU): what do we know and where do we go from here?

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000919

**Introduction:** 1.4 million per year attend hospital in England and Wales following a head injury (1). In July–September 2023 alone, King's College Hospital (KCH) admitted 588 patients via the Major Trauma Inpatient List, of these 85 with moderate–severe head injuries.
Post-traumatic amnesia (PTA) commonly occurs after traumatic brain injuries (TBI). Defined as 'the transient state of altered brain function' its duration is 'the period between the head injury and the resumption

of normal, continuous memory' (2). This duration can relate to the extent a patient returns to pre-TBI function, such as; returning to independence, study or employment (3, 4).
**Objectives:** To review the KCH CCU Multi-disciplinary Team (MDT) understanding of PTA; identify barriers impacting patient care; identify areas for development to enable enhanced care.
**Methods:** Between December 2023 and February 2024, a survey was conducted, including closed and open questions. It was disseminated by email to CCU staffing lists and promoted at MDT meetings. Quantitative data were collected and qualitative data analysed using Braun and Clarke's (5) thematic analysis.
**Results:** 45 responses were received from the MDT: 37% Nursing; 14% Physiotherapists; 12% Doctors; 11% Occupational Therapists; 11% Speech & Language Therapists; 9% Advanced Critical Care Practitioners; 2% Dieticians; 2% Pharmacists; 2% Social Workers.
The MDT reported common symptoms of PTA as 'challenging behaviour', 'confusion', and 'memory difficulties'.
Various challenging behaviour management approaches were noted, including non-pharmaceutical methods such as; verbal de-escalation (25%), identifying/avoiding triggers (38%), including the patient (20%) and environment considerations (43%). Alongside combined pharmaceutical management with non-pharmaceutical techniques (18%).
Liaison with next-of-kin was the primary role reported by 75% of the MDT. 92% of nursing staff reported using physical support to prevent movement/harm to self or others. This is of note when considering that the CCU nurses do not undertake Prevention and Management of Violence and Aggression training (PMVA) as standard on induction to the CCU.
Challenges faced included; safe de-escalation (64%), supporting family (66%), understanding behaviours (57%), and determining medications for PTA symptoms (57%).
84% of the MDT believed resources for managing challenging behaviour would aid patient care, along with a protocol for acutely agitated TBI patients (73%) and patient/family information sheets (82%).
**Conclusions:** Three key areas for development have been identified; consolidate resources for patient and family education, enhance training for staff in managing challenging behaviours (e.g. PMVA, environmental factors, de-escalation) and explore the application of a protocol for managing acutely agitated patients with an acute TBI.
Support from relevant stakeholders will be sought to incorporate these into development plans with MDT collaboration.

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6. N/A

**Topic:** Neurointensive care

## 000922

### Clinical characteristics and prognosis of patients with acute olanzapine intoxication

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**Introduction:** Olanzapine is an atypical antipsychotic drug that is increasingly used in intentional drug overdoses. Although acute olanzapine overdose is predominantly associated not only with anticholinergic symptoms and central nervous system depression, but also miosis and unpredictable fluctuations between somnolence/coma and agitation/aggression.
**Objectives:** To describe clinical characteristics and prognosis of patients admitted to the intensive care unit for acute olanzapine intoxication.
**Methods:** This is an observational, retrospective single-center study, over a period of 4 years (2020 to 2023). Inclusion of patients over the age of 14 years admitted to ICU for acute olanzapine monointoxication and also polyintoxication. We describe epidemiological, clinical and prognostic characteristics of these patients. The Poisoning Severity Score of the European Association of Poison Centres and Clinical Toxicologists (EAPCCT) assessed the intoxication severity.
**Results:** A total of 50 cases of olanzapine overdose were included. The mean age was $31 \pm 14$ years with a sex ratio = 0.6. The ingested olanzapine doses ranged from 30 to 1700 mg. All these patients were followed for psychiatric disorders: depression ($n = 13$), bipolar disorder ($n = 18$), schizophrenia ($n = 7$), personality disorder ($n = 3$) and unidentified in 9 patients. 44% of the patients in our study had a previous suicide attempt in their history. Patients presented with olanzapine monointoxication in 18% of cases in our study. For polydrug intoxication, an association with benzodiazepines was reported in 36% of cases. The most frequent findings were somnolence (50%), miosis (50%), agitation (30%), and extrapyramidal syndrome (8%). The Poisoning Severity Score was "minor" in 19 (38%), "moderate" in 2 (4%), and "severe" in 29 (58%) patients. 28 patients (56%) required invasive mechanical ventilation and only 2 patients died. 14 patients (28%) had an unspecified ingested dose of olanzapine. There was not a statistically significant association between increasing ingested olanzapine doses and poisoning severity.
**Conclusions:** Although olanzapine is tolerated relatively well in acute overdose, its evolution remains unpredictable specially if associated to other drug intoxication. It requires careful clinical monitoring, but rarely specific therapeutic interventions.

**Topic:** Poisoning/Toxicology/Pharmacology

## 000924

### Lactate threshold value in predicting poor prognosis in metformin intoxication

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**Introduction:** Metformin intoxication is associated with a hyperlactatemia varying to different degrees of severity. The increase in lactatemia in patients with metformin intoxication is frequent and constitutes a marker of severity and explains the higher incidence of recourse to urgent hemodialysis and leading to a high mortality rate.
However, the threshold value of lactate to predict poor incomes is a subject of controversy.
**Objectives:** The aim of this study is to determine the correlation between the level of lactate and poor incomes in patients with metformin intoxication.
**Methods:** This is an observational, retrospective single-center study, over a period of 4 years (2019 to 2022). Inclusion of patients over the age of 14 years admitted to ICU for metformin intoxication. We identify the predictive threshold for in-hospital mortality using the ROC curve and we study Pearson's correlation between blood lactate threshold and mortality.
**Results:** 223 patients were included. The mean age was $29 \pm 12$ years with a sex ratio = 0.5. Hyperlactatemia was reported in 182 patients (81,6%).

The cut-off value for blood lactate to predict intrahospital mortality was 15 mmol/L.
The area under the curve was 0.979; (95% CI 0.958–1; $p = 0.004$).
This new cutoff had a sensitivity of 100%, a specificity of 95,9%, a positive predictive value of 25% and a negative predictive value of 100%.
Youden's index = 0.96. The correlation coefficient between the threshold of 15mmol/L. And mortality $r = 1$ and $p = 0.004$.
**Conclusions:** The positive predictive value of the new threshold limits its adoption. Including a larger sample will allow for better analysis.

**Topic:** Poisoning/Toxicology/Pharmacology

## 000926

### Comparison of high-flow nasal oxygen therapy and conventional oxygen therapy for high-risk patients during bronchoscopy examination: a multi-center randomized controlled trial

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**Introduction:** High-flow nasal cannula (HFNC) oxygen therapy has been increasingly utilized during endoscopy examination, however, the effects of HFNC during bronchoscopy examination in high-risk patients remain uncertain.
**Objectives:** To determine whether HFNC reduces the incidence of desaturation, defined as pulse oximetry (SpO2) ≤ 90% for over 10 s, compared to conventional oxygen therapy (COT) during nasal bronchoscopy examination in patients exhibiting any of the high-risk factors associated with hypoxemia during the procedure. These factors include hypoxemia, hypercapnia, or radiologically confirmed narrow trachea observed prior to bronchoscopy, in addition to patients classified as morbidly obese.
**Methods:** In this multicenter randomized controlled trial, patients scheduled for bronchoscopy examinations and presenting with high-risk factors were randomly assigned to receive either HFNC or COT. Baseline characteristics, vital signs, and continuous SpO2 measurements during the examination were meticulously documented, and a comparative analysis of desaturation incidence, frequency of examination interruption, and the necessity for treatment escalation between the two groups was conducted. This trial received approval from the Ethics Committees of the participating hospitals and was prospectively registered with ChiCTR.org.cn (ChiCTR2100055038).
**Results:** From September 30, 2022 to June 20, 2023, 148 patients were initially enrolled after consent, but six patients withdrew from the study, leaving 72 in the HFNC group and 70 in the COT group. HFNC demonstrated a significant reduction in the incidence of desaturation during bronchoscopy examinations (34.7% vs. 61.4%, $p = 0.016$). Patients receiving COT experienced more frequent instances of examination interruption (58.6% vs. 26.4%, $p < 0.001$) and required escalated treatment more often (57.1% vs. 30.6%, $p = 0.001$). No statistically significant differences were noted in the time to first desaturation, duration of desaturation, bronchoscopy withdrawal, total duration of bronchoscopy examination, or incidence of other adverse events.
**Conclusions:** In patients undergoing nasal bronchoscopy with identified high-risk factors, the implementation of HFNC demonstrates notable benefits, including a significant reduction in desaturation incidence, decreased need for examination interruption, and lower requirement for treatment escalation.

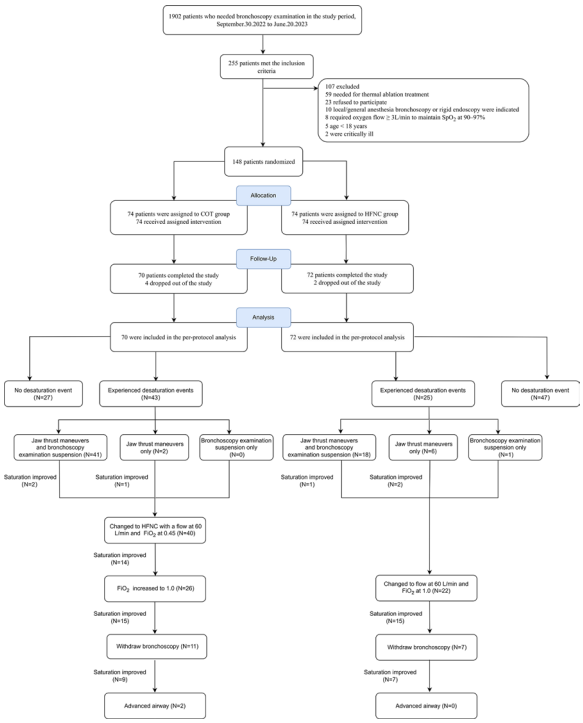


**Fig. 1 (abstract 000926)** Patient enrollment diagram and treatment algorithm
Among the 70 patients in the COT group, 43 (61.4%) experienced desaturation events, while only 24 (34.7%) out of 72 patients in the HFNC group had desaturation events ($p = 0.016$). For the 43 patients who desaturated in the COT group, jaw thrust maneuvers and/or bronchoscopy interruption only improved oxygenation for three patients. A switch to HFNC at 60 L/min and FIO2 of 0.45 enhanced oxygenation in 14 out of 40 patients, while increasing FIO2 to 1.0 was effective for 15 of the 26 remaining patients. Finally, bronchoscopy withdrawal improved oxygenation in 9 of 11 patients, with 2 still requiring advanced airway management. In comparison, for the 25 patients who desaturated in the HFNC group, jaw thrust maneuvers and/or bronchoscopy interruption improved oxygenation in 3 patients. Escalating FIO2 to 1.0 improved 15 out of 22 patients, and withdrawing bronchoscopy benefited all 7 who required it. HFNC, high-flow nasal cannula; COT, conventional oxygen therapy.

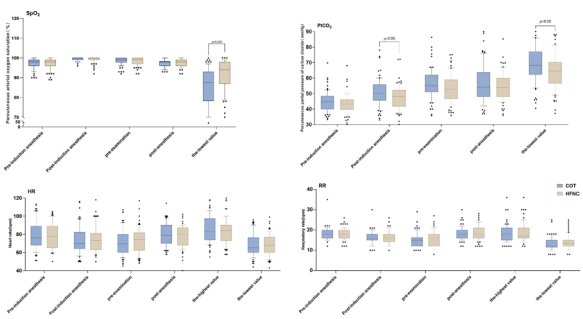


**Fig. 2 (abstract 000926)** Illustrates the alterations in SpO2, PtCO2, HR, and RR before and after anesthesia induction, before and after bronchoscopy examination, as well as the peak and nadir values recorded during the bronchoscopy procedure
The lowest SpO2 recorded during the examination was significantly lower in the COT group compared to the HFNC group ($p = 0.001$).

Additionally, the highest PtCO2 level recorded during the examination was higher in the COT group compared to the HFNC group ($p = 0.03$). SpO2, pulse oximetry saturation; PtCO2, transcutaneous pressure of carbon dioxide; HR, heart rate; RR, respiratory rate; HFNC, high-flow nasal cannula; COT, conventional oxygen therapy.

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**Topic:** Health services research and outcome

## 000927

### Mitochondrial dysfunction in propofol infusion syndrome


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**Introduction:** Propofol infusion syndrome (PRIS) is a very rare, but potentially lethal complication of propofol administration with a very high mortality rate (˃ 50%). Typical features of PRIS include unexplained metabolic acidosis, arrhythmias, hypertriglyceridemia, rhabdomyolysis, cardiac and/or renal failure. Previous studies have shown that propofol impairs mitochondrial metabolism [1]. However, its precise mechanism is not yet fully understood. In our work, we obtained muscle biopsies from two critically ill patients with suspected PRIS and we examined the bioenergetic profile in human skeletal muscle cells.
**Objectives:** Our goal was to measure global mitochondrial functions and fatty acid oxidation in human skeletal muscle cells obtained from biopsies from two critically ill patients with PRIS and compare them with two control groups (critically ill without diagnosis of PRIS and healthy volunteers).
**Methods:** Skeletal muscle cells were isolated from vastus lateralis muscle from critically ill patients diagnosed with PRIS ($n = 2$). The energy metabolism was assessed by Extracellular Flux Analysis. During the experiment, oxygen consumption rate (OCR) was measured at the baseline and after sequential addition of ATPase inhibitor, uncoupler and complex III inhibitor, which enabled to determine ATP production, proton leak and maximal capacity of the respiratory chain. The capacity of fatty acid oxidation (FAO) was measured as etomoxir-inhibitable OCR after adding of uncoupler and long-chain fatty acid palmitate. In cells, lipid droplets were also stained and imaged on electron and confocal laser scanning microscopy. All parameters were compared to values obtained in two control groups: (1) critically ill patients without a diagnosis of PRIS ($n = 10$), and (2) metabolically healthy controls (= patients undergoing elective hip replacement surgery; $n = 10$).
**Results:** In critically ill with PRIS, maximal respiratory capacity and fatty acid oxidation were significantly reduced in comparison with control groups (see Fig. 1, parts A and B). Interestingly, an increased accumulation of enlarged lipid droplets was found in the muscle cells of patients with PRIS (see Fig. 1, parts C and D). Gene expression (focused on lipid metabolism) and microscopic images of lipid droplets are currently analyzed.
**Conclusions:** In critically ill with PRIS, the most significant results were inhibition of fatty acid oxidation and lipid droplets accumulation in muscle cells.

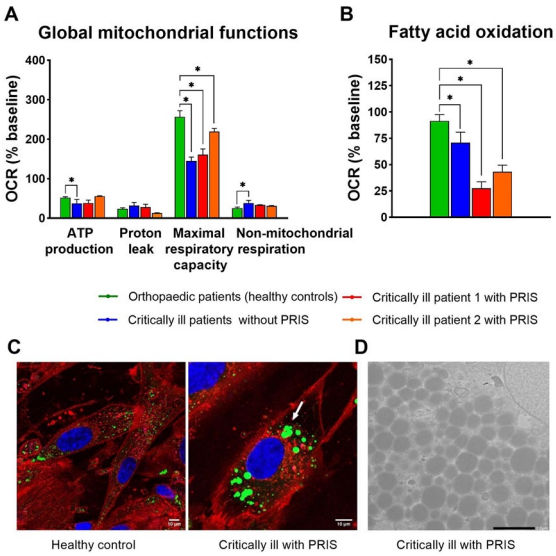


**Fig. 1 (abstract 000927)** **A)** Extracellular flux analysis: global mitochondrial parameters. **B).** Extracellular flux analysis: fatty acid oxidation. **C)** Representative image of muscle cells on confocal laser scanning microscopy: muscle cell with stained nuclei (blue), lipid droplets (green; see white arrow) and cell membrane (red). **D)** Representative image of muscle cell on electron microscopy: muscle cell with accumulation of lipid droplets surrounding nucleus in critically ill with PRIS. Note: * *p*-value is less than 0.05

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2. The work was supported by Cooperatio 33 (ICM) and grant AZV No. NU21J-06–00078.


**Topic:** Poisoning/Toxicology/Pharmacology

## 000928

### Long-term functional outcome and health-related quality of life in subarachnoid haemorrhage patients


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000928

**Introduction:** Subarachnoid haemorrhage is a severe, life-threatening condition with high morbidity and mortality [1]. Improvements in critical care management reduced short-term mortality but increased the number of patients with functional and cognitive impairment and restrictions in quality of life. However, long time follow-up of functional outcome is scarce in literature [2].
**Objectives:** Assess mortality and functional outcomes at one and five years in the subgroup of patients admitted in Neurocritical Care Unit (NCCU) with aneurysmatic subarachnoid haemorrhage (aSAH).
**Methods:** Single-centre retrospective cohort study including all adult patients admitted to a NCCU from 2018 to 2019 due to aSAH. Patient´s outcomes were assessed by modified Rankin scale (mRankin) and Glasgow outcome scale (GOS) at one and five years follow-up. Health quality of life was collected by telephone interview using the EuroQol (EQ-5D-3L) questionnaire.
**Results:** A total of 65 patients admitted to NCCU were included, mostly women ($n=43$, 66%), mean age of 57 (±13) years (Table 1). At admission, 97% of patients had a previous favourable (0–1) mRankin ($n=63$) and median SAPSS II score was 29 (P25-P75: 22-45), with an expected mortality rate of 10%. Mortality rates at NCCU discharge and hospital discharge, at 1-year and at 5-year mortality were 11% ($n=7$), 11%, 3% and 2%, respectively. GOS was favourable (GOS 4–5) in 45% (n = 29) of patients at NCCU discharge, in 68% at one year ($n=44$), and in 65% at 5 years ($n=42$). Regarding health-related quality of life, the proportions of those reporting moderate to extreme problems were as follows: mobility 25%, self-care 25%, usual activities 31%, pain/discomfort 25% and anxiety/depression 47%. Approximately 35% ($n=19$) referred no problem at any dimension. In univariate analysis, no need for tracheostomy (OR 6.333, 95% CI 1.239–32.376, $p=0.016$), favourable GOS (4–5) at NCCU discharge (OR 5.882, 95% CI 1.110–31.170, $p=0.025$), age < 70 years (OR 6.333, 95%CI 1.239–32.376, $p=0.016$) and NCCU length of stay less than 20 days (OR 10.895, 95%CI 1.265–93.856, $p=0.011$) were associated with favourable GOS (4–5) at 5-year follow-up. Regarding quality of life, presence of moderate-to-extreme mobility problems were associated with tracheostomy (OR 11.625, 95%CI 1.962–68.870), mechanical ventilation (OR 1.583, 95%CI 1.242–2.019, $p=0.030$), NCCU length of stay above 20 days (OR 6.417, 95%CI 1.490-27.641, $p=0.08$) and unfavourable GOS (1-3) at NCCU discharge (OR 6.417, 95%CI 1.490–27.641, $p=0.08$). Presence of moderate-to-extreme self-care problems were associated with tracheostomy (OR 5.556, 95%CI 1.107–27.893, $p=0.026$) and moderate-to-extreme anxiety/depression was associated with vasospasm (OR 3.667, 95%CI 1.049–12.814, $p=0.038$).
**Conclusions:** The vast majority of survivors had no major limitations. Absence of tracheostomy, younger patients, and shorter length of stay in NCCU were associated with favourable outcome 5 years after NCCU admission. However, more studies are needed to address quality of life and long-term outcome of aSAH patients.

**Table 1 (abstract 000928)** Characteristics of the patients admitted to NCCU with aSAH, from 2018 to 2019

| | | Total |
|---|---|---|
| Demographics | Female, n (%) | 43 (66,2%) |
| | Age (years), mean (SD) | 56,8 (± 12,7) |
| | mRankin at Admission | |
| | 0-1, n (%) | 63 (96,9%) |
| | 2-5, n (%) | 2 (3,1%) |
| Scores at admission | SAPSS II, median (p25-75) | 29 (22-45) |
| | Glasgow Coma Scale (GCS) on admission | |
| | GCS ≤ 8, n (%) | 17 (26,2%) |
| | GCS > 8, n (%) | 48 (73,8%) |
| | Hunt-Hess score | |
| | I-III, n (%) | 40 (61,5%) |
| | IV-V, n (%) | 25 (38,5%) |
| | Fisher score | |
| | 1-2, n (%) | 7 (10,8%) |
| | 3-4, n (%) | 58 (89,2%) |
| Characteristics | Vasospasm, n (%) | 42 (64,6%) |
| | Delayed Cerebral Ischemia, n (%) | 26 (40%) |
| | Submitted to tracheostomy, n (%) | 11 (16,9%) |
| | Ventilation days, median (p25-75) | 12 (1,0-28,0) |
| | NCCU length of stay, median (p25-75) | 20 (13-32) |
| | Hospital length of stay, median (p25-75) | 34 (22-52) |
| Outcome | GOS at discharge NCCU | |
| | 4-5, n (%) | 42 (64,6%) |
| | 1-3, n (%) | 10 (15,4%) |
| | GOS 1 year | |
| | 4-5, n (%) | 44 (67,7%) |
| | 1-3, n (%) | 9 (13,8%) |
| | GOS 5 year | |
| | 4-5, n (%) | 42 (64,6%) |
| | 1-3, n (%) | 10 (15,4%) |
| | mRankin 5year | |
| | 0-1, n (%) | 35 (53,8%) |
| | 2-5, n (%) | 30 (46,2%) |
| | Return to work, n (%) | 18 (54,5%) |
| Quality of life | Mobility | |
| | No Problem, n (%) | 33 (60,0%) |
| | Moderate to Extreme problems, n (%) | 14 (25,4%) |
| | Self-care | |
| | No Problem, n (%) | 33 (60,0%) |
| | Moderate to Extreme problems, n (%) | 14 (25,4%) |
| | Usual activities | |
| | No Problem, n (%) | 30 (54,5%) |
| | Moderate to Extreme problems, n (%) | 17 (30,9%) |
| | Pain/discomfort | |
| | No Problem, n (%) | 33 (60,0%) |
| | Moderate to Extreme problems, n (%) | 14 (25,4%) |
| | Anxiety/depression | |
| | No Problem, n (%) | 21 (38,1%) |
| | Moderate to Extreme problems, n (%) | 26 (47,3%) |

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**Topic:** Neurointensive care

## 000929

## A longitudinal study of in-hospital gabapentinoid use after spinal cord injury

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000929

**Introduction:** Recent studies in humans and rodents have demonstrated the beneficial effects of gabapentinoids administered early after spinal cord injury on the recovery of motor function. In humans, support for early gabapentinoid use is derived solely from studies in Europe, where patients are managed with gabapentinoids for neuropathic pain. Knowledge regarding standard of care in Canada is currently unknown.
**Objectives:** The goal of our study was to examine the administration of gabapentinoids in a Canadian acute spinal cord injury setting.
**Methods:** To this end, Vancouver General Hospital pharmacy data were linked with data from the Rick Hansen Spinal Cord Injury Registry between 2010 and 2019.
**Results**: In our sample of individuals with cervical spinal cord injury ($n = 257$), only 15% never received a prescription for gabapentinoids during their in-hospital stay at Vancouver General Hospital. 59% of individuals with cervical spinal cord injury were prescribed a gabapentinoid within the first 5 days of injury. The proportion of individuals prescribed gabapentinoids increased significantly from 75 to 90% after 2014. The proportion of early prescriptions nearly doubled over the same time period, from 40 to 75%.
**Conclusions:** These findings indicate a shift in the treatment of individuals with spinal cord injury at a single centre in Canada, towards early administration of gabapentinoids. Compared to Europe, our estimates of early gabapentinoid use in acute spinal cord injury care are substantially higher. The long-term impact of changes in standard of care in individuals with spinal cord injury should be evaluated in future studies.

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**Topic:** Neurointensive care

## 000930

### Association of clinical parameters with tolerance to supine position after prone cycle in ARDS patients under mechanical ventilation: preliminary results

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000930

**Introduction:** The prone position has been utilized since the 1970s to enhance oxygenation in mechanically ventilated patients with acute respiratory distress syndrome (ARDS). Physiologically, this maneuver optimizes gas exchange by recruiting the dorsal regions of the lungs, thereby improving the ventilation/perfusion (V/Q) ratio. Despite its benefits, prone positioning poses complications, necessitating clear understanding of its indications and duration. However, there remains controversy regarding the latter. Prolonged prone positioning may lead to severe muscle weakness, while shorter, repeated periods are associated with accidents and prolonged duration of invasive mechanical ventilation (IMV). Hence, precise determination of the optimal moment for supination is crucial.
**Objectives:** This study aims to identify the key factors related to tolerance of transitioning to the supine position, thereby enabling prediction of the safe cessation of prone positioning.
**Methods:** An observational clinical study was conducted in patients admitted to the ICU of the UC-CHRISTUS Clinical Hospital in Santiago, Chile, diagnosed with ARDS and connected to IMV in the prone position. The Research Ethics Committee of the School of Medicine of the Pontificia Universidad Católica de Chile approved this study. Informed consent was obtained from the patient's next of kin.
Laboratory exams, ventilatory parameters, and hemodynamics were recorded at baseline (prone position entry), one hour before supination (T0), and at 1, 8, 12, and 24 h post-supination (T1, T8, T12, and T24). Endothelial function was assessed at baseline using flow-mediated vasodilation, near-infrared spectroscopy (NIRS), and endothelial dysfunction markers in blood (angiopoietin-2, ECAM-1, VCAM-1, E-selectin, and P-selectin). Plasma inflammatory parameters, including IL-6, IL-8, and IL-10, were additionally assessed to ascertain the patient's inflammatory status and its potential impact. Arterial blood gas (ABG) analysis and distribution of ventilation and perfusion via electrical impedance tomography (EIT) were evaluated in both prone and supine positions. Lung aeration was assessed using lung ultrasound in both positions. Intolerance to the supine position was defined as the need for a second prone cycle within the first 24 h after the switch, and analysis was conducted in two groups: successful and failed. For the statistical analysis, GraphPad Prism 8.0 software was employed.
**Results:** The analysis included 20 patients, of whom 13 tolerated the position change (successful group). No significant differences were observed between groups in terms of demographics and severity of diagnosis (APACHE, SOFA). The average duration of the prone cycle was 5 days in both groups. The successful group exhibited higher ventilation support (Pmean) and significantly lower driving pressure values during the prone position (baseline) compared to the failed group. Notably, 85% of patients in the failed group had a driving pressure exceeding 15 cmH2O at the time of supination, whereas in the successful group, it was only 7%. EIT revealed a more dorsal distribution of ventilation during the prone position in the successful group, with no significant change observed after the position change, unlike the failed group. While no differences in baseline PaO2/FiO2 were found between groups, the failed group showed significantly lower values of PaO2/FiO2 at T0 and throughout the study period. Furthermore, no association was found between tolerance to position changes and pulmonary perfusion or endothelial dysfunction in this study group. Inflammatory parameters were also found to have no association with tolerance to changes in position.
**Conclusions:** In this patient cohort, oxygenation and lung mechanics emerged as the primary factors influencing tolerance to position changes, while perfusion did not significantly contribute to tolerance assessment. Larger studies are warranted to establish cut-off points for PaO2/FiO2 and driving pressure to predict patient tolerance to transitioning to the supine position. The final analysis of this study includes more advanced statistical analysis, which is still pending, for the determination of association.

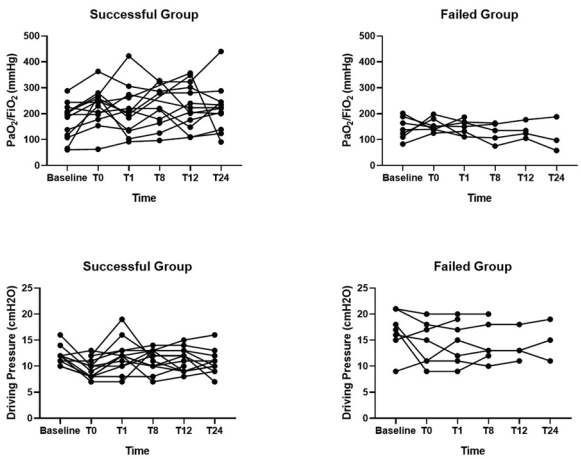


**Fig. 1 (abstract 000930)** Above: PaO2/FiO2 values over time for patients in the successful and failed groups. Below: driving pressure values over time for patients in the successful and failed groups

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000931

### Review of admissions due to cardiorespiratory arrest in a Portuguese Intensive Care Unit

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**Introduction:** Admissions due to cardiorespiratory arrest in Intensive Care Units (UCI) still have a high prevalence. A systematic evaluation of who can benefit from intensive care is necessary.
**Methods:** A retrospective observational descriptive study using data from UCI admissions between January 1st and December 31st, 2023, was conducted. Pearson's correlations, nonparametric tests, univariate and bivariate logistic regression were used.
**Results:** Of a total of 356 admissions from all causes, 51 were included (14,3%).
The mean age was 71.83 ± 11 and mostly male (70,6%); 62.74% had 2 or more personal history of high-risk disease.
76.5% of CRA occurred in the hospital and mostly in emergency department. Hypoxemia was the main cause (23,5%). The most frequent rhythm of CRA was asystole (53%) with a median duration of 11 ± 14 min. It showed a negative correlation with Glasgow after CRA ($p = 0.041$), with encephalopathy lesion on CT scan ($p = 0.009$) and when > 12 min was associated with a 6 times higher probability of death ($p = 0,013$).
The median of post-event Glasgow score was 3; patients With Glasgow < 6 were 3.85 times more likely to die ($p = 0.004$).
Reduced ventricular ejection fraction in post-arrest transthoracic ultrasound occurred in 64.35%, but it did not show a significant impact at outcomes. Post-arrest shock occurred in 62.7% of patients conditioning a 6,25 times greater probability of death ($p = 0.002$).
44.7% of patients had evidence of encephalopathy on CT scans and it was associated with a 6.33 × higher probability of death ($p = 0,012$).
47.1% of patients underwent EEG and 83% had dysfunction. However, this variable did not show a significant correlation with the final outcome. The median Glasgow after lifting sedation was 5 and was strongly correlated with the status and Glasgow score at discharge ($p \leq 0.001$).
The median length of stay in the unit was 5 days and at hospital discharge 21.56% of patients were alive.
An end-of-life decision was made in 35.3% and the most frequent was withdrawal of invasive life support (66.6%); it occurred with a median of 4 days. No patient was referred to palliative care.
The SAPSII index was a mean value of 68.96 ± 17.995 and APACHE II index of 30.41 ± 8.9. There was a significant negative relationship between severity indices and state at discharge (APACHE $p = 0.013$, SAPSII $p = 0.002$).
**Conclusions:** The mean age of patients admitted after CRA was higher than other studies. Although age and the presence of previous comorbidities are established factors of worse outcome this was not observed in the present study.
The main predictors of better outcome were: CRA duration < 12 min; Glasgow score after CRA/sedation lift, absence of post-CRA shock/encephalopathy and lower severity índices, corroborating the literature. The presence of reduced ejection fraction did not affect the outcome, contrary to expectations.
Mortality was high (78%) overlapping with the existing literature.
The end-of-life decision was infrequent and tended to be taken late.

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**Topic:** Cardiac arrest

## 000932

### Inhibition of dipeptidyl-peptidase 4 during systemic inflammation exerts vascular and organ protection

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**Introduction:** Major surgery and critical illness are associated with systemic inflammation that contributes to organ dysfunction and failure. Therapeutic strategies targeting selective molecular pathways have mostly failed to improve patient outcome. The dipeptidyl-peptidase 4 (DPP4) N-terminally cleaves more than eighty cytokines, chemokines and inflammatory mediators, thereby modulating their receptor preferences and activity (1). Clinically licensed DPP4 inhibitors (gliptins) are associated with vascular and organ protection, but their capability to modulate the acute systemic inflammatory response has not been dissected yet (2, 3).
**Objectives:** We here evaluated in mice and patients whether DPP4 inhibition during systemic inflammation can modulate inflammation associated with preservation of vascular function and organ integrity.
**Methods:** Wild type (WT) mice treated with either vehicle or 5 mg/kg of the DPP4 inhibitor sitagliptin and *Dpp4*-deficient mice were subjected to a paramedian laparotomy (major surgery model) or polymicrobial sepsis induction. The cellular and humoral immune response, vascular genomic profiles and function and histological parameters of organ integrity were assessed. In $n = 14$ patients undergoing cardiac surgery, the postoperative inflammatory response was compared in $n = 7$ patients with preoperative sitagliptin intake using a flow cytometry-based systems biology approach. Microvascular integrity was monitored using incident darkfield microscopy and clinical parameters were assessed.
**Results:** Sitagliptin application and *Dpp4*-deficiency were associated with reduced leukocytosis ($P < 0,01$ vs. vehicle-treatment in WT mice, $n > 5$ mice/group), mobilization of immature neutrophils

(P < 0,05) and reduced levels of various cytokines (i.e. TNFalpha, all $P < 0,05$) 8 h after laparotomy or induction of polymicrobial sepsis. Mice treated with sitagliptin showed a reduction in gene activation during systemic inflammation in the endothelium (< 2500 vs. > 4.500 differentially regulated genes) that correlated with maintained response of isolated arteries to the vasopressor phenylephrine ($P < 0,01$), reduced capillary leakage ($P < 0,001$ for albumin extravasation) and pulmonary edema formation ($P < 0,001$). In addition, DPP4 inhibition was associated with reduced tubular injury ($P < 0,001$) and hepatic tissue damage ($P < 0,001$) in septic m ice. In cardiac surgery patients, preoperative intake of sitagliptin induced multiple changes in both innate and adaptive immune responses 24 h after surgery that were associated with augmented functional characteristics of the microcirculation ($P = 0,019$) as well as reduced vasopressor ($P = 0,065$) and crystalloid requirements ($P = 0,009$).
**Conclusions:** Inhibition of DPP4 during surgery- or sepsis-associated systemic inflammation results in modulation of cellular and humoral immune response characteristics that correlate with augmented vascular function and preserved organ integrity.

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**Topic:** Perioperative care

## 000933
### Organ donation after medical assistance in dying: initial experience

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**Introduction:** The enactment of the Organic Law Regulating Euthanasia (LORE) on June 21, 2021 has sparked increasing interest in its clinical application. However, research on this topic remains scarce. Furthermore, specific information regarding patients undergoing euthanasia as potential organ donors is even more limited.
**Objectives:** To analyze the characteristics of donors following Medical Assistance in Dying (MAiD), the donation process, and outcomes in the initial cases conducted at Hospital del Mar.
**Methods:** Retrospective, observational, and descriptive analysis of potential organ donors following MAiD identified at Hospital del Mar, Barcelona, from the enactment of the Organic Law Regulating Euthanasia (LORE) on June 21, 2021, until November 30, 2023. Data collected included donor age, sex, underlying condition leading to MAiD, responsible physician's specialty, need for intensive care unit (ICU) admission, type of MAiD (euthanasia vs. assisted suicide), location of MAiD administration and death, extraction method, number of organs retrieved and transplanted, total warm ischemia time (from medication administration to cold perfusion or start of normothermic regional perfusion), and functional warm ischemia time (from significant hypoperfusion to cold ischemia or start of normothermic regional perfusion). Variables are expressed as absolute numbers, percentages, and means (max–min).
**Results:** A total of 10 patients who obtained favorable resolution for MAiD were evaluated by the Transplant Coordination team. Among them, 6 had 4 absolute medical contraindications and 2 declined donation. Ultimately, 4 donors were identified, with 50% being women and a mean age of 68 years (range: 48–90). The underlying pathology was degenerative disease (ALS) in 75% of cases. In 3 cases, the responsible physician was a neurologist at Hospital del Mar, and in 1 case, it was their primary care physician. 75% required ICU admission as part of the controlled donation procedure. Euthanasia was chosen in all cases, with medication administration and death occurring in the operating room in 100% of cases. Rapid extraction was performed in 50% of donors, while the other 50% underwent normothermic regional perfusion using extracorporeal membrane oxygenation (ECMO) with sedation for orotracheal intubation and premortem cannulation. Total warm ischemia time was 21.75 min (range: 9–43), and functional warm ischemia time was 9.75 min (range: 5–21). A total of 15 organs were retrieved, with 12 transplanted (5 kidneys, 4 lungs, 2 livers, and 1 pancreas), yielding a transplant/donor organ ratio of 3.
**Conclusions:** Organ donation after euthanasia represents a viable source of transplantable organs. The typical profile involves patients with degenerative neurological conditions who die in the operating room. A significant proportion of these donors require ICU admission during the procedure.

**Topic:** Brain death, organ donation and transplantation

## 000934
### Visual stress index estimation is a reliable parameter in monitoring mechanical ventilation safety

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**Introduction:** It has been postulated that in patients undergoing controlled mechanical ventilation (CMV) with square flow waveforms, the straight shape of the pressure–time curve during inflation indicates that tidal ventilation (TV) occurs between the two inflection points of the pressure–volume curve, which identifies the pressures at which recruitment and overdistension begin. To analyze the shape of the pressure–time curve, the stress index (SI) has been defined, such that: when $SI = 1$, the line is straight and VT occurs in the safe zone; when $SI < 1$, the line is convex and VT occurs in the collapse zone; when $SI > 1$, the line is concave and VT occurs in the overdistension zone. Computing processing of the pressure–time curve data is required to measure SI, although it has been postulated that simple visual inspection could serve to estimate it.
**Objectives:** To analyze the accuracy of visual estimation of SI by a group of non-expert observers in mechanical ventilation (MV).
**Methods:** Measurement of SI in 19 patients undergoing CMV with square flow waveform using the FluxMed monitor. Patients were classified into three groups based on the measured SI: safe zone ($SI = 1$), overdistension ($SI \geq 1.1$), and collapse ($SI < 0.9$). Simultaneously with measurement, pressure–time curve of each patient was captured. Subsequently, curves were processed and sequentially presented to eight different non-expert observers in MV. After a brief introduction to the concept of SI, each observer completed a questionnaire in which they classified each trace, according to their visual perception into one of the following categories: safe zone, overdistension and collapse. The accuracy of the observers in correctly classifying the curves was analyzed.
**Results:** Nineteen mechanically ventilated patients were included in the study, with 31% (6) with an ARDS diagnose. Patients were ventilated with an average TV of 7.76 ml/kg ([6.5—11.8], CI 95%), and mean measured SI was 1.06 ([0.9—1.5] CI 95%). Visual estimation had a sensitivity of 72% for detecting overdistension ($SI \geq 1.1$) and a specificity of 89%. For collapse detecting ($SI \leq 0.9$), sensitivity was 87% and specificity 92%. There was an overall error percentage of 24%, with an underestimation percentage of 15%. Interobserver agreement was moderate (kappa index 0.442).
**Conclusions:** SI can be estimated visually by non-expert observers in MV and, therefore used to monitor bedside MV safety.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000935

### Feasibility of performing vascular Doppler in liver transplantation by intensivists

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**Introduction:** The accuracy with which ICU specialists can perform an ultrasound study aimed at detecting vascular complications in the immediate postoperative period of liver transplantation was evaluated.
**Methods:** Cross-sectional observational study in the medical-surgical ICU of a tertiary hospital. All patients admitted after liver transplantation who were to undergo a standardized Doppler study performed by a specialist radiologist were included. The sample consisted of 29 ultrasound studies, conducted in 28 patients admitted between July and November 2023.
Intensivists (ICU group) who had undergone a previous training session in Doppler ultrasound aimed at ruling out vascular complications obtained measurements of resistance index (RI) and peak systolic velocity (PSV) in the hepatic artery and classified the flow pattern as "normal", "non-pathological hemodynamic variant (NPHV)", and "pathological". Additionally, flow and velocity in the portal vein (PV) were evaluated, and flow was categorized as "normal" and "pathological". The study by the ICU group was blinded to the standardized one performed within a period of 24 to 72 h. Concordance analysis was performed using Cohen's Kappa statistic for qualitative variables and the intraclass correlation coefficient (ICC) for quantitative variables.
**Results:** The most common indication for performing an ultrasound study was to evaluate the presence of vascular complications in the postoperative period (1–2 days) after liver transplantation.
The ICU group classified 17 (59%) patients with normal arterial flow, 11 (38%) with NPHV, and failed to visualize the artery in 1 (3%) case. The radiologist classified 18 (62%) patients with normal arterial flow and 11 (38%) with NPHV. Thus, pathological flow was ruled out in 97% of the cases evaluated in the ICU, and there was substantial agreement (Kappa 0.77) in distinguishing between normal flow and non-pathological variants.
Regarding flow in the PV, the ICU group classified 28 (97%) patients with normal arterial flow and 1 (3%) with pathological flow. There was total agreement in all 29 studies.
For RI, the ICC was 0.81 ($n = 27$). In the case of PSV, an ICC of 0.51 ($n = 24$) was obtained, while for velocity in the PV, an ICC of 0.88 ($n = 28$) was calculated between the ICU and radiology groups.
**Conclusions:** The performance of Doppler ultrasound by ICU specialists aimed at ruling out vascular complications in the immediate postoperative period of liver transplantation appears feasible after specific training.

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**Topic:** Brain death, organ donation and transplantation

## 000936

### Comparative analysis among cancer patients according to underlying disease and cause of admission to the ICU

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**Introduction:** Onco-hematological patients are increasingly being admitted to intensive care units in the last 20 years, largely due to the improvement of treatments, which have not only extended survival but also enhanced their quality of life. It is necessary to understand the profile of onco-hematological patients admitted to the ICU.
**Objectives:** To understand the differential epidemiological characteristics according to underlying disease: medical, elective surgery and urgent surgery; and according to cause for admission: unrelated to cancer (UTC), post-surgical complications related to cancer (PRC), and medical complications related to cancer (MCRC) in oncological patients admitted to the ICU.
**Methods:** Retrospective study conducted in a second-level hospital ICU from January 2020 to December 2023. Patients with a history of both hematologic and solid organ neoplasms diagnosed up to 5 years prior to ICU admission were selected. The following variables were collected: age, sex, ICU length of stay, severity scales (SAPS 2, APACHE II), comorbidities, cancer type (solid, hematologic), anatomical tumor location, oncological and ICU support treatment, cause of admission, whether any form of limitation of life-sustaining treatment had been received, and outcome. Qualitative variables are expressed as percentages and quantitative variables as mean and standard deviation or as median and interquartile range (p25-p75). Bivariate analysis was performed using the Chi-square test for qualitative variables and the Kruskal–Wallis test for quantitative variables. A $p$-value < 0.05 was considered significant for all analyses.
**Results:** 163 of the 1543 patients (10.5%) admitted to the ICU during the study period had a history of neoplasm. There were no statistically significant differences related to the underlying disease or cause of admission regarding the neoplasm itself when analyzing age, severity at admission, ICU length of stay, or mortality. Many of the patients with a medical underlying disease presented immunosuppression (75.8%) compared to scheduled post-surgical patients (9.1%) and urgent post-surgical patients (15.2%). Sepsis was the most common reason for admission to the ICU in patients with a medical underlying disease (41.9%) and urgent post-surgical patients (41.9%), compared to 16.1% in scheduled post-surgical patients. Patients with solid colorectal neoplasms were mostly admitted after urgent surgery (38.6%). Patients admitted after urgent surgery more frequently received parenteral nutrition (40.6%) compared to scheduled post-surgical patients (31.3%) or those with a medical underlying disease (28.1%). When considering the cause of admission in relation to the neoplasm itself (UTC, PRC, and MCRC), neutropenia (87.5%) and malnutrition (70%) were more frequent in patients admitted for MCRC. In patients admitted for PRC, colorectal neoplasm was the most frequent (52.3%). In

other locations, admission was either unrelated to cancer or secondary to MCRC, with hematologic tumors predominating in the latter case (50%). Most of the patients who received ventilatory support beyond 24 h of admission were admitted for MCRC (60%). Among medical patients, a high percentage were admitted for non-cancer-related reasons (53.4%), while in scheduled surgical patients, admission was mostly related to cancer (84.6%). Among patients admitted for MCRC, a significant proportion underwent some form of limitation of therapeutic effort (48.5%) compared to the other groups (NRC: 42.4% and PRC: 9.1%; $p < 0.001$).

**Conclusions:**

- The main reason for admission to the ICU was related to cancer in patients who suffered from: neutropenia, malnutrition, scheduled post-surgical patients, colorectal location, hematologic tumors, chemotherapy, or immunotherapy treatment.
- Patients admitted for medical complications related to cancer are mostly intubated within 24 h of admission.
- Patients admitted for medical complications related to cancer are the group where some form of limitation was most frequently implemented.

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**Topic:** Haematologic-oncologic issues in the ICU

## 000937

### The relevance of shock index in pelvic trauma patients

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**Introduction:** Trauma is one of the main causes of death and morbidity worldwide (1). Pelvic trauma (PT) is associated with high-energy injury mechanisms, which often leads to it being associated with other injuries (2). Mortality rates are high, especially in patients who are hemodynamically unstable (3).

**Objectives:** To analyze the association between the Shock Index (SI) and the severity and outcome of critically ill patients with PT.
**Methods:** Retrospective, single-center study of all patients over 18y with PT admitted to the emergency room (ER) of a Tertiary University Hospital between January 2020 and December 2023. The Young and Burges and the WSES classifications were used to classify PT and its instability. Coagulopathy was defined if ≥ 1 of the following conditions were met: PT > 15 s, aPTT > 40 s or fibrinogen < 150 mg/dL. The SI (heart rate divided by systolic blood pressure) ≥ 0,9 (4,5) was used as a predictor of severity. Major trauma was defined as Injury Severity Score (ISS) > 15 (6). Statistical analysis was done using SPSS version 29.0.2.0.
**Results:** A total of 111 patients were included, 83 were men (74,77%) with a mean age of 47y (± 18,82) and a median ISS of 25 (14–38). Median ICU and hospital length of stay were 5 (1,75–18,25) and 21,50 (9–44,5) days, respectively. 5 patients died in the ICU (4,5%) and 11 in the hospital (9,9%). SI was ≥ 0,9 (HSI) in 55 patients (49,55%) while 56 patients (50,5%) had SI < 0,9 (LSI). The most common mechanism of injury was falls (42,9%) in the LSI group and road accidents (40%) in the HSI group ($p = 0{,}0625$). Major trauma (ISS > 15) was more frequent in the HIS group (59% vs 41%; $p < 0{,}001$). The HSI group had higher median APACHE II (15,5 vs. 11,0; $p = 0{,}009$) and SAPS II (34,0 vs. 23,5; $p = 0{,}078$) scores. As for the WSES classification, a significantly higher proportion of patients in the HIS group were included in WSES grade IV (83,3% vs. 16,7%; $p < 0.001$). The majority of PT was classified as LC (79,5%), 14% as APC and 6,5% as VS according to The Young and Burges classification.
At ER admission, lactate > 2 mmol/l was significantly more frequent (59,3% vs 40,7%; $p = 0{,}003$) and median pH was significantly lower (7,31 vs. 7,36; $p = 0.019$) in HSI group. Patients in the HSI group presented a higher prevalence of coagulopathy (74,3% vs. 25,7%; $p < 0{,}001$) and tranexamic acid was more frequently administered in this population (63,6% vs. 36,4%; $p = 0{,}016$). No statistically significant differences between both groups were found with regard length of stay and mortality either in the ICU or in the hospital.
**Conclusions:** Although no statistically significant differences were found in the outcome of PT patients, SI ≥ 0,9 seems to correlate well with patient severity at ER admission. Thus, SI is an easy score to calculate that can be used as a triage tool for patients with PT, identifying those who need urgent treatment and stabilization and aiming to reduce associated morbidity and mortality.

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**Topic:** Tr
auma

## 000938 The impact of FDA-approved compounds on endothelial Tie2 shedding: paving the road for future capillary leakage therapies

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000938

**Introduction:** Endothelial barrier breakdown is a key element in the pathophysiology of sepsis, leading to the formation of tissue edema and subsequent organ failure. Cleavage of the endothelial tyrosine kinase Tie2 from the cell surface, known as Tie2 shedding, has been described as a crucial step in the development of capillary leakage [1]. To date, there are no therapies targeting Tie2 shedding in septic patients with capillary leakage.

**Objectives:** This study aims to repurpose FDA-approved drug compounds to inhibit pathological Tie2 shedding in sepsis models with a potential beneficial impact on capillary leakage.
**Methods:** A high-throughput screening (HTS) was conducted to find potential inhibitors of Tie2 shedding utilizing SCREEN-WELL® FDA approved drug library with 800 unique compounds. Human umbilical vein endothelial cells (HUVEC) were treated with 10 µM of each compound for 24 h. Supernatants were then assessed for soluble Tie2 (sTie2) levels via enzyme-linked immunosorbent assay (ELISA) and a CCK-8 assay was utilized to evaluate cytotoxicity. Compounds that reduced sTie2 by over 20% while maintaining cell viability above 80% were identified as potential candidates. These candidates were subsequently verified through dose–response analysis, as well as by investigating their impact on the temporal progression of Tie2 shedding in HUVEC models with TNF-α-induced inflammation. One-way ANOVA was employed to analyze differences between treatment groups at different timepoints.
**Results:** The HST screening identified 7 compounds meeting the predefined criteria for potential candidates—namely ciclesonide, deferasirox, hydrocortisone, miconazole, montelukast, sertaconazole and 1,25-dihydroxyvitamine D3. Montelukast and ciclesonide showed the most pronounced effect, reducing sTie2 in supernatants to 58.3 ± 1.66 and 43.7 ± 0.08% of controls, respectively ($p < 0.001$). Treatment with 1, 10 and 100 µM of each compound demonstrated a dose-dependent decline of sTie2 (Fig. 1A). Investigation of the longitudinal trajectory of Tie2 revealed an increment of sTie2 over time in the control group (DMSO + PBS group), which could be enhanced by stimulating cells with TNF-α additionally (DMSO + TNF group). Treatment with ciclesonide and montelukast successfully antagonized TNF-α-induced sTie2 shedding (at 36 h $p < 0.001$, Fig. 1B).
**Conclusions:** FDA-approved compounds, including montelukast and ciclesonide, significantly affect Tie2 shedding in vitro and may offer protective off-target benefits for patients experiencing capillary leaks in sepsis.

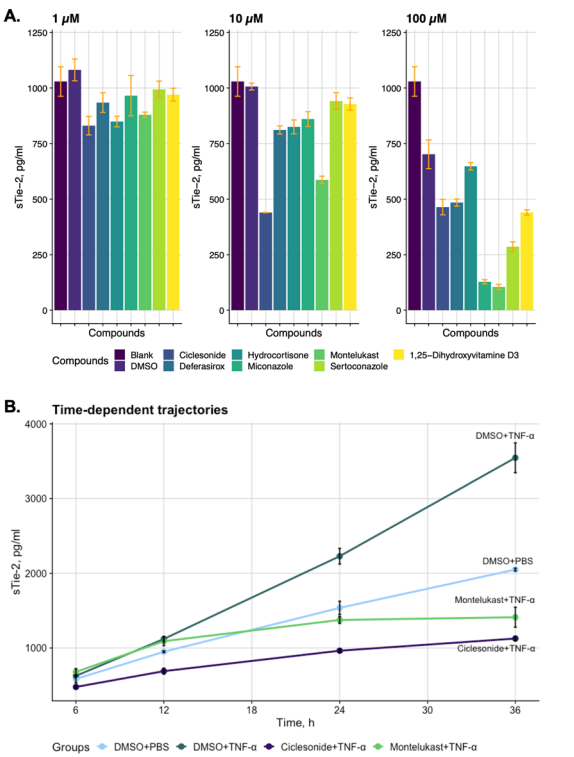


**Fig. 1 (abstract 000938)** A) Dose–response analysis: impact of various compounds on sTie2 levels in supernatants of HUVEC. B) Longitudinal analysis of sTie2 levels: sTie2 in HUVEC supernatants following TNF-α stimulation and treatment with montelukast and ciclesonide, with DMSO serving as control

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**Topic:** Sepsis

## 000939

### Neuroprotective effects of xenon application

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**Introduction:** The lack of effective strategies to prevent and minimize the consequences of acute damage to the central nervous system contributes to the search for new methods of neuroprotection. According to the obtained clinical and experimental data, the use of inhaled anesthetic xenon, whose neuroprotective potential has already been proven in a number of studies, is able to solve this problem.

**Objectives:** To identify the results obtained within the framework of the use of xenon in patients who have suffered an ischemic stroke.
**Methods:** The study included 24 patients who met the following inclusion criteria:

- Men and women between the ages of 18 and 75;
- Acute period of cerebral infarction;
- Severe neurological disorders (GCS < 12 points, NIHHS > 15 points, FOUR < 13 points);
- The need for a ventilator.
- Absence of a cerebral infarction in the previous 6 months;
- Absence of infectious diseases in the last month.

After randomization and inclusion of patients in the study, a standard protocol was followed based on current clinical recommendations for the treatment of ischemic stroke. Sedation was initiated within the first 12 hours from the moment of admission to the ICU or confirmation of the diagnosis of cerebral infarction. In the control group ($n = 12$), propofol sedation was performed at a dose of 2–4 mg/kg per hour using continuous intravenous perfusion. In the study group ($n = 12$), therapeutic anesthesia with Xenon was performed for 6 h at a concentration of 50 vol. % (0.5 MAC). The effectiveness of the therapy was assessed by evaluating such parameters as: indicators of GCS, NIHHS and FOUR on days 1, 3 and 8 from the start of sedation, as well as the level of neuronal damage protein S100ß.
**Results:** When assessing the level of consciousness on the Glasgow coma scale by 8 days against the background of xenon use, the results were significantly better than in the control group—7 [6–8] points in the control versus 13 [11–15] in the xenon group ($p = 0{,}026$). According to the FOUR scale, by day 8, a significant recovery in the level of consciousness was also noted against the background of xenon use—8 [7–8] points in the control group versus 14 [13–15] points in the study group ($p = 0{,}026$). The severity of neurological disorders on the NIHSS scale was also significantly lower against the background of xenon use—24 [12–27] points in the study group versus 32 [30–34] in the control group ($p = 0{,}008$). When assessing the level of S100 b protein on day 8, the concentration in the xenon group was significantly lower both in relation to the baseline level ($p = 0{,}04$) and compared with the protein level on day 8 in the propofol group ($p = 0{,}017$).
**Conclusions:** When comparing the effect of the sedation method on the level and speed of consciousness recovery, medical sedation with

xenon showed significantly better results compared with the use of propofol.

**Reference(s)**
1. The state assignment of the Ministry of Education and Science of Russia (No 075-00483-21-01 «Anesthetic neuroprotection with xenon and sevoflurane in severe brain injuries. Clinical and experimental study»)

**Topic:** Neurointensive care

## 000940

### The intensivist role in donation-oriented care: a comparison of activity evolution in Spain and in Castilla y León

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000940

**Introduction:** The role of the intensivist physician in the donation process is crucial throughout, from identifying potential donors, their admission to the ICU, providing care, to interacting with the family. We propose a review in the evolution of the donor profile at both national and regional levels in Spain and *Castilla y León* over the past 10 years.
**Objectives:** To describe the evolution of the organ donation process in Spain and compare it with data from *Castilla y León* (Spain). Furthermore, relate this evolution to intensivist role.
**Methods:** Retrospective descriptive analysis of the organ donation process in Spain and *Castilla y León* region between 2013 and 2022. We comparatively analyzed the donation rate, type of donation, cause of donation, donor characteristics, and evolution of family refusal.
**Results:** In the last ten years between 2013 and 2022, number of national donors has increased by 32.68%, and by 18% in *Castilla y León*, with an effective donor rate of 46.3 per million population (pmp) and 46 pmp, respectively. The highest rate was observed in 2019 (49 pmp), marked by a decrease in subsequent years due to the pandemic (37.4 pmp in 2020). Donations from controlled donation after circulatory death (DCD) accounted for 41.97% of total effective donations in the last year (rate 19.2 pmp), and 21.10% in *Castilla y León*. Between 2014 and 2017, DCD donations increased by 96.89%. In *Castilla y León*, there was an increase from 2 to 17 DCD donations from 2017 to 2018. The average age of the donor patient in Spain is 59.7 (SD 16.1) and 63.1 (SD 15.2) in *Castilla y León*. Most of them were male, and primary cause was acute cerebrovascular accident (ACVA), both nationally and regionally. Family refusal rate for donation stands at 16% nationally, a higher percentage than in 2019, which was 14%, the year with the highest number of donors. *Castilla y León* would be below the national average with a 13% family refusal rate.
**Conclusions:** The activity of the donation process in *Castilla and León* compared to Spain shows very similar data. In the early nineties, the National Transplant Organization (ONT) was established. Since then, there has been an annual increase in donation rates until 2020, interrupted by the pandemic, and to this day, the previous rates of effective donors have not been recovered. Currently, there is a noticeable growth in donation rates in controlled donation after circulatory death (DCD) in recent years, but also an increase in family refusal, likely influenced by current society. Therefore, the active participation of the intensivist physician in the process (donor detection, legal aspects, family interviews, organizational aspects, management, communication with the media), and coordination of organ donation is essential.

**Topic:** Brain death, organ donation and transplantation

## 000941

### Renal resistance index measured with Doppler ultrasound as a predictive tool of acute kidney injury in neurocritical patients with hyperosmolar therapy

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000941

**Introduction:** Osmolar therapy is a medical treatment strategy frequently used in patients with intracranial hypertension with the aim of decreasing cerebral edema. Within neurocritical care units, the use of hyperosmolar intravenous solutions is not exempt from side effects, and one of the most important is the possibility of developing acute kidney injury. The IRR is an index that continues to be researched, and in recent years it has found a field of study in cardiorenal syndrome and sepsis, two conditions that in the acute context have found the possibility of continuous serial follow-up. The prognostic value of this index as an early predictor of acute kidney injury remains to be clarified, there are pathologies that associate an effect of microvascular damage that is combined with greater systemic vascular rigidity. The aim of this study was to evaluate this index in patients receiving hyperosmolar therapy who developed acute renal injury by establishing a cut-off point.
**Objectives:** To evaluate the renal resistance index as a tool to predict the risk of acute kidney injury in neurocritical patients requiring hyperosmolar therapy.
**Methods:** The sample was collected from all patients who required management with hyperosmolar therapy and who met the inclusion criteria and without exclusion criteria, determining baseline serum levels of creatinine, sodium, and chlorine, and then Doppler IRR measurements were performed prior to hyperosmolar therapy at 24, 48, and 72 h.
**Results:** An ROC curve showed an area under the curve (AUC) of 0.68 (95% CI 0.49–0.87), with a sensitivity of 77.7% and a specificity of 35.7%. When the classification correction was performed via DLR+, the point was 0.56, with a sensitivity of 83.3% and a specificity of 71.4%.
**Conclusions:** A high index of renal resistance was correlated with the risk of developing water-induced renal injury, however, the sample size was limited to a statistically significant value.

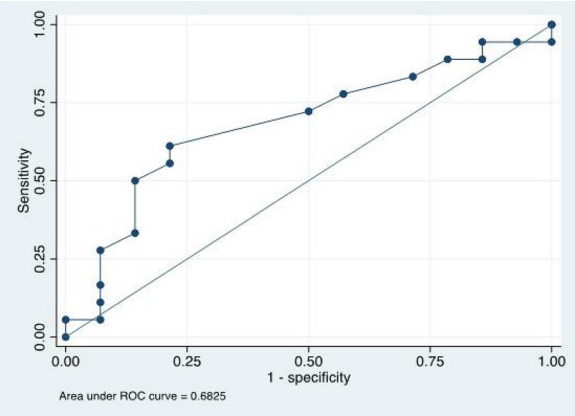


**Fig. 1 (abstract 000941)** Análisis ROC de la TIR como prueba diagnóstica de LRA

**Topic:** Neurointensive care

## 000942

## B-Hydroxybutyrate exposure restores mitochondrial function in skeletal muscle satellite cells of critically ill patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000942

**Introduction:** Dysfunction of skeletal muscle satellite cells might impair muscle regeneration and prolong ICU-acquired weakness, a condition associated with disability and delayed death. In recent years, there have been many efforts to prevent muscle catabolism and muscle loss through various rehabilitation approaches as well as nutritional support. Traditional ways of metabolic support have focused mainly on supplementation of proteins and amino acids, but failed to improve patient-centered outcomes. In turn, it has been hypothesized that ketone bodies might be used as an alternative, readily available fuel in critically ill patients [1].
**Objectives:** Before testing ketone bodies in clinical, outcome-based trials, we aimed to study ex vivo the metabolic effects of ketone bodies (β-OH-butyrate; β-OHB) in satellite cells isolated from vastus lateralis muscle biopsies of patients with ICU-acquired weakness.
**Methods:** Satellite cells were extracted by Bergström needle technique from vastus lateralis muscle biopsies of patients with ICU-acquired weakness ($n=10$; age $53\pm17.5$) and control group of healthy volunteers or patients undergoing elective hip replacement surgery ($n=10$; age $51.3\pm17.2$). The cells were exposed to standard culture media supplemented with β-OH-butyrate (5 mM) to assess its influence on cell proliferation by ELISA, mitochondrial functions by extracellular flux analysis, electron transport chain complexes by high resolution respirometry, and reactive oxygen species production by confocal laser scanning microscopy.
**Results:** Critical illness led to a significant decline in maximal respiratory capacity, ATP production and glycolytic capacity and increased reactive oxygen species production in ICU patients' cells. Notably, the function of complex II was impaired due to critical illness but restored to normal levels upon exposure to β-OH-butyrate (Fig. 1, parts B and D). Additionally, β-OH-butyrate significantly reduced reactive oxygen species production in both control and ICU groups (Fig. 1, part G). In ICU patients, cells exposed to β-OHB tended to increase proliferation, although these changes did not reach statistical significance (Fig. 1, part H).
**Conclusions:** Critical illness induces measurable bioenergetic dysfunction of skeletal muscle satellite cells. β-OH-Butyrate displayed a potential in rectifying complex II dysfunction caused by critical illness and this warrants further exploration.

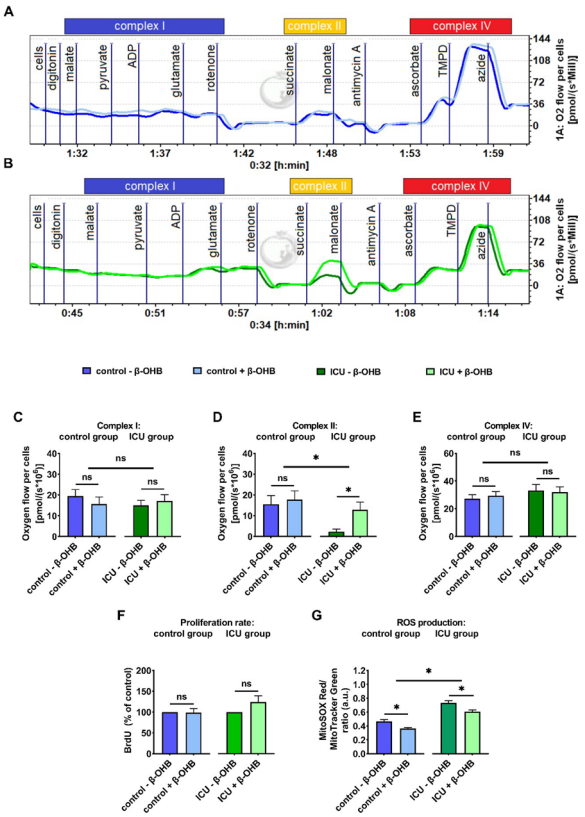


**Fig. 1 (abstract 000942)** Impact of β-OH-butyrate on skeletal muscle satellite cells. A) and B) Representative images of real-time oxygen flow measurement on high-resolution respirometry reflecting respiration linked to individual complexes of electron transport chain (complexes I, II and IV) normalized to 106 cells in control group and ICU group; C) respiration linked to complex I calculated as the oxygen flow after addition of 4 mM ADP and substrates for complex I (2.5 mM malate, 10 mM pyruvate and 15 mM of glutamate) minus the oxygen flow after addition of complex I inhibitor (rotenone). Data are presented as mean ± SEM and normalized to 106 cells; D) respiration linked to complex II calculated as the oxygen flow after addition of substrate for complex II (succinate) minus the oxygen flow after addition of complex II inhibitor (malonate). Data are presented as mean ± SEM and normalized to 106 cells; E) respiration linked to complex IV determined as the oxygen flow after addition of complex III inhibitor (antimycin A) and substrates for complex IV (ascorbate + TMPD) minus the oxygen flow after addition of inhibitor for complex IV (azide). Data are presented as mean ± SEM and normalized to 106 cells; F) proliferation rate demonstrating actively proliferating cells after staining with BrdU (= thymidine analogue incorporating into newly synthesized DNA of actively proliferating cells). Data are presented as mean ± SEM and normalized to control group (= medium with no β-OHB). G) ROS production determined as the fluorescence intensity of MitoSOXTM Red divided by fluorescence intensity of MitoTrackerTM Green (MitoSOXTM Red is a superoxide indicator specifically targeted to mitochondria, whilst MitoTrackerTM Green labels all mitochondria). Data are presented as mean ± SEM from values measured in 10 independent experiments ($n \geq 60$ cells per each condition). Note: *$p<0.05$, β-OHB = β-hydroxybutyrate, ADP = adenosine diphosphate, ICU = intensive care unit, ROS = reactive oxygen species, TMPD = N,N,N′,N′-tetramethyl-p-phenylenediamine dihydrochloride

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2. The work was supported from Cooperatio 33 (ICM) and AZV NU21J-06–00078.

**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000943

### Spontaneous intra-cerebral hemorrhage in critically ill patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000943

**Introduction:** Spontaneous intra-cerebral hemorrhage (ICH) comprises 10–15% of all strokes, is associated with high morbidity and mortality and requiring frequently the admission to intensive care units (ICU).
**Objectives:** To describe the characteristics of patients admitted to an intensive care unit in a third level hospital with diagnosis of spontaneous intra-cerebral hemorrhage.
**Methods:** Observational, retrospective study performed on patients with spontaneous ICH admitted to ICU of a third level hospital between 2022 and 2023 years. Epidemiological data, ICH risk factors, comorbidities, severity scores (APACHE II and ICH score), organic support, hemorrhage characteristics (including the presence of intraventricular involvement (IVH) and midline displacement), patient clinical characteristics and outcome defined by the modified Rankin score (mRS), were collected during ICU stay.
Descriptive data were reported as means with standard deviation (SD) for normally distributed continuous variables, medians with interquartile range (IQR) for non-normally distributed variables, and as percentages for categorical data.
**Results:** Eighty-nine patients were included. 63% were male, mean age was 60 ± 15 yrs and Charlson Comorbidity Index 0 (IQR 0–2). ICH risk factors were: hypertension 55%, dyslipidemia 36%, obesity 20%, diabetes 17%, smoker 26% and previous stroke 10%. Severity scores: APACHE II 21 ± 8, ICH score 3 (IQR 2–4), initial GCS 10 (5–14) and the neutrophil-to-lymphocyte ratio 5 (IQR 3–11). The arterial hypertensive was the most common cause of hemorrhage (65.2%), followed by arteriovenous malformation (15.7%), amyloid angiopathy (6.7%) and thrombocytopenia and/or coagulopathy (6.7%). The supratentorial location was the most frequently observed (75%), with brainstem involvement in 9% of patients. Over half of the patients (57%) exhibited midline shift on admission imaging, with a median of 3 mm (IQR 0–11). Intraventricular bleeding was associated with 66.3% of hemorrhages. Surgical intervention was performed in 24.7% of patients (hematoma evacuation and/or decompressive craniectomy). Ventricular drainage was placed in 28% of patients. During ICU stay, 85.4% required mechanical ventilation, and 36% underwent tracheostomy. Any ICU complications were observed in 80% of patients, highlighting: aspiration pneumonia (45%) and intracranial hypertension (25.8%). Other complications included rebleeding (10%), ventricular dysfunction (2.2%), and ARDS (2.2%). Nearly half of the patients (42.7%) experienced some infectious complication, highlighting: ventilator-associated pneumonia (23.6%), bloodstream (5.6%), tracheostomy-related bronchitis (17%), and other infections (23.6%). The ICU stay was 9 days (2–30) with a 51.7% of mortality and the hospital stay was 16 days (2–51) with a mortality of 55.1%
The functional status at discharge, assessed by the Rankin scale, indicated: asymptomatic (4.5%), non-disability (1.1%), mild disability (2.2%), moderate disability (12.4%), moderately severe disability (20.2%), severe disability (4.5%), and deceased (55.1%). Hence, 75.8% of patients exhibited an unfavorable outcome, defined as moderately severe disability, severe disability or death.
**Conclusions:** In our experience, the spontaneous intra-cerebral hemorrhage was mainly supratentorial location, with a significant volume of hematoma, frequently causing midline displacement and with reduced possibilities of surgical treatment. For these reasons, it is a devastating entity that is associated with severe disability and mortality.

**Topic:** Neurointensive care

## 000946

### Skeletal muscle regeneration in survivors of critical illness

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**Introduction:** Intensive care unit-acquired weakness (ICU-AW) is a common complication of critical illness associated with an increased morbidity and mortality [1]. *Skeletal muscle satellite cells* are considered to play a crucial role in muscle regeneration [2]. During injury, satellite cells are firstly activated from quiescent state, and subsequently they proliferate, differentiate and fuse into new myotubes (Fig. 1, A). In critically ill, dysfunction of these cells might lead to an impaired muscle regeneration and thus contribute to the development of muscle weakness.

**Objectives:** Our goal is to determine whether satellite cell number, their activation, differentiation or function is affected in critically ill with ICU-AW over time.
**Methods:** We enrolled 16 critically ill patients with MRC score < 48 points (= muscle weakness). We performed biopsy at "day 1" (< 72 h after admission to ICU) and after next 7 days. Muscle samples were frozen in isopentane for determination of satellite cell number (Pax 7 positive) in muscle fibers (type I and II). Satellite cells were isolated using magnetic beads technique to obtain the purified cell culture. Proliferation rate was observed at the different time points (after 24, 36, 48, 72 h) and determined using BrdU proliferation kit on fluorescence microscopy. The ability of cells to fuse into myotubes was determined after staining of cytoskeleton and nuclei and calculated as the % of nuclei located inside myotubes divided by the total number of nuclei. In both proliferating muscle cells and myotubes, Extracellular Flux Analyzer was used to measure oxygen consumption rate (OCR) at the baseline and after a sequential addition of ATP synthase inhibitor, uncoupler and complex III inhibitor which enabled to determine proton leak, ATP production, maximal respiratory capacity and non-mitochondrial respiration.
**Results:** All parameters were compared with sex- and age-matched metabolically healthy volunteers (n = 10). Number of satellite cells was significantly decreased in all types of muscle fibers. We also observed a tendency to decrease proliferation over time (Fig. 1, B). Fusion index was slightly decreased and highly variable between individual subjects (Fig. 1, D). The most significant result was decreased maximal respiratory capacity to 62% and 56% of control values in myotubes obtained from biopsies at day 1 and 7, respectively (Fig. 1, E).
**Conclusions:** Our pilot data show that the number of satellite cells is significantly decreased in muscle fibers obtained from critically ill with ICU-AW. Additionally, mitochondrial functions are affected in differentiated myotubes of critically ill with ICU-AW from biopsies obtained in the first week of ICU stay.

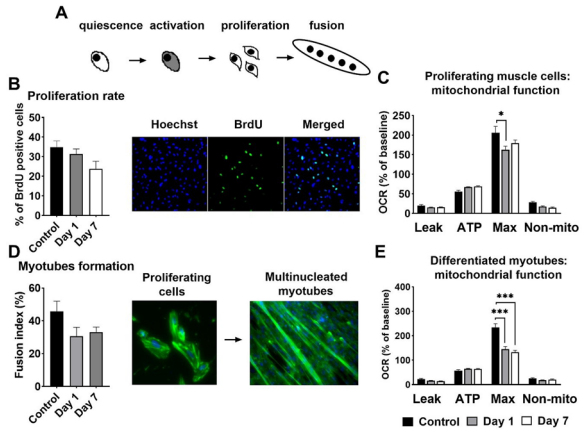


**Fig. 1 (abstract 000946)** **A)** Simplified scheme of satellite cell role in muscle regeneration. **B)** Proliferation rate calculated as the % of nuclei of proliferating cells accumulating BrdU (green)/ total number of cells (blue). Example from one time point (after 24 h). **C** and **E)** Extracellular Flux Analysis: proton leak, ATP production, maximal respiratory capacity, non-mitochondrial respiration. **D)** Left: fusion index. right: proliferating cells and multinucleated myotubes—cytoskeleton (green) and nuclei (blue). Note: *$p$?0.05, ***$p$?0.001

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3. The work was supported by Cooperatio 33 (ICM) and grant AZV No. NU21J-06-00078.

**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000947

## Evaluation of the tensile strength of endotracheal tube securing devices using an innovative strategy: simulation study on mannequin

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000947

**Introduction:** Intubation with an endotracheal tube (ETT) is a widely used technique in anesthesiology and intensive care units (1). After insertion, the ETT have to be secured to prevent its mobilization, unplanned extubation being specifically dreaded. To date, there are no formal recommendations about securing systems, and various practices are observed (2). A few studies have compared the resistance to extubation of these securing systems. Nevertheless, the forced extubation method was not rigorously standardized [manual traction (3) or counterweight release (4)]. In addition, forced extubation was defined as either an ETT mobilization with a magnitude chosen arbitrarily (4) or a modification of the securing system (5) (breakage, detachment). However, in real life practice, extubation does not systematically occur along with these events.
**Objectives:** The main objective of this prospective study with rigorous monitoring conditions was to compare the ability of widely used ETT securing systems to withstand a tensile stress simulating extubation on a mannequin. Four conditions of traction were evaluated: 2 speeds (5 and 50 cm/min) and 2 traction plans (sagittal and frontal).
**Methods:** This study was approved by the national Ethics Committee for Anesthesia and Critical Care Research on November 11, 2022 (IRB 00010254-2022-114). Along with the absence of securing system (control), 6 securing systems were assessed: 3 using cord (single, with knot, with adhesive band), 2 using adhesive elastic band (short 35 cm band and long 65 cm band) and, one standalone marketed device. A unique type of ETT was used (7.5 mm internal diameter). To be as realistic as possible, the mannequin's airway was pressurized using a mechanical ventilator. Extubation was defined as an abrupt loss of airway pressure (Fig. 1). ETT traction was performed till extubation by a tensile testing machine. The force required to achieve extubation was recorded. Five measurements per condition were collected. Results are presented as median and interquartile range [IQR]. Comparisons were performed with Wilcoxon test or Kruskal–Wallis test and Bonferroni post hoc analysis. A $p$-value < 0.05 was considered significant.
**Results:** In June 2023, 140 tests were completed.
Whatever the device, the force yielding extubation was lower when the traction was applied in the sagittal than in the frontal plan: 44 [26–57] and 108 [88–145] N ($p < 0.001$), respectively (pooled data). The traction speed had no significant influence: 65 [43–101] and 87 [35–117] N ($p = 0.4$) at 5 and 50 cm/min traction speed, respectively.
In the sagittal plan, unlike what was observed with other securing systems, the force yielding extubation was not different between both short and long adhesive elastic bands and the absence of securing systems. Forces yielding extubation with respect to the securing systems and the traction plan are detailed in Fig. 2.
**Conclusions:** Extubation is more easily observed when the ETT was pulled in the sagittal rather than the frontal plan and when it was secured with adhesive elastic bands. Other securing systems performed grossly similarly.

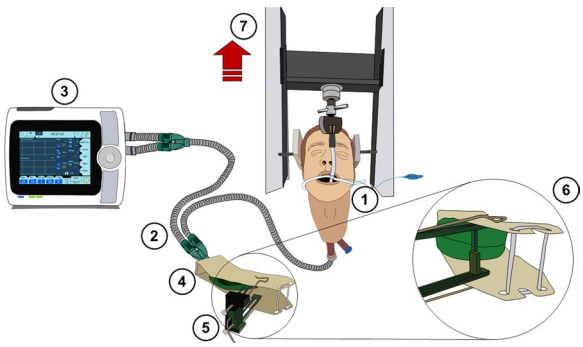


**Fig. 1 (abstract 000947)** The endotracheal tube, previously sealed, was inserted into the throat of the mannequin (1). It was then gripped to the tensile testing machine (2) and ETT cuff was inflated to 30 cm H2O (3). The ventilator was started to deliver a constant pressure of 20 cmH2O (4). The test lung (5) and the extensometer (6) were then under pressure (7). The traction could begin (8). As soon as the extubation occurred, the airway depressurized, immediately detected by the extensometer, and the test lung returned to its initial position (5). Thus, the precise moment marking extubation can be identified

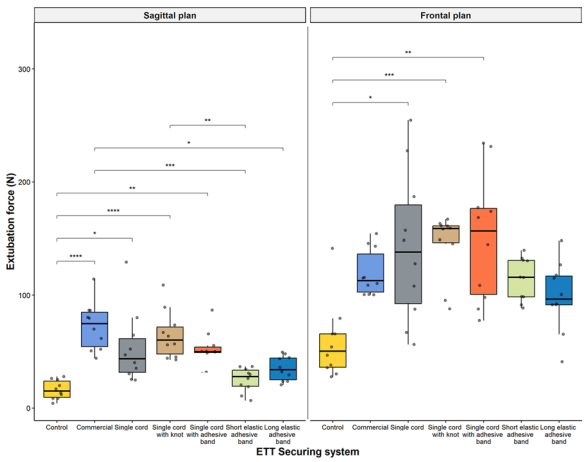


**Fig. 1 (abstract 000947)** Boxplots indicate the median value (thick black line) and the first and third quartile (thin black lines) of the force measurements at extubation with the respect of securing systems and traction plans. Comparisons were performed with Kruskal–Wallis test and Bonferroni post hoc analysis. ETT: endotracheal tube. *$p < 0.5$ **$p < 0.1$ ***$p < 0.01$ ****$p < 0.001$

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000948

### Central venous catheter and invasive mechanical ventilation as risk factor for catheter-related bloodstream infection and ventilator-associated pneumonia: a retrospective study


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000948


**Introduction:** Catheter-related bloodstream infection (CRBSI) and ventilator-associated pneumonia (VAP) are linked to critical and possibly fatal outcome of intensive care unit (ICU) stay. Use of central venous catheter (CVC) and invasive mechanical ventilation bundles can considerably reduce CRBSI and VAP rates in hospitalized patients. However, despite widespread adoption of these bundles in hospitals worldwide, these nosocomial infections remain prevalent. In our case, we base our routine on the Portugal's National Health Service clinical guidelines and on the ERS/ESICM/ESCMID/ALAT guidelines.
**Objectives:** The aim of the present study was to determine whether longer duration of CVCs placement and mechanical invasive ventilation are related to CRBSI and VAP in hospitalized adults, despite the implementation of preventive bundles.
**Methods:** A retrospective study was performed among hospitalized patients who had a CVC and/or were invasively ventilated during a 6-month period (July 2022–December 2022) and developed CRBSI and VAP. Age, gender, SOFA, APACHE II, SAPS II, IMV days, CVC placement duration and length of stay were recorded. Two groups were made: group A, 2–10 days, and group B, > 10 days of IMV/CVC placement, that were compared regarding VAP and CRBSI development. We also evaluated whether the development of VAP and CRBSI events was associated with the length of stay in ICU. A $p$-value of $\leq 0.05$ was considered as statistically significant.
**Results:** We enrolled 204 patients with CVC placement, 115 (56.37%) males, mean age of 65,14 ± 17,73 years: 180 in group A, and 24 in group B. CRBSI was found in 6,67% of patients from group A, and in 29.17% of patients from group B ($p = 0{,}0004$). We also enrolled 61 patients on IMV, 36 (59,02%) males, mean age of 63.44 ± 14.64 years: 51 in group A and 10 in group B. VAP was found in 33.33% of patients from group A and in 70% of patients from group B ($p = 0.0299$). Patients who developed AVP and CRBSI events had an increased length of stay in ICU, $p = 0.00010$ and $p = 0.00012$, respectively.
**Conclusions:** Our findings suggest that duration of CVC placement and the number of days intubated remain important risk factors for CRBSIs and VAPs in ICU patients, even after the adoption of the aforementioned prevention bundles. Our results were below the expected, when compared with other European ICU numbers, making us believe that we need do audit bundles compliance. The development of CRBSIs and VAP contributed to worst outcomes like the increase in length of stay in ICU as we expected.

**Topic:** Infections and prevention

## 000950

### Implementation of inhaled isoflurane for sedation in a district general hospital intensive care unit: what are the benefits?


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**Introduction:** Sedation in intensive care is classically achieved with intravenous sedative agents, most commonly propofol with an opioid analgesic. However, in some patients, this combination is ineffective at producing adequate sedation to facilitate critical care interventions. Prior to 2023, our 18-bed unit in a district general hospital most commonly used intravenous midazolam as an alternative. Though effective, midazolam has significant downsides compared to propofol when used for sedation in ICU, including increased delirium [1], reduced gut motility [2,3] and prolonged effect after cessation of therapy [4]. As such, we sought to implement inhaled isoflurane, via a Sedaconda device, as an alternative sedation option for our ICU patients.
**Objectives:** We aimed to analyse the first six months of isoflurane use on our ICU and compare to our previous experience with IV midazolam prior to our implementation of inhaled sedation.
**Methods:** Data were collected via retrospective review of admission charts and medical notes of patients identified by a search of electronic isoflurane prescriptions. Where indication for isoflurane was not documented, this was provided by interpretation of the available clinical information at the time of data collection.
**Results:** 19 patients received isoflurane in our first 6 months of use. For 15 patients, the indication was difficulty with achieving adequate sedation with first-line sedatives, while 4 had alternative indications, such as short sedation duration ($n = 2$) and as a bronchodilator in obstructive airways disease ($n = 2$). The average length of isoflurane use was 5.4 days, with 6 patients remaining on isoflurane for 7 days or more. The incidence of side effects was low. Only 2/19 had documented delirium following sedation, and 1 patient developed paralytic ileus, who notably had also received IV midazolam during admission. 9 patients were changed to alternative sedative agents

before sedation was ultimately discontinued, including 3 who were switched to IV midazolam infusions.
**Conclusions:** We successfully implemented a new technology into regular use on our ICU, giving an alternative sedation option aside from intravenous agents. While initially introduced for "difficult to sedate" patients, this also allowed us to utilise isoflurane for its other characteristics, such as its bronchodilator effect [5] and shorter wake-up times [6]. Side effects were relatively rare with isoflurane, with delirium and paralytic ileus occurring infrequently compared to our previous experience with midazolam infusions. Isoflurane was often changed to an alternative sedative prior to sedation being discontinued, possibly reducing the benefits of its use. The reason for these changes was not clear. Whilst we cannot rule out undocumented inadequate or adverse responses to isoflurane, this could simply represent need for further staff training to improve familiarity with this new technology, or that the initial indication for isoflurane had resolved.

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**Topic:** Sedation, analgesia and delirium

## 000951

### Microcirculatory evaluation of the skeletal muscle and intensive care unit (ICU)-acquired weakness (ICU-AW), a prospective observational study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000951

**Introduction:** The impact of ICU-acquired weakness (ICU-AW) can be reduced by early physical rehabilitation programs that start from when the patient is still at the ICU. Therefore, detecting those patients with a higher risk or degree of muscle impairment remains a challenge. To date, optical technologies, such as near-infrared-spectroscopy (NIRS), have demonstrated their value in the evaluation of the health of the capillaries and microvasculature in muscles. We hypothesized that alterations in the microvasculature of the skeletal muscle would correlate with the degree of muscle weakness.
**Objectives:** To assess the relationship between ICU-acquired weakness (ICU-AW) and the microcirculatory status of the muscle.
**Methods:** Single-centre prospective observational study in a general ICU. Patients with > 48 h of mechanical ventilation (MV) were included, excluding cognitive and/or neurological disorders prior to or at admission. Muscle strength was assessed with dynamometry and the Medical Research Council sum score (MRC), and the microcirculatory status of the brachioradialis muscle measured non-invasively with photonic technology (Vascovid System) at awakening, ICU discharge, hospital discharge and at 6 months. Adding the 6-min walk test (6MWT) at 6 months. The Vascovid system quantifies tissue oxygen saturation (StO2) and microvascular flow (BFi). A transient ischemic test was used to obtain dynamic microvascular parameters, such as tissue metabolism and microvascular reactivity. ICU-AW was defined as MRC < 48, and altered 6MWT at < 400 m. Correlation analysis between strength and microcirculation was performed, as well as comparative and evolutionary analysis for the presence of ICU-AW and/or 6MWT alteration.
**Results:** We included a total of 57 ICU patients. Mean age was 63 ± 16 years old. The main cause of ICU admission was acute respiratory failure. At inclusion, 68% of the patients showed ICU-AW, which was associated with lower handgrip performance. The microcirculatory status was significantly different according to the presence of ICU-AW, in terms of oxygenation, microvascular reactivity, and baseline microvascular blood flow. Both MRC and the handgrip evaluation improved over time (Figs. 1 and 2). After 6 months, no differences in the MRC score and the handgrip evaluation were observed between those patients initially diagnosed with ICU-AW and those with preserved strength at inclusion, and no significant differences in microvascular parameters were observed over time.
At 6 months, 38% of patients had limited functional capacity, evaluated by the 6MWT. While MRC and handgrip values at inclusion were not different, microvascular oxygenation impairments in the first evaluation were associated to altered 6MWD (Fig. 3). The best predictive association was observed with StO2 values at inclusion. A ROC analysis exploring the predictive value of StO2 in the first examination for detecting a severely impaired 6-min walking test at 6 months, showed an AUC of 0.88 ($p = 0.001$).
**Conclusions:** We studied a critically ill population with high incidence of ICU-AW. Microcirculatory differences were detected according to the presence of ICU-AW. After a 6-month follow-up, strength parameters had recovered, and they did not differ between ICU-AW and no-ICU-AW at inclusion. However, severe alterations in functional exercise capacity were observed in almost 40% of the patients, which was not associated to a previous condition of ICU-AW. While strength parameters were not useful in predicting the observed functional capacity, microcirculatory parameters at inclusion, and mostly tissue oxygenation parameters, were associated to poor functional performance. The addition of microcirculatory evaluation early, in the recovery phase of the ICU stay, might help detecting those patients at risk of poor functional outcomes after the critical illness.

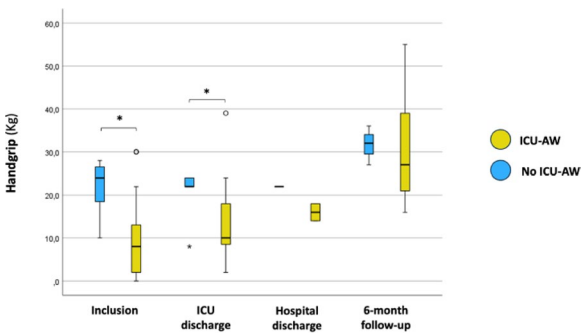


**Fig. 1 (abstract 000951)** Handgrip score at different times

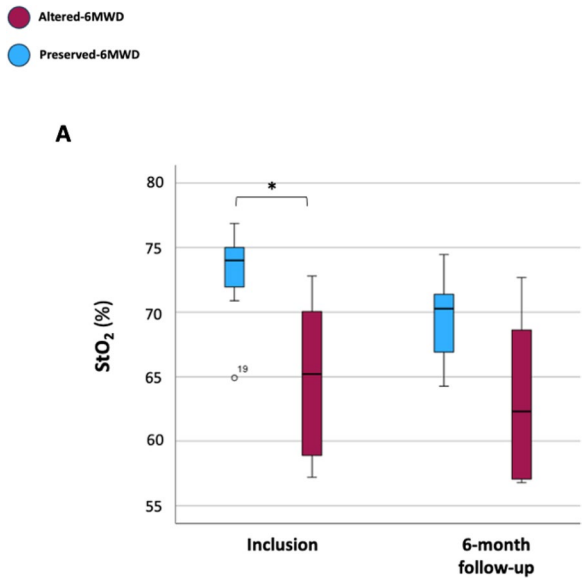


**Fig. 2 (abstract 000951)** Microcirculatory parameters according to the 6-min Walking Test with tissue oxygen saturation

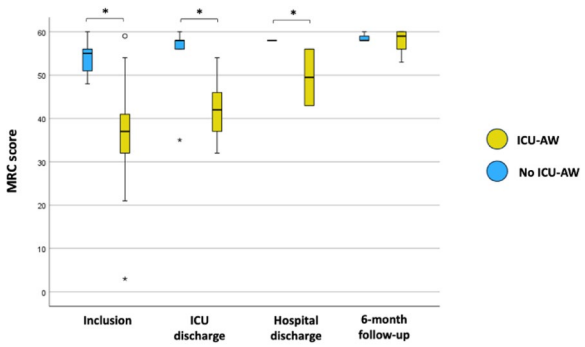


**Fig. 3 (abstract 000951)** MRC Score at different times

**Reference(s)**

1. Fundació La Marató TV3, project number: 202109-30

**Topic:** Cardiovascular issues in ICU

## 000952

### Lactate as a predictor of citrate accumulation in critically ill patients undergoing continuous renal replacement therapy

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000952

**Introduction:** Regional citrate anticoagulation (RCA) is the preferred option for anticoagulation in continuous renal replacement therapy (CRRT) due to its superior efficacy and reduced risk of bleeding [1]. Nevertheless, the use of RCA in patients with impaired organ perfusion is debated because of the potential for decreased citrate metabolism leading to citrate accumulation and subsequent toxicity. To date, only a limited number of studies have investigated the likelihood of citrate accumulation based on lactate levels as surrogate for a decreased metabolism capacity to choose the best anticoagulation strategy [2].

**Objectives:**

1 To investigate the association between plasma lactate levels prior to the initiation of CRRT and the risk of citrate accumulation.
2 To predict the likelihood of citrate accumulation based on lactate levels at baseline.

**Methods:** This single-center retrospective analysis enrolled ICU patients admitted between January 2018 and December 2021, who required CRRT with RCA. Baseline lactate levels just before CRRT initiation were selected as the predictor variable, while the occurrence of a calcium quotient (ratio of albumin-corrected total calcium to ionized calcium) $\geq 2.5$ served as the primary endpoint, suggesting citrate accumulation. Follow-up was two weeks or until the discontinuation of CRRT. Logistic regression models were used to investigate the association between lactate and citrate accumulation. Predicted probabilities to reach the primary endpoint were calculated for various lactate levels and graphically represented to identify potential threshold values for accurately forecasting citrate accumulation.

**Results:** Electronic documentation of CRRT was available for 878 patients. A calcium quotient of $\geq 2.5$ was observed at least once in 170 individuals (19.4%) during the two-week follow-up period and occurred on average 16 [IQR 8–96] hours after onset of CRRT. The median lactate levels at the start of the filter were overall 1.7 [IQR 1–2.6] mmol/L, 1.5 [IQR 1.0–2.8] mmol/L for patients without citrate accumulation and 3.25 [IQR 1.6–8.6] mmol/L for individuals with signs of citrate accumulation. Logistic regression models identified a significant association between lactate levels and the risk of citrate accumulation, indicating that the odds ratio of developing citrate accumulation increased by 1.19 [95% CI 1.15–1.24] with every 1 mmol/L increase in lactate levels ($p < 0.001$). Figure A presents the probabilities of citrate accumulation as a function of different lactate levels.

**Conclusions:** This investigation underscores lactate's potential as a predictive marker for citrate accumulation in critically ill patients undergoing CRRT with RCA. Additional studies from multiple sites are warranted to validate these results prospectively and to consolidate exact thresholds for precise risk assessment.

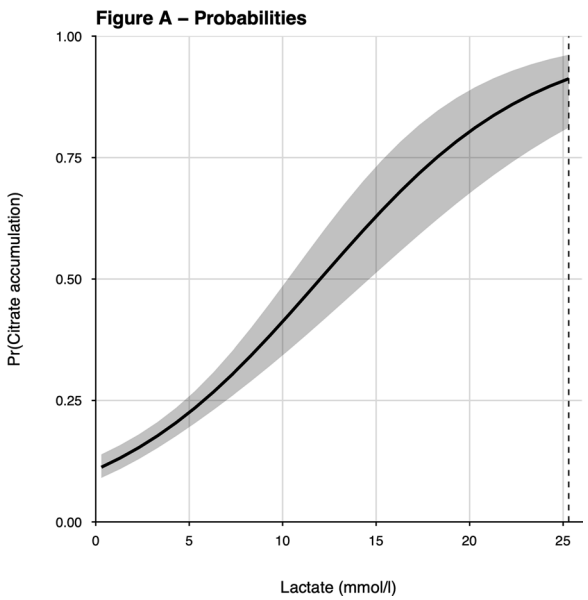


**Figure A (abstract 000952)** Visualization of the predicted probabilities of reaching the primary endpoint of citrate accumulation based on plasma lactate levels

**Reference(s)**
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**Topic:** Acute kidney injury and haemofiltration

## 000953 A
## minoglycosides in septic patients with impaired renal function

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**Introduction:** Sepsis is one of the main causes of mortality and morbidity in an ICU setting, while the responsible microorganisms most frequently isolated are multidrug-resistant Gram-negative bacteria. Aminoglycosides (AG) seem to be particularly effective in dealing with these microbes, however their potential toxicity, especially nephrotoxicity, often makes them an unsuitable treatment option.

**Objectives:** The purpose of this study was to achieve the most frequent administration interval of aminoglycosides during septic shock treatment with the complementary use of CVVHDF for effective clearance, in order to minimize toxicity after achieving a therapeutic serum concentration.
**Methods:** This is a randomized controlled study (randomization 2:1) which is conducted in the University Hospital of Larissa, Greece, and the data were collected between April 2023 and March 2024 (NCT06226441). Patients are included if they present with sepsis/septic shock, have impaired renal function (GFR $\leq$ 40 ml/min/1.73m$^2$) and are treated with an AG according to the treating physician. The patients are divided in two groups, according to the receipt of CVVHDF therapy (CVVHDF group-control group). CVVHDF is started despite the lack of absolute criteria for renal replacement therapy. The recorded data include: demographics, AG trough levels daily, the AG dose interval, the total AG doses received in each group. Comparisons between the groups were performed using Mann–Whitney *U* test or *t*-test, where applicable.
**Results:** Sixteen patients were included in the study, all intubated; 11 patients comprised the CVVHDF group and 5 the control group. The median age in CVVHDF group was 70 (51,77) vs 71 (71,78), $P=0.279$, the mean APACHE II score was 20 $\pm$ 2.1 vs 20 $\pm$ 2.9, $P=0.390$ and the mean sofa score was 8.6 $\pm$ 1.2 vs 10.4 $\pm$ 1.12, $P=0.197$. Day 2 and Day 3 AG trough levels were lower in the intervention group (D2, 4,5 $\pm$ 1,3 vs 7.1 $\pm$ 1.7 mg/L, $P=0{,}01$ and D3, 2 $\pm$ 0.88 vs 5 $\pm$ 0.53, $P<0{,}001$, respectively). Trough levels on days 4–9 did not differ between the study groups ( D4, 3.4 mg/L (1.6,12) vs 3.3 mg/L (2.8,5), $P=0.91$; D5, 2.2 mg/L (1.5,6) vs 2.5 mg/L (1.2,3.7) $P=0.841$; D6 3.7 mg/L $\pm$ 1.2 vs 6.1 mg/L $\pm$ 3.7, $P=0.158$; D7 3 mg/L $\pm$ 1.6 vs 5.5 mg/L $\pm$ 2.5, $P=0.09$; D8 3.5 mg/L $\pm$ 2.8 vs 4.5 mg/L $\pm$ 2; D9 5.1 mg/L $\pm$ 5.7 vs 4.2 mg/L $\pm$ 1.5, $P=0.722$). The mean dosing interval to the second and third dose was significant lower for the intervention group (50 $\pm$ 10 vs 96 $\pm$ 44 h, $P=0{,}006$ and 47 $\pm$ 14 vs 114 $\pm$ 30, $P<0{,}001$, respectively). The total dosing interval was significantly lower for the intervention group (48 $\pm$ 13 vs 100 $\pm$ 37 h, $P<0.001$). The total number of AG doses administered until day 7 was 3 (2,4) vs 2 (2,2), $P=0.002$. The number of doses received/total duration of treatment was 59% vs 30% ($P<0.001$), respectively.
**Conclusions:** Using CVVHDF concurrently with AG administration in patients with sepsis/septic shock and impaired renal function can provide an effective method for administering these drugs at shorter intervals.

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**Topic:** Sepsis

## 000954
## The role of echocardiographic measurement of ventriculoarterial coupling (RVPAC) in critically ill patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000955

**Introduction:** Right ventricular (RV) dysfunction is common and associated with worse outcome in critically ill patients. The right heart's ability to adapt to increased afterload with preserved ventriculoarterial coupling (RVPAC) is highly prognostic in non-ICU-patients but its role in the critically ill is still unclear. Due to the complexity of invasively measured RVPAC, the non-invasive surrogate tricuspid annular plane systolic excursion (TAPSE)/tricuspid regurgitation velocity (TRV) measured by echocardiography has been studied in various patient groups but the feasibility and prognostic value in ICU-patients is not fully understood.
**Objectives:** The aim was to assess RVPAC through TAPSE/TRV in a mixed ICU cohort in terms of feasibility, distribution, and prognostic significance.
**Methods:** This is a secondary analysis of a prospective echocardiographic study in a mixed population of critically ill patients primarily focusing on LV dysfunction[1]. Echocardiography was performed within 24 h from admission after initial resuscitation. Clinical data were recorded on admission and at time of echo. RV function was assessed through TAPSE, fractional area change (FRAC) and tissue Doppler in the RV free wall (RV S´). To estimate RVPAC TAPSE was divided by TRV. Since there are no accepted cut-offs of TAPSE/TRV patients were divided into the lowest and upper three quartiles.
**Results:** A total of 411 patients were included in the parent study of whom 266 (65%) had measurements of both TAPSE and TRV. The mean value of TAPSE was 2.1 $\pm$ 0.6 cm and for TRV 2.51 $\pm$ 0.46 m/s. The mean value of TAPSE/TRV was 0.88 $\pm$ 0.31 (median 0.84, interquartile range 0.67–1.10) ranging from 0.22 to 1.80. The cut-off for the lowest quartile was 0.67. Patients in the lowest quartile of RVPAC were older, had more often a history of hypertension, cardiac and pulmonary disease. Sepsis, a cardiovascular or respiratory reason for admission were more common. They had a higher heart rate, lower ejection fraction and displayed more impaired RV function with lower TAPSE, RV S´ and FRAC. Values of TRV were higher and pulmonary acceleration times lower.
There was a strong positive correlation between TAPSE and TAPSE/TRV ($R^2=0.719$) and a moderate inverse correlation between TRV and TAPSE/TRV ($R^2=-0.380$).
In a logistic regression analysis, echocardiographic parameters of RV function (TAPSE, FRAC, RV S´) and TAPSE/TRV were associated with an increased risk of death at 90 days. However, only TAPSE/TRV (OR 0.22 [0.06–0.90], $p=0.035$) and RV S´ (OR 0.89 [0.79–0.99], $p=0.037$) were associated with an increased risk of death after adjustment for SAPS 3, age and left ventricular ejection fraction.

**Conclusions:** In conclusion, RVPAC measured noninvasively as TAPSE/TRV is a promising and feasible echocardiographic parameter in critically ill patients. More impaired RVPAC is associated with LV dysfunction, cardiac, respiratory disease as well as sepsis. Despite the correlation between RVPAC and TAPSE, RVPAC may be a better prognostic marker than TAPSE and TRV alone. The value of RVPAC as a serial marker to evaluate treatment response remains to be elucidated.

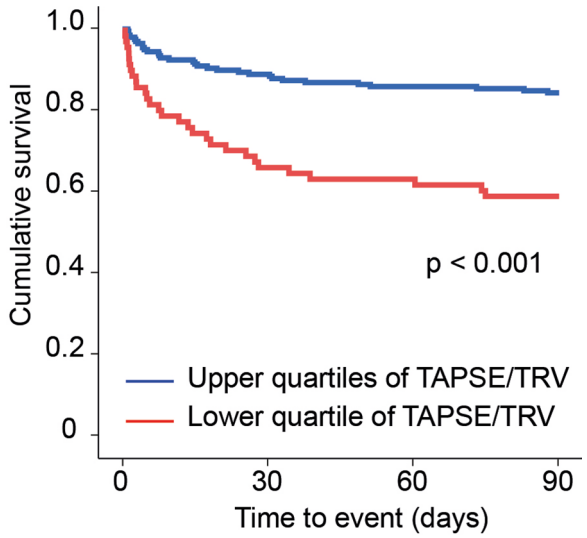


**Fig. 1 (abstract 000954)** Mortality over 90 days in patients in upper three quartiles and lower quartile of TAPSE/TRV

**Reference(s)**

1. 1. Cavefors et al., Regional left ventricular systolic dysfunction associated with critical illness: incidence and effect on outcome, ECS Heart Failure 2021
2. Swedish Heart–Lung foundation (number 2017063, 20190292), grants from the Swedish state under the agreement between the Swedish government and the county councils, the ALF agreements (ALFGBG-775041, ALFGBG-942924, ALFGBG-966053), the foundation of Ollie and Elof Ericsson and the Emelle foundation.

**Topic:** Cardiovascular issues in ICU

## 000955

### Very elderly trauma patients: the experience of a tertiary hospital ICU

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**Introduction:** Older adults constitute a more prominent population of patients admitted to the ICU as life expectancy rises. Age itself does not constitute a single criterion, but it is still unclear under what conditions older patients may benefit from ICU admission. The elderly suffer more severe consequences from traumatic injuries compared with the young, presenting unique challenges for physicians.
**Objectives:** Our goals were to analyze the outcomes at ICU discharge, 28-day and 90-day among very elderly trauma patients admitted to a tertiary hospital in a time span of 30 months.
**Methods:** This study was a was a retrospective review of trauma patients aged ≥ 80 years old admitted to the ICU between January 2021–June 2023. Statistical analysis was performed with logistic regression to analyze variables related to mortality. A $p$-value < 0.05 was considered statistically significant.
**Results:** In the 30 months analyzed, there were a total of 363 trauma patients admitted to the ICU. Of them, 39 were aged ≥ 80 years old (10.7%). The mean patient age was 84.6 ± 3.8 years. 17 patients (43.6%) suffered from polytrauma. Most frequent injury mechanism was fall from own height (15 patients, 38.5%), followed by road traffic accidents and fall from height 3 ≥ meters (8 patients each, 20.5%). Trauma brain injury was the most common injury, present in 23 patients (59%). The mean ISS was 37.28 ± 18.12, with a mean ICU stay of 15.5 ± 11.98 days and a mean time of mechanical invasive ventilation of 13.98 ± 11.80 days.
The probability of survival based on the TRISS methodology was 52.25 ± 31.51%. The ICU mortality rate was 25.64%, with an in-hospital mortality rate of 33.33% and a 3-month mortality rate of 61.76%.
A statistically significant relationship was found between the presence of polytrauma and mortality at 28 days ($p$ value < 0.05). No statistically significant relationship was found between the presence of isolated trauma (TBI, thoracic, abdominal, or pelvic) or hemorrhagic shock with ICU, 28-day and 90-day mortality.
Logistic regression analysis confirmed that previously anticoagulated patients had an increased ICU mortality risk (odds ratio, 6.55; confidence interval, 1.17–36.60; $p$-value < 0.05) and 28-day mortality risk (odds ratio, 4.44; confidence interval, 1.07–18.35; $p$-value < 0.05).
ICU mortality was related to limitation of life sustaining therapy in 4 patients (40%), and to brain death in 3 patients (30%).
**Conclusions:** The ICU mortality in the very elderly patients was lower than predicted based on the severity of injury. Polytrauma was associated with increased 28-day mortality, but not with ICU-mortality and 90-day mortality. Previous anticoagulation was associated with increased risk of ICU and 28-day mortality. ICU mortality is mostly associated with limitation of life sustaining therapy and brain death. More studies are needed to evaluate outcomes in the very elderly trauma patients, particularly at the early follow-up setting.

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**Topic:** Trauma

## 000956

### Characteristics and outcomes among patients with stress ulcer after trauma: a nested case–control study in Japan

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**Introduction:** Stress ulceration is a major complication among patients admitted to the intensive care unit after trauma. However, there have been few prior studies investigating the characteristics and outcomes of patients with stress ulcers within the general trauma population.

**Objectives:** Our aim was to compare the characteristics and outcomes of patients with and without stress ulcers admitted to the intensive care unit after severe trauma.
**Methods:** This is a nested case–control study using the Japan Trauma Data Bank (JTDB) from 2004 to 2017. The JTDB is a nationwide trauma registry in Japan. We included patients who aged ≥ 18 years old; had blunt or penetrate trauma; underwent mechanical ventilation in the emergency department; admitted to the intensive care unit; and survived for more than 3 days after hospital admission. A nested case–control study (1:5) was conducted using propensity score matching. The variables included in the propensity score were age, gender, number of comorbidities, mechanism of injury, emergency medical service (helicopter or ambulance), vital signs at emergency department, and Injury Severity Score. Then, we performed descriptive analyses comparing patients with and without stress ulcers, using the Wilcoxon signed-rank and Chi-square tests for continuous and categorical variables, respectively.
**Results:** Among the entries in the JTDB database, we identified 186 patients with stress ulcers and 930 patients without, selected through propensity score matching. The median age was 59 (interquartile range (IQR): 41–72), and male was 794/1,116 (71.1%). Blunt trauma was 1,031 (92.4%) and penetrating trauma was 85 (7.6%), respectively. The median Injury Severity Score was 25 (IQR: 16–33).
Patients with stress ulcers had chronic heart failure and cirrhosis more than those without stress ulcers (3.2% vs. 1.0% [$p = 0.03$], 3.2% vs. 0.8% [$p = 0.01$], respectively). There was no consistent trauma pattern observed in the Abbreviated Injury Scale scores between the two groups. Notably, patients with stress ulcers underwent craniostomy as the initial surgical procedure more frequently than those without stress ulcers (9.1% vs. 4.5% [$p = 0.02$]). Several concomitant complications occurred more frequently in patients with stress ulcers than those without stress ulcers. Such complications included acute respiratory distress syndrome (9.7% vs. 2.9% [$p < 0.001$]), acute renal failure (5.4% vs. 1.7% [$p = 0.006$]), disseminated intravascular coagulation (22.6% vs. 5.3% [$p < 0.001$]), wound infection (18.8% vs. 4.1% [$p < 0.001$]), and sepsis (10.8% vs. 3.7% [$p < 0.001$]). However, in-hospital mortality did not differ significantly between the two groups (10.2% vs. 11.7% [$p = 0.66$]). Patients with stress ulcers had longer hospital stays compared to those without (66 [IQR: 32–120] days vs. 33 [IQR: 16–58] days [$p < 0.001$]).
**Conclusions:** While no consistent trauma pattern was observed among patients with stress ulcers after trauma; they did undergo craniostomy as the emergency surgical procedure more frequently than those without stress ulcers. Additionally, they had a higher incidence of several concomitant complications and longer hospital stays compared to those without stress ulcers.

**Topic:** Trauma

## 000957 D
## evelopment of automatic interpretation assistant of ventilator screen

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**Introduction:** In recent years, we have introduced technology in the ICU that transmits videos of ventilator screens to physicians' mobile phones. At the request of physicians who have used the system, we have added an application that performs automated interpretation of the recorded ventilator screen video and sends it to ICU physicians' mobile phones.
**Objectives:** To develop a tool which automatically interprets mechanical ventilation data from video recordings of ventilator screens.
**Methods:** Detection of ventilation parameters from the video and digitalization of pressure and flow graphs were programmed in MATLAB R2023b.
The output data from MATLAB is further analysed and presented in spreadsheet (Numbers 13.2., Apple) using its standard program functions. The graphs are digitalised and can be edited in spreadsheet using scroll cursors.
The spreadsheet is supplemented with an assessment of the presence of dyssynchronies and commentary manually.
The created worksheet, comprising two sheets (Fig. 1a, Fig. 1b), is shared with the doctors on their iPhones via iCloud drive.
**Results:** We have developed an app evaluating ventilator screens that is available on ICU physicians' mobile phones.
The resulting annotation includes:
- Automatic detection of ventilatory parameters from ventilator screen videos. Detected parameters are digitalised and exported in a spreadsheet format. Ventilation parameters are ordered, out-of-limit values are marked in red, Fig. 1a.
-Digitalised screen graphs are on a separate sheet with the capability to edit the data using the scroll cursor, Fig. 1b.
-Evaluation of the presence of dyssynchronies and commentary.
Conclusions: We have developed software for automatic clinical evaluation of the ventilation screen. The assessment is sent to the user's mobile phone. The expert system can potentially improve the level of mechanical ventilation in the ICU, saves physicians' time. In addition, it is an excellent educational tool.

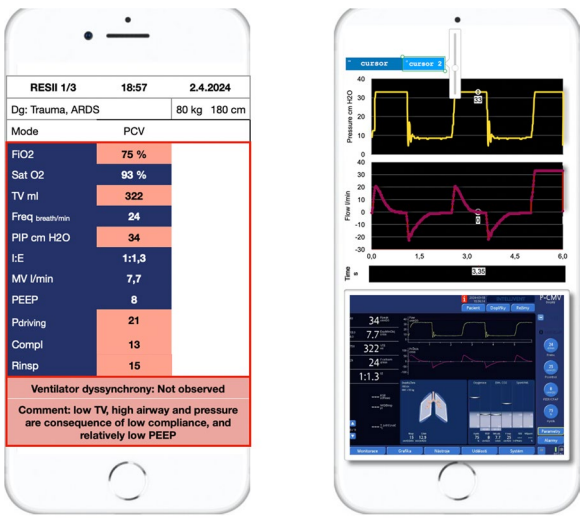


**Fig. 1 (abstract 000957)** Annotation of ventilator video screens on mobile phone. Figure 1a: Ventilation parameters, out-of-limit values are marked in red (the upper part). Figure 1b Digitalised screen graphs with the capability to edit the data using the scroll cursor and video of ventilatory screen (the lower part of image)

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2. Supported by Grant Ministry of Health, Czech Republic, AZV NU22-06-00625

**Topic:** Acute respiratory failure and mechanical ventilation

## 000958

### Enhancing protection for healthcare workers against respiratory infections: efficiency improvements in novel protective hoods through computational fluid dynamics analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000958

**Introduction:** The recent outbreaks of respiratory viruses such as SARS-CoV-2 highlight the need for improved protection for healthcare workers (HCWs), especially during aerosol-generating procedures (AGPs) like CPR, intubation, and suctioning. Current personal protective equipment (PPE) is not fully effective against aerosol transmission and can hinder medical procedures. This study introduces a protective hood optimized with Computational Fluid Dynamics (CFD) analysis to better protect HCWs by minimizing aerosol dispersion.
**Methods:** Our study utilized Computational Fluid Dynamics (CFD) analysis to design and optimize a novel protective hood, focusing on minimizing aerosol dispersion within medical environments. A critical step in our methodology was generating an internal concentration of PAO aerosol at 30 µg/L and assessing leakage using a photometer specific for PAO particles. Notably, the hood's open side was divided into nine segments to accurately identify the areas most susceptible to leakage. This comprehensive approach enabled us to determine the primary leakage points, which, intriguingly, were found to be near the suction area of the hood. To validate the CFD predictions, we conducted practical tests to compare the simulated leakage locations against actual leakage observations, ensuring that our design modifications were grounded in both theoretical and empirical evidence. This iterative process of analysis and testing was pivotal in refining the hood's design to effectively minimize leakage and enhance safety for healthcare workers.
**Results:** Leak tests showed that, even with the hood partially open, PAO particle leakage was less than 0.03%, with this minimal leakage contained within 10 s. Moreover, all generated aerosols within the hood were removed within 30 s, demonstrating a significant improvement over closed-system alternatives which took over 2 min for similar aerosol clearance, even at higher negative pressures exceeding − 50 Pa.
We identified differences in the primary leakage points based on the direction of aerosol generation (simulated coughing with PAO particles) and suction. Notably, the direction of simulated coughing and the suctioning action significantly influenced these leakage points. Leakage did not predominantly occur near the aerosol source or suction inlet; instead, it shifted due to complex airflow dynamics, including the effects of coughing, suction, and airflow along the walls. This led to unexpected leakage locations, underscoring the intricate interplay of airflow within the protective hood. The actual observed leakage patterns aligned with the predictions made by the CFD simulations, demonstrating the nuanced impact of cough and suction directions on aerosol containment.
This approach facilitated the accurate adjustment of the hood's airflow dynamics, enabling the establishment of an effective negative pressure environment that promotes swift aerosol clearance. The comparison between CFD simulations and actual performance confirmed the design's efficiency in reducing aerosol leakage.
Furthermore, the insights gained from the study underscore the importance of understanding the internal gas dynamics within the hood not only for enhancing device efficiency but also for minimizing the impact on patients. The principles derived from the hood's design and optimization process have potential applications beyond this specific device. This methodology could inform the development and refinement of various infection control measures within healthcare environments, emphasizing the critical role of precise airflow management in safeguarding both healthcare workers and patients.
**Conclusions:** This study highlights the effectiveness of using Computational Fluid Dynamics (CFD) analysis for optimizing protective hood designs to enhance healthcare safety by efficiently managing airflow and minimizing aerosol leakage. Insights into internal airflow dynamics emphasize the importance of precise design in reducing patient and healthcare worker exposure to airborne pathogens. The methodologies developed and validated here offer a foundational approach for improving infection control measures across various healthcare settings.

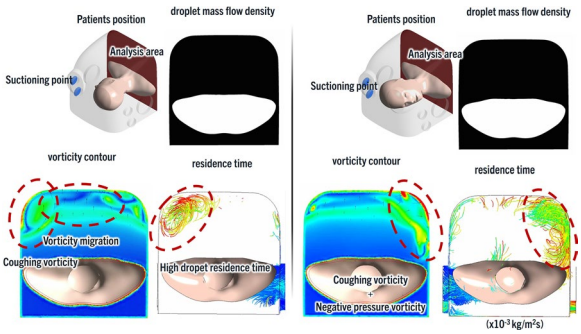


**Fig. 1 (abstract 000958)** .

**Reference(s)**
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**Topic:** Infections and prevention

## 000960

### Therapeutic drug monitoring of isavuconazole on extracorporeal membrane oxygenation

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**Introduction:** The triazole antifungal agent isavuconazole is a recommended treatment for invasive pulmonary aspergillosis (IPA) (1). While phase-III study results suggested that routine therapeutic drug monitoring of isavuconazole might not be required (2), more recent analyses including patients supported by extracorporeal membrane oxygenation (ECMO), observed a higher degree of variability and frequent underdosing (3). Further data are necessary to evaluate drug monitoring, time-dependent course of serum trough levels and potentially necessary dose adjustments in the specific critically ill patient population on ECMO.

**Objectives:** Retrospective analysis of isavuconazole plasma trough levels and dose adjustments during extracorporeal membrane oxygenation.
**Methods:** All adult critically ill patients treated at the University Hospital Zurich receiving isavuconazole and had a documented plasma level during ECMO support were included. Based on the literature, we defined targeted therapeutic thresholds at a plasma concentration > 1 mg/L in the first 7 days, followed by > 2.5 mg/L thereafter (4, 5).
**Results:** Out of 48 screened individuals, 16 patients were included in the analysis. Patients had a median Simplified Acute Physiology Score II of 47 [IQR 36, 58], were mostly female ($n = 9$, 56%) and their median age was 52 [IQR 39, 62] years. All patients were mechanically ventilated and 7 (44%) patients received kidney replacement therapy. Indication for isavuconazole was proven, probable and possible invasive pulmonary aspergillosis in 1 (6%), 6 (38%) and 7 (44%) patients, respectively. Two patients (12%) had another fungal infection. Isavuconazole was newly started in 14 (88%) patients during ECMO support with a loading dose of 6 × 200 mg over two days, followed by a maintenance dose of 200 mg daily. In two (12%) patients with preexisting isavuconazole, maintenance dose was administered without loading. Overall median isavuconazole trough plasma level was 1.9 [range 0.3–5.5] mg/L. Early isavuconazole levels (day 3 to 7) were available in 7 patients, median 1.2 [IQR 0.8, 1.5] mg/L. In these periods, two patients (29%) had plasma levels ≤ 1 mg/L. After > 7 days of therapy patient median trough level of isavuconazole was 1.9 [IQR 1.2, 2.7] mg/L. Levels ≤ 1 mg/L and ≤ 2.5 mg/L were registered in 6 (46%) and 12 (92%) patients after 7 days. Dose adjustment was performed in 6 (38%) patients.
**Conclusions:** Isavuconazole target plasma levels are often not achieved in critically ill patients with ECMO support. Dose adjustment towards higher doses was necessary in over one-third of patients, without any dose reduction. Thus, routine therapeutic drug monitoring and evaluation of higher doses in specific patient populations such as the collective on ECMO support seems warranted.

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**Topic:** Poisoning/Toxicology/Pharmacology

## 000962

### Prognostic mortality model in elderly patients (≥ 80 years) admitted to an intensive care unit


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**Introduction:** Patients classified as very elderly, 80 years or older, are a growing population in Brazil and worldwide. Understanding the peculiarities of this subgroup is essential to assess the benefit of admissions to intensive care units (ICU), aiming for proper resource allocation and the provision of the best hospital care (1–5).
**Objectives:** The objective of this study was to identify clinical variables that were related to hospital mortality of very elderly patients admitted to the ICU of a private tertiary hospital in Belo Horizonte, Brazil. And additionally, to develop a prognostic mortality model for this specific population according to different clinical profiles.
**Methods:** We conducted a single-center, observational, and retrospective study that included 1225 patients aged 80 years or older admitted to the ICU between January 1, 2019, to July 31, 2021, and registered in the Epimed database.
The primary outcome, hospital mortality, was calculated using point estimation and a 95% confidence interval (6).
Subsequently, univariate analyses were conducted to identify factors associated with hospital mortality. Bilateral hypothesis tests were performed at a significance level of 5% ($\alpha = 0.05$). Categorical variables were evaluated using Pearson's Chi-square test or exact tests (when necessary), while quantitative variables were assessed using the non-parametric Mann–Whitney test (7).
In the final stage, multivariate analysis was performed using logistic regression for hospital mortality. Variables included in the model were selected based on univariate analysis (p-value ≤ 0.25). Organizing a database of 1225 patients into two groups (75% for model construction and 25% for validation), a ROC curve with good predictive capacity was obtained (Fig. 1) (8).
**Results:** In univariate analysis, age was not a significant risk factor for hospital mortality (p = 0.61). Based on multivariate analysis, age, blood transfusion, Charlson Comorbidity Index, female sex, Simplified Acute Physiologic Score (SAPS 3), Sequential Organ Failure Assessment Score (SOFA), and tobacco consumption ($p = 0.006$) were identified as risk factors for hospital mortality in the population studied (Table 1).
From the logistic regression model, it was possible to simulate expected mortality according to 64 different patient profiles. The calculation was performed by varying the age from 80 to 110 years, with two levels for each explanatory variable (tobacco use, blood transfusion, gender, Charlson Comorbidity Index, SOFA Score, and SAPS 3). For quantitative variables, the low level was defined by the median and the high level by the 90th percentile. For each of the 64 patient types, graphs with mortality simulations were generated. By evaluating the extremes of risk, we analysed patients with high and low mortality risk, comparing other variables to age (Fig. 2).
**Conclusions:** Chronological age should not be used as an isolated parameter for medical decision-making, as it becomes a risk factor for mortality when associated with comorbidities, severity of acute illness, increased frailty, and decreased functionality. Thus, the importance of studies to validate prognostic scores in elderly patients admitted to ICU is highlighted.

**Table 1 (abstract 000962)** Multivariate analysis to identify factors associated with hospital motility in patients aged 80 years or older admitted to the ICU

| Variable | Regression Coefficient | Standard Error | Odds Ratio | P-value |
|---|---|---|---|---|
| Age | 0,053 | 0,021 | 1,05 | 0,013 |
| Blood transfusion | 0,740 | 0,252 | 2,10 | 0,003 |
| Charlson Comorbidity Index | 0,121 | 0,042 | 1,13 | 0,004 |
| Female | -0,484 | 0,202 | 0,62 | 0,017 |
| SAPS 3 | 0,029 | 0,005 | 1,03 | 0,000 |
| SOFA Score | 0,213 | 0,035 | 1,24 | 0,000 |
| Tobacco consumption | 0,924 | 0,335 | 2,52 | 0,006 |
| Constant | -8,079 | | | |

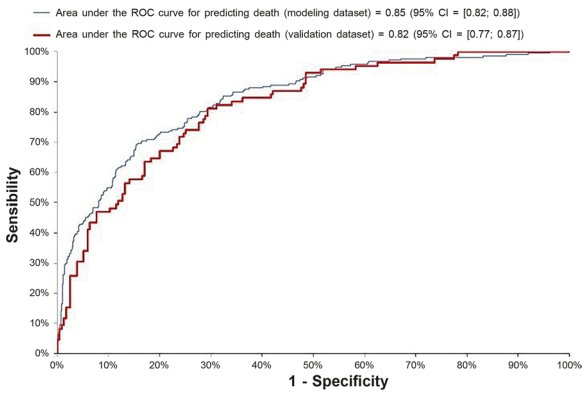


**Fig. 1 (abstract 000962)** ROC curves considering the logistic regression model for predicting hospital mortality of advanced elderly patients (80 years or older) admitted to the ICU

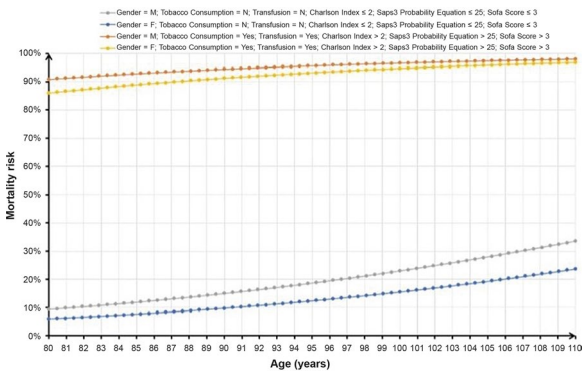


**Fig. 2 (abstract 000962)** Expected mortality: comparison of extremes and severity

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**Topic:** Health services research and outcome

## 000963

### Comparison of two strategies for preventing, post-contrast, acute kidney injury in patients with chronic kidney disease undergoing angiography and percutaneous coronary intervention: systematic review and meta-analysis

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**Introduction:** Contrast-induced acute kidney injury (CI-AKI) is a complication associated with the intravascular administration of iodinated contrast, which represents a significant risk for patients with chronic kidney disease who require examinations or procedures that require its use. The ideal strategy to prevent IC-AKI remains debated, despite the main guidelines advocating intravascular hydration.

**Objectives:** Our objective was to perform an updated systematic review and meta-analysis comparing two important strategies in this scenario, the use of N-acetylcysteine (NAC) plus sodium bicarbonate (BIC) versus the use of BIC alone in patients already with chronic kidney disease, who will undergo angiography and percutaneous coronary intervention, with the goal of not occurrence of IC-IRA.

**Methods:** Articles were searched in PubMed, Embase and Cochrane until March 2024, for studies comparing the use of the two strategies, BIC only or BIC plus NAC with dosages according to the protocol of each study analyzed. The outcome of interest was an increase in serum creatinine (SCr) of 0.5 mg/dL or 25% compared to the patients' initial SCr level 48 h after contrast infusion. Statistical analysis was performed using R-4.3.3. Heterogeneity was assessed with $I^2$ statistics.

**Results:** 665 patients were included from 5 randomized clinical studies, with follow-up ranging from 2 to 30 days. Among patients, 338 underwent BIC plus NAC (50.8%) and 327 underwent BIC (49.2%). In the pooled analysis, the occurrences of AKI-IC were lower in patients undergoing BIC plus NAC (9.4%) compared to BIC alone (12.5%) (OR 0.73 95% CI [0.41;1.32], $p = 0.298$; $I^2 = 8\%$ $P = 0.36$; Fig. 1).

**Conclusions:** Our findings suggest a benefit in combining NAC with BIC, as evidenced by a lower occurrence of AKI-CI compared to BIC alone. However, the difference was not statistically significant. Our findings suggest that it is recommended to consider the inclusion of NAC with BIC in the preparation of high-risk patients, while more evidence and other comparisons involving other drugs.

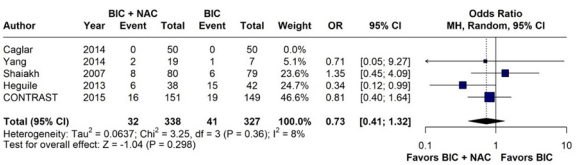


**Fig. 1 (abstract 00963)** Forest plot showing that recurrence of CI-AKI was less common in patients who received BIC plus NAC compared to BIC alone

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10. No grant acknowledgment

**Topic:** Acute kidney injury and haemofiltration

## 000964

### The research activities of Ontario's large community acute care hospitals: an updated scoping review

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000964

**Introduction:** In Canada, hospitals have traditionally been designated as "community" or "academic". Community hospitals provide the majority of patient care while academic hospitals do the majority of clinical teaching and research [1]. A scoping review of the research publications of Ontario's large community hospitals (LCHs) from 2013 to 2015 identified the total research output for 44 hospitals was 798 publications, representing an annual output of 266 publications [2]. This disconnect between where the majority of patients receive their care and where health research is conducted leads to poor recruitment into clinical studies and decreased generalizability of research results [3].
**Objectives:** The purpose of this scoping review was to provide an updated picture of the research activities undertaken by Ontario's LCHs, describing the extent of research, type of publications and frequency of collaboration within and between Ontario's LCHs.
**Methods:** In adherence with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews guidelines, 3 medical databases (PubMed, Embase, and the Cumulative Index to Nursing and Allied Health Literature) were systematically searched for publications from January 2016 to December 2022 that included at least one author affiliated with an Ontario LCH. All publication types were included but the topic had to be hospital or medicine related. Screening and extraction occurred concurrently by 4 members of the research team. The first 20 articles were screened and extracted by all screeners to ensure consistency. Results were described using descriptive statistics.
**Results:** 3,719 publications were identified as including at least one author from one of 47 Ontario LCHs, representing an annualized output of 531 publications. The majority of publications were peer-reviewed full-text articles (96%). While the most common study design were observational studies (46%), randomized controlled trials were among the less frequent designs (9%). The most common disciplines of study were outpatient specialty care (31%), health systems research (22%), inpatient hospital care (12%) and surgery (11%). Across all articles, 722 (19%) displayed collaboration within the same LCH, 249 (7%) displayed collaboration between two or more Ontario LCHs, and 72 (2%) displayed collaboration both within and between Ontario LCHs. The remaining 2,676 (72%) publications involved only a single LCH-affiliated author, with all other authors being affiliated with academic institutions.
**Conclusions:** Health research by LCH-affiliated clinicians and researchers increased significantly in 2016–22 relative to 2013–5. Participation in randomized controlled trials, however, remains low, suggesting that further efforts are required to build clinical research infrastructure in LCHs.

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**Topic:** Health services research and outcome

## 000965

### Mechanical ventilation reconnection for one hour after spontaneous breathing trial: a randomized clinical feasibility trial

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**Introduction:** Two randomized trials tested the hypothesis that reconnecting to mechanical ventilation (MV) for 1 h after a successful spontaneous breathing trial (SBT) would decrease extubation failure (EF). They demonstrated that the intervention reduced the reintubation rate within 48 h in patients with more than 12 h of MV (1) and might have been associated with a lower reintubation rate among patients with more than 72 h of MV before extubation (2).
**Objectives:** The primary objective is to evaluate the feasibility of performing a larger clinical trial to analyze whether reconnection to

MV for 1 h after a successful SBT reduces the risk of reintubation or death within 7 days in patients with more than 72 h of MV. Feasibility is defined as the capability to complete the study according to the planned schedule and with adherence above 90% to the procedures of the experimental group (reconnection to MV for 1 h [± 10 min] after SBT followed by extubation) and control group (extubation immediately after SBT).

**Methods:** This was a randomized feasibility (pilot) non-blinded multicenter trial conducted at four Brazilian sites. The study compared two weaning strategies from MV in critically ill patients admitted to intensive care units with more than 72 h of MV and who had a successful SBT on pressure support or T-tube. Eligible participants were randomized into two groups immediately after a successful SBT: (1) reconnection to MV using the previous ventilatory parameters for 1 h followed by extubation; (2) extubation immediately after SBT. The study protocol included: a daily assessment checklist for evaluating eligibility for weaning and SBT (1, 2); performing the SBT on pressure support or T-tube (3); assessment and management of laryngeal edema risk and (4, 5); use of non-invasive ventilation (NIV) and/or or high-flow nasal cannula (HFNC) after extubation in patients at high risk of EF (6, 7). As this was a study to assess feasibility (pilot), a convenience sample size of 60 patients was defined. Statistical analyses were realized using the intention-to-treat principle. The effect of treatment on the EF outcome was estimated using ratio of proportions and difference of proportions, and respective 95% confidence intervals. Kaplan–Meier curves were used to analyze the 7 days' time to reintubation outcomes that were compared using the log-rank test. The study was approved by the ethics and research committee of the participating centers (CAAE 70984323.1.1001.5362) and registered in clinical trials (Clinical Trials identifier: NCT 05999526).

**Results:** From November 2023 to March 2024, 66 patients fulfilled eligibility criteria and were enrolled in the study (Fig. 1), well within the planned schedule. Clinical characteristics were similar between groups. One patient was erroneously randomized, because he was not eligible, and thus was excluded from analysis. This patient was not extubated and was transferred to another hospital. The study intervention was performed as assigned in 95% of patients (control 33 [100%] vs intervention 30 [93.7%]). In the intervention group, the reconnection for one hour was not performed according to protocol in two patients: one patient required surgical intervention immediately before extubation (surgical curative), and this patient was reconnected to the MV for 130 min followed by extubation; and one patient was reconnected to MV but developed tachypnea and sweating and was not extubated (this case was classified as EF and included in intention-to-treat analysis). The other items of the protocol (checklist for assessing eligibility for weaning and SBT, SBT according to the protocol, assessment and management of laryngeal edema risk) had 100% adherence. NIV and/or HFNC after extubation in high-risk patients were used in 42.4% of patients in control group and 43.7% in intervention group. EF within 7 days occurred in 8 (25%) patients in the intervention group as compared to 14 (42.4%) patients in the control group (risk difference 17; 95% CI − 5.8 to 37.5). The Kaplan–Meier (Fig. 2) shows the behavior of the groups studied regarding EF in 7 days (hazard ratio, 0.53; 95% CI 0.22–1.23; $P = 0.14$).

**Conclusions:** This pilot study demonstrated the feasibility of performing a larger clinical trial to analyze whether reconnection to MV for 1 h after a successful SBT reduces the risk of reintubation or death within 7 days in patients with more than 72 h of MV.

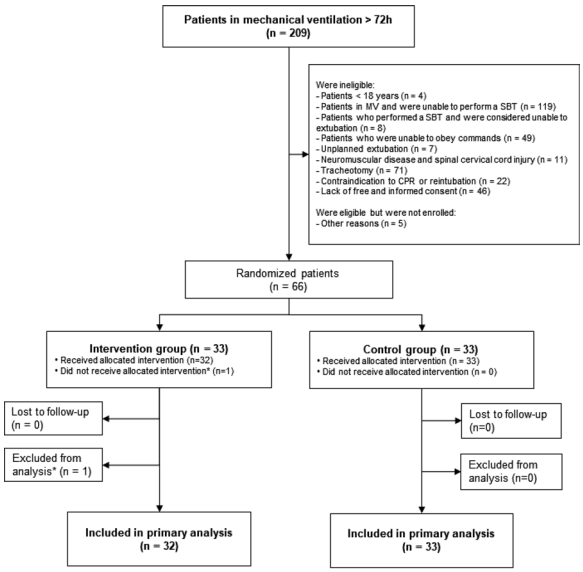


**Fig. 1 (abstract 000965)** Enrollment, randomization, intervention, and follow-up. ICU: intensive care unit; MV: mechanical ventilation; SBT: spontaneous breathing trial; CPR: cardiopulmonary resuscitation. *One patient was randomized in error, because he was not eligible, and thus was excluded from analysis. This patient was not extubated and was transferred to another hospital

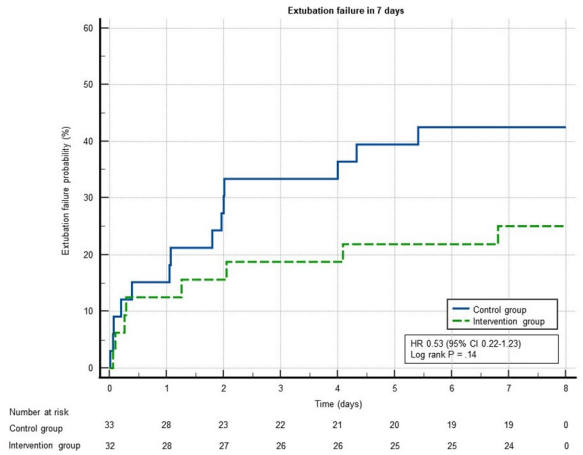


**Fig. 2 (abstract 000965)** Kaplan–Meier analysis of risk of extubation failure within 7 days after randomization in control vs intervention group

Extubation failure was defined as need of reintubation or death within 7 days after extubation.

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8. Our acknowledgment to the medical teams and physiotherapists of the hospital's intensive care units participating in the study, who were fundamental to the implementation and execution of the study protocol. To the Hcor statistical team, who assisted in the randomization platform.

**Topic:** Acute respiratory failure and mechanical ventilation

## 000967

## Red blood cell transfusion practices in critically ill patients with sepsis: a prospective observational study in South Korea

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**Introduction:** Red blood cell (RBC) transfusion is common in critically ill patients with sepsis. Our objective was to investigate RBC transfusion practices and to assess the impact of RBC transfusion on mortality in patients with sepsis admitted to the intensive care unit (ICU).
**Methods:** This study is a secondary analysis of the Korean Sepsis Alliance registry, a multicenter prospective observational cohort of patients with sepsis in South Korea. The included patients were aged ≥ 19 years and hospitalized in the intensive care unit for more than 48 h. Patients were excluded if there were medical reasons to transfuse (Fig. 1).
The primary outcomes were the occurrence of RBC transfusion within the first three days of ICU admission. Secondary outcomes were in-hospital mortality and possible physiological triggers for RBC transfusion. Data were collected from September 2019 to December 2022.
To investigate the association between RBC transfusion and in-hospital mortality, we conducted a 1:1 propensity score matching between transfused and non-transfused patients.
**Results:** A total of 3582 patients were included in final analysis (Fig. 1). The mean (SD) age was 71.6 (13.4) years, 58.4% were male (2,099/3,582). Transfused patients exhibited a higher incidence of abdominal infections and bacteremia (Table 1). A total of 1572 patients (43.8%) received 1 or more RBC transfusions during their ICU day 1–3 and 2563 RBC transfusion cases were identified. Of these, 88% (2,261/2,563) were carried out at hemoglobin levels of 7 or higher. The most common physiologic trigger for transfusion was a lactate level greater than 2 mmol/L (63.8%), followed by the use of two or more vasopressors (34.6%).
In a multivariable Cox regression model conducted in a propensity-score matched cohort, RBC transfusion was not associated with risk of in-hospital mortality (adjusted hazard ratio 1.02, 95% CI 0.91–1.13). However, a significant interaction was observed between RBC transfusion and in-hospital mortality in the subgroup delineated by a pH level of 7.2 (Fig. 2). The cubic spline curve analysis revealed that among individuals who did not receive RBC transfusion, a lower pH was associated with a higher mortality rate. However, in those who received RBC transfusion, the mortality rate did not continue to increase below a pH of 7.2 (Fig. 3).
**Conclusions:** In this study, 43.8% of sepsis patients admitted to the ICU received RBC transfusions within the first 3 days, and 88% of transfusions were carried out at hemoglobin levels of 7 or higher. Subgroup analysis revealed that RBC transfusion at a pH of 7.2 or less could potentially contribute to improved in-hospital mortality.

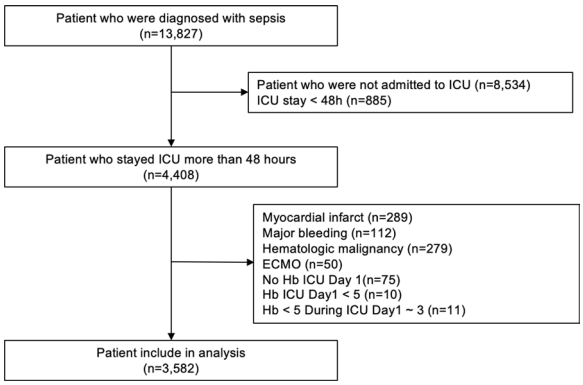


**Fig. 1 (abstract 000967)** Patient flow

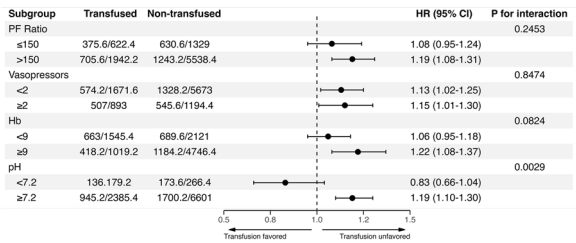


**Fig. 2 (abstract 000967)** Subgroup analysis and interaction terms for in-hospital mortality

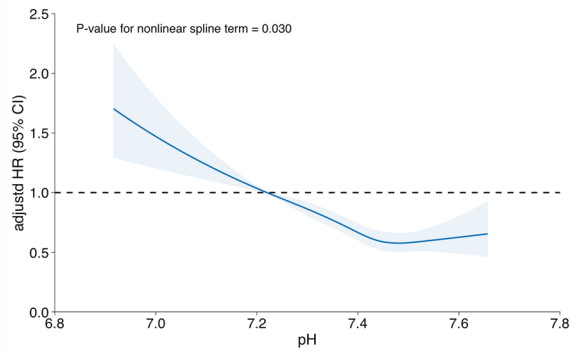


**Fig. 3 (abstract 000967)** Estimated ratio for in-hospital mortality based on pH. (A) Estimated hazard ratio for in-hospital mortality in non-transfused patients. (B) Estimated hazard ratio for in-hospital mortality in transfused patients

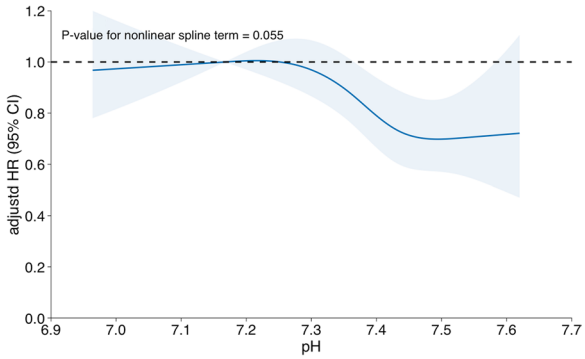


**Table 1 (abstract 000967)** Baseline characteristics of study population

| Variables | Total (n=3,582) | Transfused (n= 1,572) | Non-transfused (n=2,010) | P value |
|---|---|---|---|---|
| Age, year | 71.6 ± 13.4 | 70.6 ± 13.3 | 72.5 ± 13.5 | <0.001 |
| Sex | | | | 0.776 |
| Male | 2,099 (58.6) | 917 (58.3) | 1,182 (58.8) | |
| Female | 1,483 (41.4) | 655 (41.7) | 828 (41.2) | |
| **Characteristics of infection** | | | | |
| Type Of Infection | | | | <0.001 |
| Community onset sepsis | 2,151 (60.1) | 878 (55.9) | 1,273 (63.3) | |
| Hospital onset sepsis | 1,431 (39.9) | 694 (44.1) | 737 (36.7) | |
| Site of infection | | | | |
| Respiratory | 1,685 (47.0) | 620 (39.4) | 1,065 (53.0) | <0.001 |
| Abdominal | 989 (27.6) | 573 (36.5) | 416 (20.7) | <0.001 |
| Urinary tract | 785 (21.9) | 321 (20.4) | 464 (23.1) | 0.056 |
| Bacterial blood sepsis | | | | |
| Gram positive blood sepsis | 527 (14.7) | 260 (16.5) | 267 (13.3) | 0.006 |
| Gram negative blood sepsis | 1,338 (37.4) | 684 (43.5) | 654 (32.5) | <0.001 |
| **Characteristics at ICU admission** | | | | |
| Lab | | | | |
| Lactate (mmol/L) | 3.8 ± 3.4 | 4.8 ± 4.0 | 3.1 ± 2.7 | <0.001 |
| Hb (g/dL) | 10.5 ± 2.4 | 9.5 ± 2.1 | 11.3 ± 2.2 | <0.001 |
| Platelet ($10^3$/uL) | 172.2 ± 116.9 | 135.4 ± 113.9 | 200.9 ± 111.1 | <0.001 |
| Creatinine (mg/dL) | 2.1 ± 1.9 | 2.4 ± 2.0 | 1.9 ± 1.8 | <0.001 |
| Vasopressors on ICU day 1 | | | | |
| SAPS 3 on ICU day 1 | 72.0 ± 14.5 | 76.7 ± 14.7 | 68.3 ± 13.2 | <0.001 |
| Septic shock on ICU day 1 | 1,895 (53.9) | 1,016 (66.2) | 879 (44.3) | <0.001 |
| Invasive ventilation on ICU day 1 | 1,599 (44.6) | 789 (50.2) | 810 (40.3) | <0.001 |

**Topic:** Sepsis

## 000968

### First-attempt success of endotracheal intubation using hyper-angulated videolaryngoscopy versus conventional direct laryngoscopy: a randomized multiple cross-over cluster trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000968

**Introduction:** Endotracheal tubes are usually inserted with direct laryngoscopy, but patients sometimes require multiple attempts which can provoke morbidity.1
Videolaryngoscopy improves airway visualization, but endotracheal tubes are nonetheless sometimes difficult to pass through the vocal cords. 2 Whether improved glottis visualization facilitates intubation and reduces intubation attempts remains unclear.
**Objectives:** We therefore tested the primary hypothesis that fewer intubation attempts are required when initial laryngoscopy is performed with videolaryngoscopy than with direct laryngoscopy in surgical patients.
**Methods:** We conducted a cluster-randomized multiple crossover trial in patients having cardiothoracic or vascular surgery at the Cleveland Clinic Main Campus, Cleveland, OH. Patients were randomized to either hyperangulated videolaryngoscopy or direct laryngoscopy for the initial intubation attempt. The primary outcome was number of intubation attempts. Secondary outcomes were intubation failure and a composite of airway and dental injuries. The trial was registered with clinicaltrials.gov (identifier NCT04701762), current trial status closed for enrollment.
**Results:** We enrolled 8,429 surgeries from March 2021 to December 2022. 4,413 (52%) surgeries were randomized to videolaryngoscopy, and 4,016 (48%) to direct laryngoscopy. About 70% of initial intubations were performed by nurse anesthetists or residents, supervised by attending anesthesiologists. Videolaryngoscopy reduced the need for multiple intubations by about a factor-of-four from 7.6 to 1.7% and reduced the number of intubation attempts compared to direct laryngoscopy [(OR 0.19 (95% CI 0.13, 0.28; $P<0.001$)] (Fig. 1). Intubation failed in 0.27% with videolaryngoscopy vs. 4% with direct laryngoscopy [RR 0.05 (95% CI 0.02, 0.12; $P<0.001$)] (Table 1). Airway and dental injuries did not differ between videolaryngoscopy (41 injuries, 0.93%) vs. direct laryngoscopy (42 injuries, 1.1%), RR 0.85 (95% CI 0.53, 1.39; $P=0.376$)].

**Table 1 (abstract 000968)** Treatment effect on the primary and secondary outcomes

| Outcome | Video (*N* = 4413) | Direct (*N* = 4016) | Treatment effect estimate (95% CI)[b] | *P* value |
|---|---|---|---|---|
| Secondary outcomes | | | Relative risk | |
| Intubation failure | 12 (0.27) | 161 (4.0) | 0.05 (0.02, 0.12)[a] | < 0.001 |
| Composite injury | 41 (0.93) | 42 (1.1) | 0.85 (0.53, 1.39)[a] | 0.376 |

[a] Relative risk (95% CI) and *P* value was estimated from generalized linear mixed effects log-binomial model (log link) adjusting for period, operating room and within-subject correlation, weighted by the stabilized weights

[b] Confidence intervals are interim-analysis adjusted, so actually 99.32%, but we refer to them as 95% for simplicity and to emphasize that alpha was controlled at 5% throughout the study

**Conclusions:** Videolaryngoscopy is a preferable initial approach for intubating surgical patients.

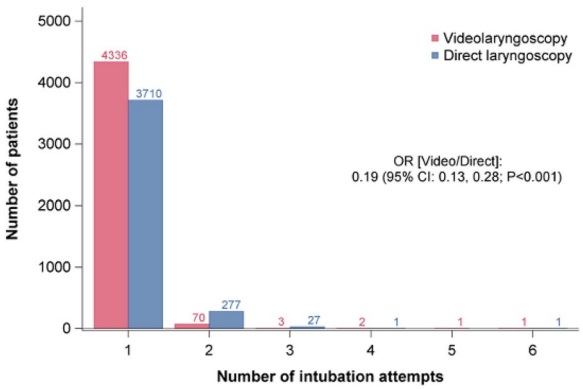


**Fig. 1 (abstract 000968)** Primary outcome by randomized group

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2. 2) AzizMF,DillmanD,FuR,BrambrinkAM. Comparative effectiveness of the C-MAC video laryngoscope versus direct laryngoscopy in the setting of the predicted difficult airway. Anesthesiology. 2012;116(3):629–636. doi: 10.1097/ALN.0b013e318246ea34
3. This trial was supported by departmental and institutional support only. The GlideScope video laryngoscopes and GlideRite stylets were provided by Verathon Inc.

**Topic:** Perioperative care

## 000969

### Epidemiology and outcomes of ventilator-associated events in mechanically ventilated patients: an observational study from tertiary medical center in Russia

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000969

**Introduction:** Mechanical ventilation (MV) is associated with multiple complications in intensive care units (ICU). In 2013, the American Centers for Disease Control and Prevention (CDC) replaced the ventilator-associated pneumonia (VAP) surveillance definition with definitions for ventilator-associated events (VAE). The VAE framework exploits a set of objective criteria of nosocomial respiratory deterioration, such as increase in FiO2 or PEEP for 2 or more consecutive days after at least 48 h of stable respiratory function. Several studies have shown a strong association of VAE with poor outcomes. However, the adoption of VAE surveillance outside the USA is still limited, possibly due to scarce research data in other regions. We decided to conduct an observational study to describe the epidemiology and outcomes of VAEs in a tertiary medical center in Moscow.
**Methods:** In our study, we used a local registry of mechanically ventilated patients in Kommunarka Medical Center. Medical and surgical patients that received MV between June 1, 2022, and December 1, 2023 for more than four consecutive days, were included in the analysis. The determination of VAE cases was performed using data from electronic health records in accordance with CDC criteria. We estimated VAE incidence in the analyzed cohort, and calculated mortality and number of ventilator-free days by day 28 in patients with and without VAE.
**Results:** 312 episodes of MV were analyzed, accounting for 4052 ventilator-days. We identified 31 VAE cases by day 28, so the incidence rate was 7,65 events per 1000 ventilator-days. Patients who developed VAE had higher 28-day mortality (HR, 2.52; 95% CI 1.46 to 4.36). The number of ventilator-free days was similar in VAE and non-VAE cases (mean [SD], 10[10] vs. 8[9], $p = 0.245$).
**Conclusions:** According to our research, the incidence of VAE was 7.65% by 28th day of MV. Presence of this condition was associated with increased risk of 28-day mortality. These findings suggest the importance of VAE surveillance in our region. We plan to enroll more patients in the study cohort to evaluate risk factors and long-term outcomes of VAE.

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6 The EU-VAE Study Investigators Group, Ramírez-Estrada, S., Lagunes, L., Peña-López, Y., Vahedian-Azimi, A., Nseir, S., Arvaniti, K., Bastug, A., Totorika, I., Oztoprak, N., Bouadma, L., Koulenti, D., & Rello, J. (2018). Assessing predictive accuracy for outcomes of ventilator-associated events in an international cohort: The EUVAE study. Intensive Care Medicine, 44(8), 1212–1220.

**Topic:** Acute respiratory failure and mechanical ventilation

## 000970

### Deciphering the ZBED6-regulated pathway: a translational approach to combat sepsis-induced muscle atrophy

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000970

**Introduction:** Sepsis-induced muscle atrophy afflicts 40–70% of patients, significantly compromising their recovery and long-term health. Preliminary multi-omics analyses across human and porcine subjects have implicated the transcription factor ZBED6 in the development of muscle atrophy during sepsis. Utilizing a novel porcine model, we observed that ZBED6 deficiency mitigates muscle atrophy, suggesting its pivotal role, although the underlying mechanisms remain to be elucidated.
**Objectives:** This study aims to delineate the mechanisms by which ZBED6 influences sepsis-induced muscle atrophy and to validate these mechanisms in clinical settings. Understanding these pathways will facilitate the development of targeted therapeutic and diagnostic strategies focusing on ZBED6.
**Methods:** We employed multi-omics techniques to identify TGF-β3 as a critical mediator influenced by ZBED6. The regulatory effects of ZBED6 on TGF-β3 transcription were investigated using molecular biology approaches, including dual-luciferase reporter assays and chromatin immunoprecipitation followed by PCR (ChIP-PCR). In vitro experiments using ZBED6-knockout porcine models treated with TGF-β pathway agonists and inhibitors helped unravel both inhibitory and stimulatory effects within this pathway, providing insights into the molecular mechanisms at play. Additionally, we analyzed patient samples to assess the clinical relevance of these findings.
**Results:** Our results demonstrate that ZBED6 directly regulates TGF-β3 expression, a key mediator in sepsis-induced muscle atrophy. In the absence of ZBED6, septic pigs showed significantly reduced TGF-β3 levels, leading to diminished activation of the TGF-β signaling pathway and reduced muscle atrophy. Conversely, myotubes overexpressing ZBED6 exposed to septic conditions displayed increased TGF-β3 levels and enhanced muscle atrophy. Clinical data supported these findings, showing elevated ZBED6 and TGF-β activity in septic patients.
**Conclusions:** The ZBED6-TGF-β3 axis emerges as a novel and actionable therapeutic target for combating sepsis-induced muscle atrophy. Targeting this pathway could potentially reverse or halt the progression of muscle wasting, substantially improving patient outcomes in critical care settings. This study not only advances our understanding of sepsis pathophysiology, but also opens new avenues for targeted

therapeutic interventions, potentially transforming the landscape of critical care medicine.

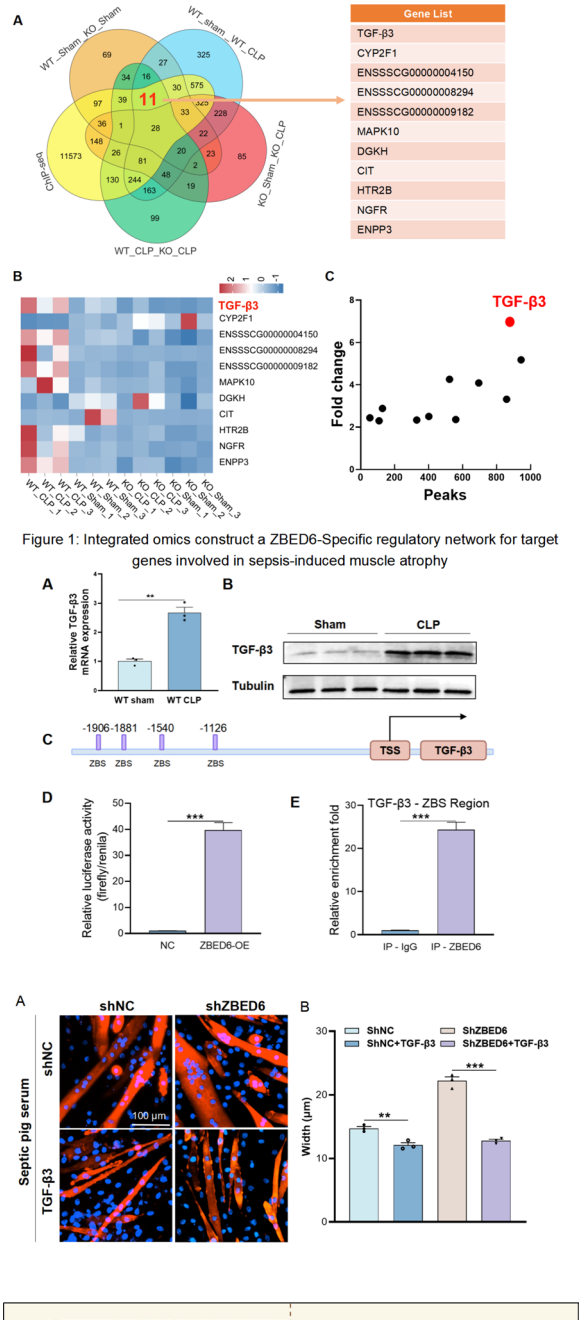


Figure 1: Integrated omics construct a ZBED6-Specific regulatory network for target genes involved in sepsis-induced muscle atrophy







**Figures 1–3 (abstract 000970)** .

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2. The National Natural Science Foundation of China 82272234 (R. L)
3. The National Natural Science Foundation of China 82372203 (M. M)
4. The National Natural Science Foundation of China 82270087 (E.C)

**Topic:** Sepsis

## 000971

### Time-specific mean arterial pressure thresholds to prevent unfavorable neurologic outcome in post-cardiac arrest patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000971

**Introduction:** Mean arterial pressure (MAP) target provided in current guideline may not suffice due to impaired cerebrovascular autoregulation post-cardiac arrest. This study aims to determine optimal MAP thresholds over time to improve neurological outcomes using a machine learning approach.
**Methods:** In this retrospective study at Korea University Anam Hospital (2017–2020), adult post-cardiac arrest patients were analyzed to explore the relationship between MAP and neurological outcomes. Employing machine learning, particularly a random forest model, the study assessed hourly MAP measurements over the first 24 h post-arrest. Key variables, including demographics, cardiac arrest specifics, and treatment factors, were evaluated for their impact on outcomes. The analysis focused on understanding variable importance through random forest and the direction of variable associations via Shapley additive explanation (SHAP) values. This comprehensive approach aimed to identify optimal MAP thresholds in different post-arrest phases to refine neuroprotective strategies.
**Results:** Out of 1,014 cardiac arrest patients, 291 were eligible for the study, which reported a 40.5% in-hospital mortality rate and identified significant outcome predictors like age, witnessed arrest, and CPR duration. The random forest model excelled in predicting post-cardiac arrest outcomes, achieving an accuracy of 0.881 and an area under the curve of 0.850. This model was further analyzed due to its superior performance. The MAP recorded 6 h after Return of Spontaneous Circulation (ROSC), termed MAP006, was identified as highly significant, with early MAPs in 6 h ranking among the top 10 indicators. According to the SHAP summary, lower MAP values were positively linked to adverse outcomes, while higher values indicated better prognoses, especially within the first 6 h. The analysis of the area below the threshold (ABT) for incremental MAP ranges from 50 to 100 mmHg in each time segment showed that values below 75 mmHg in the first 6 h were strongly associated with negative outcomes. In later segments, this correlation was less apparent, prompting further subgroup analyses. Within the subgroup of cardiac causes, a consistent negative correlation between ABT and poor outcomes was observed, with the optimal MAP threshold for preventing adverse outcomes gradually increasing from 75 to 95 mmHg over time.

**Conclusions:**
In our study, machine learning analysis confirmed the highest correlation between the first 6 h post-resuscitation and unfavorable outcomes. Notably, exposure to a MAP below 75 mmHg during this period was most strongly associated with unfavorable neurologic outcomes. For patients with cardiac causes, subsequent periods also demonstrated a link between MAP levels and unfavorable outcomes, with the MAP threshold gradually increasing over time.

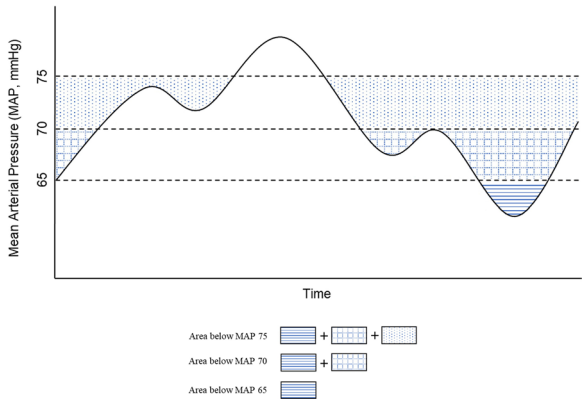


**Fig. 1 (abstract 000971)** Derivation of ABT using mean arterial pressure over time plot. ABT = area below blood pressure threshold; MAP = mean arterial pressure

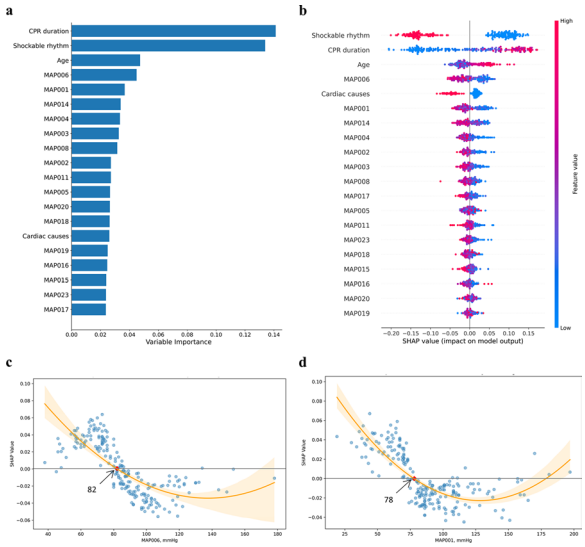


**Fig. 2 (abstract 000971)** Variable importance and SHAP value of the random forest model incorporating baseline characteristics and 24-h MAP data. (a) Variable importance. (b) SHAP dot plot. (c) Dependence plot for MAP006 with regression line, cutoff value (red dot, 82 mmHg). (d) Dependence plot for MAP001 with regression line, cutoff value (red dot, 78 mmHg). MAP, mean arterial pressure

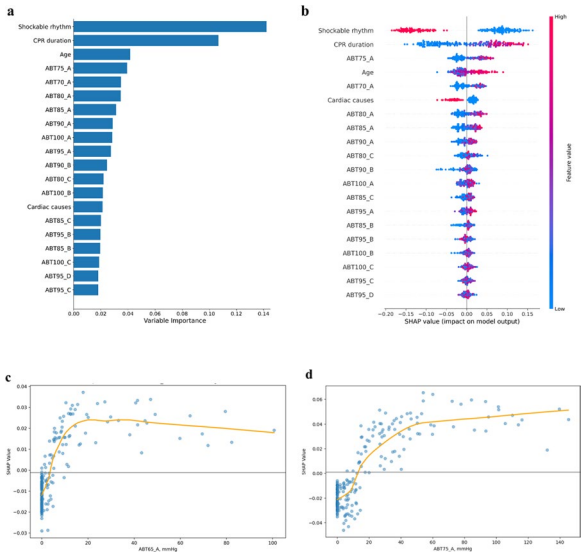


**Fig. 3 (abstract 000971)** Variable importance and SHAP value of the random forest model incorporating baseline characteristics and ABT data. (a) Variable importance. (b) SHAP dot plot. ABT, area below threshold. (C) Dependence plot for ABT65_A with regression line. (D) Dependence plot for ABT75_A with regression line

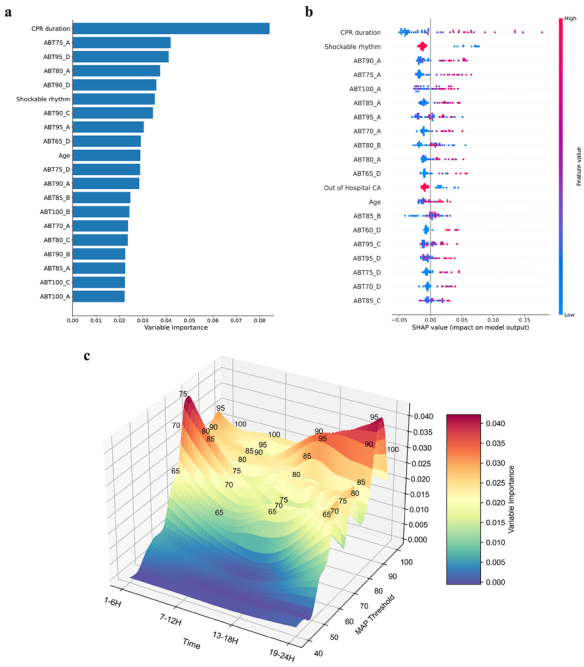


**Fig. 4 (abstract 000971)** Subgroup analysis in the cardiac cause group. (a) Random forest variable importance. (b) SHAP summary plot. (c) 3D plot for variable importance (y), time segment (x), MAP threshold (z). MAP, mean arterial pressure; ABT, area below threshold; time segment, A:1–6 h, B:7–12 h, C:13–18 h, D:19–24 h

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**Topic:** Cardiac arrest

## 000973 Id entification of immune-related subtypes of sepsis and mechanistic signatures

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**000973

**Introduction:** Sepsis, a life-threatening condition characterized by dysregulated host responses to infection, exhibits heterogeneity in immune response (1–3). Conventional therapies have not adequately addressed immune dysregulation in septic patients, emphasizing the urgent need for immune typing to enable precise management (4–6).
**Methods:** Through the 28 immune cell features annotated by single-sample Gene Set Enrichment Analysis and the consensus clustering, we analyzed the Gene Expression Omnibus (GEO) datasets (GSE65682) and clustered sepsis patients into two immune subtypes. Subsequently, various immune infiltration analysis methods, including ESTIMATE, CIBERSORT, quanTIseq, TIMER, MCP-counter, xCell, and Estimating the Proportion of Immune and Cancer cells (EPIC), were employed to evaluate immune infiltration in the two immune subtypes. We further analyzed the changes associated with inflammatory factors in both groups. Gene Set Variation Analysis (GSVA) approach was used to annotate 10 signaling pathways commonly altered in sepsis and to observe changes in these pathways in the two immune subtypes. We further incorporated the differential genes into GO and KEGG enrichment analysis to analyze the pathway alterations. We further analyzed the alterations and differences in glucose metabolism, lipid metabolism and protein metabolism in the two immune subtypes.
**Results:** We clustered sepsis patients into immune-normal (subtype 1) and immune-suppressed subtypes (subtype 2). Figure 1A–D shows that binary classification of sepsis subtypes based on immune infiltration was the best. Most of the immune cell infiltration of subtype 1 was higher than that of subtype 2, while macrophages and regulatory T cells were lower than that of subtype 2 (Fig. 1E, F). In addition, the subtype 1 ESTIMATE score and immunity score were higher than that of subtype 2 (Fig. 1G). To ensure that the two consensus clusters were not biased by the analytical algorithm, six other algorithms, including TIMER, quanTIseq, MCP-counter, xCell, EPIC, and CIBERSORT, were used to verify the stability and robustness of the ssGSEA results. (Fig. 2). Further analysis revealed significant differences in signaling pathway alterations and metabolic reprogramming between the two immune subtypes. The volcano plot demonstrates the most significantly altered genes between subtype1 and 2 groups. (Fig. 3A). The results showed that TGF-β pathway and Notch pathway were upregulated in the subtype 1, while the Hippo, Cell cycle, and PI3K pathways were upregulated in the subtype 2 (Fig. 3B). Gene Ontology (GO) analysis indicated that the variation of different subtypes lies in "regulation of inflammatory response", "leukocyte chemotaxis", "T cell differentiation", and "positive regulation of T cell activation" (Fig. 3C). Kyoto Encyclopedia of Genes and Genomes (KEGG) analysis suggested that some classical pathways, such as the "PI3K-Akt signaling pathway", "Cell adhesion", "MAPK signaling pathway", were altered between different subtypes (Fig. 3D). GSEA analyses further validated these alterations in immune and metabolism related signal, including "positive regulation of immune system process", "Dendritic cell apoptotic process", "Natural killer cell mediated cytotoxicity", "glucose catabolic process", " Glycolysis/Gluconeogenesis" (Fig. 3E, F).
**Conclusions:** We elucidated immune heterogeneity in septic patients, successfully stratifying them into immune-normal and immune-suppressed subtypes. Significant differences in immune infiltration and alterations in signaling pathways among different immune subtypes provide a theoretical basis for precision medicine in sepsis treatment. Moreover, our findings offer new insights into understanding immune regulatory mechanisms in sepsis and developing personalized therapeutic strategies.

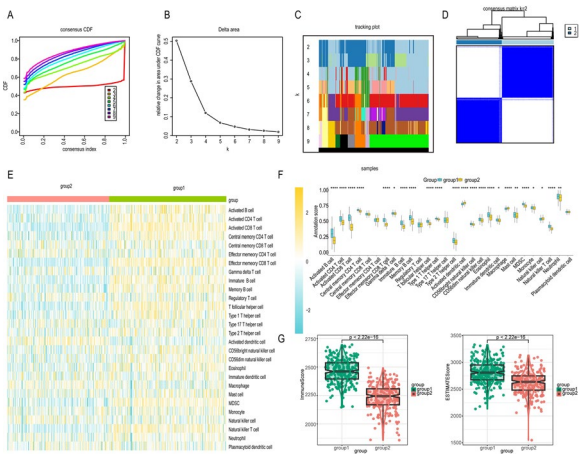

**Fig. 1 (abstract 000973)** Identification of the immune subtypes through consensus clustering analysis. (A–D) Unsupervised clustering process of immune cell features based on transcriptomics. (E) Heatmap to show the differences of two immune subtypes. (F) Boxplot to show the differences of two immune subtypes. (G) The immune and estimate score between two immune related subtypes

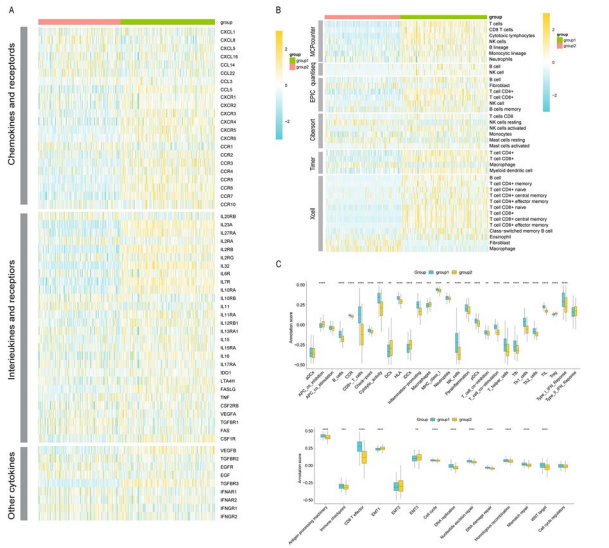


**Fig. 2 (abstract 000973)** Characterization of transcriptomics immune related subtype. (A) Characterization of inflammatory factors in different subtypes. (B) Abundance of immune infiltration in different subtypes. (C) Variation of different immune features in different subtypes

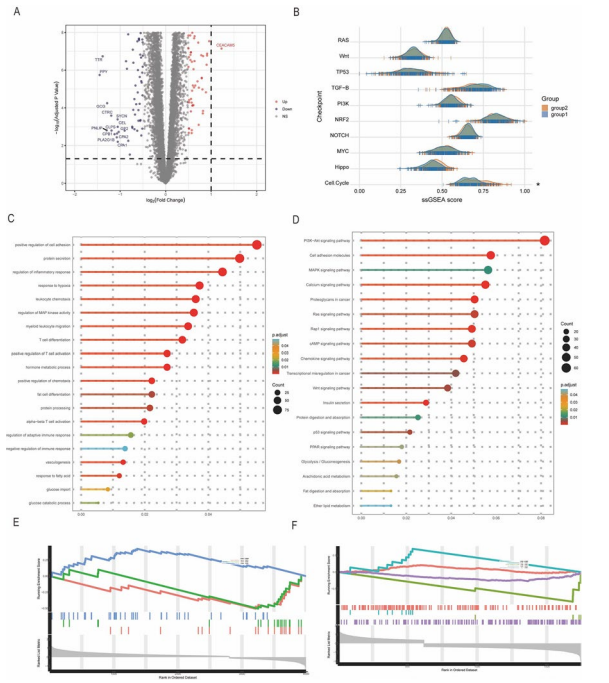


**Fig. 3 (abstract 000973)** Variation of immune-related signal and metabolic reprogramming in different subtypes. (A) The volcano plot to show differential genes between different subtypes. (B) The difference of common pathways in various subtypes. (C) Gene Ontology annotation of the differential genes. (D) KEGG analysis of the differential genes. (E–F) GSEA analysis of the biological pathways between different subtypes

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**Topic:** Sepsis

## 000974

## Awake prone positioning in non-intubated patients with COVID-19-related acute hypoxemic respiratory failure: an individual participant data meta-analysis


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**Introduction:** Awake prone positioning (APP) has been widely adopted since the onset of the COVID-19 pandemic and has shown promise in reducing the need for intubation, as evidenced by our previous meta-analysis encompassing 10 randomized controlled trials (RCTs). As of now, 18 RCTs have been published. Given the evolving

nature of evidence surrounding APP, particularly its impact on mortality, it is imperative to reassess its effects.
**Objectives:** We aimed to evaluate the effects of APP on clinical outcomes in patients with COVID-19-related acute hypoxemic respiratory failure (AHRF).
**Methods:** We conducted an individual participant data meta-analysis. Two independent research teams searched PubMed, EMBASE, the Cochrane Library, and ClinicalTrials.gov for RCTs on APP in patients with COVID-19-related AHRF published in English from January 1, 2020, to July 1, 2022. We reached out to all principal investigators of both published and unpublished RCTs for their individual participant data. The primary outcome was survival without intubation, which was also defined as APP treatment success. Secondary outcomes included intubation, mortality, and death with intubation. We also explored predictors of APP success. Individual participant data provided by each trial were synthesized into a pooled dataset and analyzed using a 1-step mixed-effects model. Multivariate analyses were performed to identify the predictors associated to treatment success. The study was reported following the PRISMA-IPD guideline. The study protocol was prospectively registered with PROSPERO (CRD42022343625). Data from quasi-RCTs were included for sensitivity analysis.
**Results:** We included 11 RCTs (including 2 unpublished) with 2,453 patients and one quasi-RCT with 501 patients from 11 countries. Compared to the control group, APP significantly increased the likelihood of survival without intubation for COVID-19-related AHRF (odds ratio [OR] 4.166 [95% CI 1.797 to 9.658]), reduced the risk of intubation (0.269 [0.122 to 0.592]), mortality (0.274 [0.105 to 0.717]), and death with intubation (0.333 [0.134 to 0.827]). Similar results were observed in sensitivity analysis with the quasi-RCT. Predictors of APP success included age younger than 60 years, shorter time from hospitalization to enrollment ($\leq$ 1 day), treatment in the ICU, higher SpO2/FIO2 ratio before APP ($\geq$ 159), lower respiratory rate before APP ($\leq$ 24 breaths/min), and longer duration of APP within the first three days ($\geq$ 13 h).
**Conclusions:** Among patients with COVID-19-related AHRF, APP was associated with improved survival without intubation and reduced risks of intubation and mortality. Younger age, shorter time from hospitalization to enrollment, treatment in the ICU, higher SpO2/FIO2 ratio, lower respiratory rate before APP, and longer duration of APP within the first three days were associated with APP treatment success.

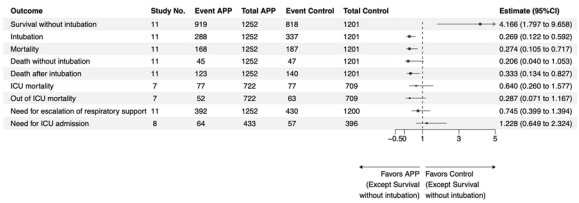


**Fig. 1 (abstract 000974)** Effects of APP on clinical outcomes. APP, awake prone positioning

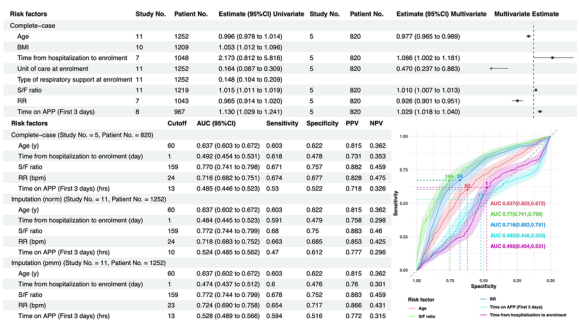


**Fig. 2 (abstract 000974)** Factors associated with APP treatment success (survival without intubation). APP, awake prone positioning

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000975

### Achievement of a negative fluid balance during the first 48 h is related to mortality in ARDS patients

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**Introduction:** Achievement of a negative fluid balance (NFB) increases arterial oxygenation which affects mortality and organ function.
**Objectives:** We aimed to evaluate whether a NFB in first 48 h affects mortality or an improvement in organ functions in ARDS patients.
**Methods:** ARDS patients (Berlin criteria) were included. SOFA scores, hemodynamic variables, P/F ratio, vasopressor dose, daily fluid balance for 72 h after ICU admission were recorded. NFB (furosemide, ultrafiltration) was initiated during first 48 h after ICU admission. Patients were separated by patients who did or did not achieve a NFB $\geq$ 1 L within 48 h without hypotension (success vs unsuccess). Patients were divided by ICU mortality and a reduction of SOFA scores $\geq$ 2 in 72 h ($\Delta$SOFA72).
**Results:** 52 ARDS patients were included. 34/52 (65%) patients were on HFNC. SOFA scores and PF ratios were 4 (3–4),119 (79–191). Lactate was 1.0 (0.5–1.5) mmol/L. 3 patients receiving vasopressor. All patients received intravenous furosemide 40 (20–80) mg/24 h. 32/52 (62%) patients were in success group and 23 (70%) of these patients had $\Delta$SOFA $\geq$ 2. 32 of 52 (61%) were survivors. There were no differences in SOFA scores, P/F ratios, hemodynamic variables, between patients in success and unsuccess, $\Delta$SOFA72 $\geq$ 2 vs $\Delta$SOFA72 < 2, survivors and non-survivors.
Patients with $\Delta$SOFA72 $\geq$ 2 (Fig. 1) and survivors (Fig. 2) had lower accumulative fluid balance at 48 h than another group. Mechanical ventilator (MV) and HFNC supporting days were lower in patients in success group than in unsuccess group (7 (5–11) vs 10 (7–12) days, $p < 0.05$, respectively).
**Conclusions:** To achieve a NFB $\geq$ 1 L in the first 48 h would be associated with reduced mortality and organ dysfunction.

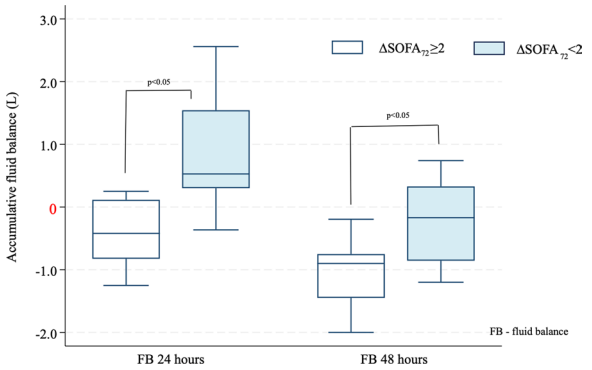


**Fig. 1 (abstract 000975)** Accumulative fluid balance at 24 and 48 h in patients with ?SOFA ≥ 2 vs < 2

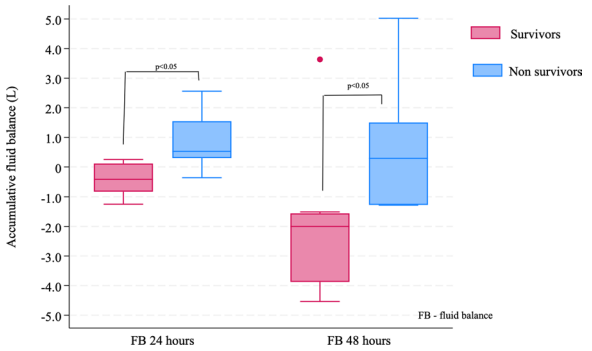


**Fig. 2 (abstract 000975)** Accumulative fluid balance at 24 and 48 h in survivors and non-survivors

**Topic:** Cardiovascular issues in ICU

## 000976

### Substitution of PCR with IL-6 in NUTRIC-SCORE: early-stage analysis

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**Introduction:** The NUTRIC-SCORE scale, the first standardized nutritional risk (NR) scale for critically ill patients (2), incorporates variables commonly found in ICUs, including age, APACHE II, SOFA, comorbidities, days from hospital admission to ICU admission, and interleukin-6 (IL-6) (3). However, due to cost and limited availability, the original scale was modified to exclude IL-6 (2).
A high NR is indicated by a NUTRIC score > 6 points, although it was later adjusted to > 5 points (1). Given its accessibility, research has explored using C-reactive protein (CRP) instead of IL-6 as an inflammatory biomarker (1).
The optimal CRP cutoff values for predicting ICU mortality, ranging from 100mg/l to 152mg/l (4). Consequently, the minimum value is proposed as a substitute for IL-6. Despite this change, high nutritional risk is still defined as > 6 points.

**Objectives:** Estimate high NR and mortality given among the variants of the NUTRIC score.
**Methods:** A prospective cohort study was conducted on adult patients admitted to the ICU of a tertiary hospital in Mexico. Patients with mechanical ventilation and severe pneumonia were included. Data were summarized with means and standard deviations, while categorical data were presented as frequencies and percentages. Mortality scales including APACHE II, SOFA, NUTRIC, and modified NUTRIC were computed. IL-6 in the original scale was replaced by CRP with a cutoff of 100 mg/dl. ROC curve analysis was performed to calculate AUC along with sensitivity, specificity, and predictive values (5). Additionally, a Kappa test was conducted to assess agreement.
**Results:** 21 patients were included, hospitalized during 2023 with a diagnosis of severe pneumonia, 81% male, aged 46 years (±20), comorbidities hypertension 61%, type 2 diabetes mellitus 43%. Prognostic scales were calculated among the survivor and non-survivor groups, with BMI of 23 (±1)/29 (±3.6), APACHE II 6 (±2)/13 (±7), SOFA 4 (±0.5)/8 (±3), NUTRIC 2 (±0.5)/4 (±1.3), NUTRICm 3 (±0.5)/3 (±1.3), NUTRICpcr 2.3 (±0.5)/4 (±1.5), CRP 50 (±22)/146 (±120), IL-6 66.8 (±50)/60 (±101), and ICU stay of 5 (±1.5)/5.5 (1.3), respectively (Table 1). There was a mortality rate of 71%. The ROC AUC obtained the best accuracy with the SOFA score to predict mortality (Fig. 1), the NUTRIC and NUTRICm scales were 0.73, and NUTRICpcr was 0.77 (Fig. 2). The Kappa test for agreement value was 0.12 between the NUTRIC and NUTRICpcr scales.

**Table 1 (abstract 000976)** Diagnostic accuracy for severity scores and mortality

| | AUC | Sensitivity (%) | Specificity (%) | PPV (%) | NPV (%) |
|---|---|---|---|---|---|
| APACHE II | 0.93 | 86 | 75 | 87 | 100 |
| SOFA | 1 | 100 | 100 | 100 | 100 |
| NUTRIC | 0.73 | 60 | 68 | 25 | 100 |
| NUTRICm | 0.73 | 60 | 56 | 71 | 71 |
| NUTRICpcr | 0.77 | 70 | 50 | 73 | 67 |

**Conclusions:** The NUTRICpcr scale shows moderate accuracy in predicting patients with high nutritional risk; however, due to the small sample size, promising results are obtained, which could lead to a more accessible alternative.

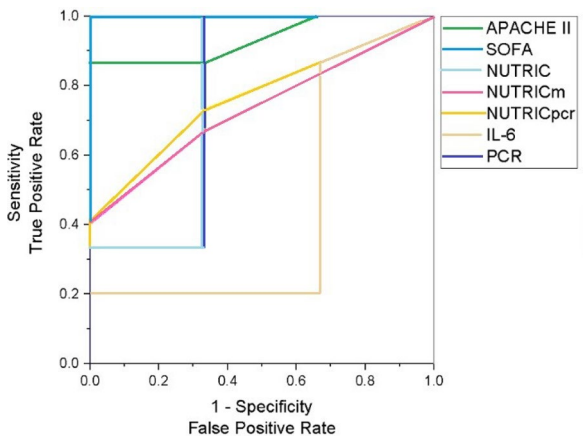


**Fig. 1 (abstract 000976)** AUC ROC with mortality and nutritional risk assessment scores and biomarkers

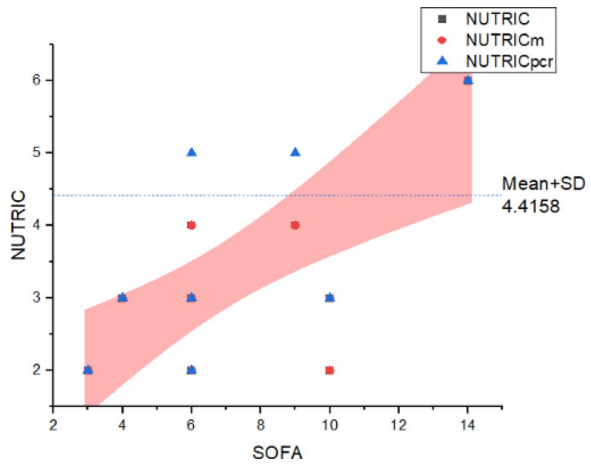


**Fig. 2 (abstract 000976)** Correlation between nutritional risk assessment and SOFA as prognostic scales for mortality ($r = 0.73$, 0.73, 0.70 for NUTRIC, NUTRICm and NUTRICpcr, respectively, $p = 0.000$)

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000977

### Ultrasound monitoring of skeletal muscle wasting in critically ill patients using shear wave elastography—MUScleNut study sub-analysis

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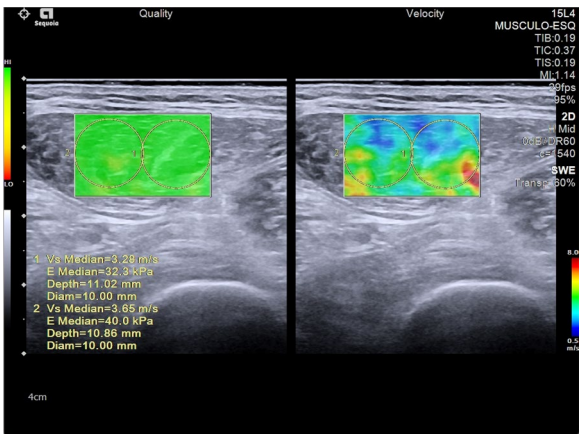
**Introduction:** Skeletal muscle wasting is characterized by an early and rapid loss of muscle mass, strength and quality affecting more than a half of critically ill patients and is associated with negative clinical outcomes. Shear wave elastography (SWE) is a non-invasive, objective and practical ultrasonographic (US) method that provides a quantitative measurement of muscle shiftiness, reflecting changes in muscle composition, such as increased fibrosis and adipose tissue deposition and demonstrated a higher reliability with eco-intensity on gray scale US and computed tomography in detecting muscle changes. This study aimed to characterize the SWE muscle changes in critically ill patients and the association with the clinical outcomes and mortality.
**Methods:** Prospective cohort study involving ultrasound measurements of quadriceps at baseline (MMA1) and day 7 to 10 (MMA2). Rectus femoris (RF) shear wave elastography (SWE) was measured by a trained registered dietitian using a linear array transducer 15-L (ACUSON Sequoia Ultrasound System, Siemens Healthineers) and applying minimal pressure accordingly with the US method and image acquisition protocol developed for the study. The size and number of the regions of interest (ROIs) differ because of the RF size variability among patients. The ROIs were placed to include the greater RF area, at the same level of the SWE image. The mean stiffness in kilopascal (kPa) and the mean velocity (m/s) was calculated. The severity of illness was assessed thought the Sequential Organ Failure Assessment (SOFA) and Acute Physiology and Chronic Health Evaluation II (APACHE II) scores, the duration and type of organ support, such as renal and ventilatory support, the ICU days and 90-day mortality were also collected. The data were statistically analyzed through Stata BE v18 v26 (Stata Corp, College Station, Texas 77845 USA).
**Results:** 20 patients (age 56 ± 16 years, 80% male) admitted in Medical Emergency and ECMO ICUs of S. José Hospital, CHULC EPE in Lisbon, Portugal. There was reduction in SWE from MMA1 (3,0 m/s ± 1,36; 33,7 kPa ± 31,3) to MMA2 (2,88 m/s ± 1,04; 28,6 kPa ± 21,1). A significant relationship between SOFA and APACHEII scores and SWE (m/s) ($p = 0,06$; $p = 0,03$) and SWE (kPa) ($p = 0,05$; $p = 0,02$) was observed. A larger sample is necessary to clarify the association between continuous renal replacement technique (CRRT) and mechanical invasive ventilation (MIV) duration and SWE (m/s) ($p = 0,08$; $p = 0,09$) and SWE (kPa) ($p = 0,07$; $p = 0,04$). A significant relationship between 90-day mortality and SWE (m/s) ($p = 0,02$) and SWE (kPa) ($p = 0,01$) was observed.
**Conclusions:** In critically ill patients with skeletal muscle wasting, RF shiftiness showed to reduce in the first week of ICU stay and was associated with worse clinical outcomes.




**Figures 1 (abstract 000977)** SWE on RF muscle. SWE quality panel (left) and color map SWE image (right) were simultaneously displayed on USG monitor and three consecutive images were acquired. Two circular region of interests (ROIs) were placed. Then the mean of ROIs in each of three SWE image were considered to represent the stiffness and shear wave velocity (SWV) of evaluated muscle

**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 000978

### Phenotypes of cardiogenic shock: reproducibility, application and mortality in Mexican population

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000978

**Introduction:** Cardiogenic shock (CS) leads to prolonged intensive care unit stays heightened long-term morbidity, economic costs, and impacts survivor`s health related quality of life.
CS carries high in-hospital mortality rates, with incidences around 6–13% in acute coronary syndrome (ACS) and about 4% in heart failure (HF), though other etiologies can contribute. In Mexico, most records focus on ischemic heart disease.
The Cardiogenic Shock Working Group (CSWG) recently proposed a subclassification of CS into 3 phenotypes, synergistically associated with the Society for Coronary Angiography and Interventions (SCAI) classification for greater prognostic relevance.
Currently, there are few compilations with classifications, although none performed or validated in our population, thus the variability in treatment response is a problem we frequently face due to the absence of consensus on the treatment of choice based on severity scales or etiological classification. This would enable us to prioritize resources and scale treatment in a targeted manner.
**Objectives:** Our research aims to explore the frequency of each CS phenotype and its association with mortality in an intensive care setting in Mexico.
**Methods:** A historical cohort study included patients admitted to the intensive care unit with CS diagnosis according to CSWG and SCAI criteria, encompassing stages C, D, and E Phenotype classification with mortality probabilities estimated.
**Results:** From January 2021 to December 2023, 65 patients admitted to the intensive care unit with a diagnosis of CS were studied. Of these, 55% ($n=36$) were male and 45% ($n=29$) female, with an average age of $65.7 \pm 15.2$ years and an average length of stay of $6 \pm 32.4$ days. The distribution by phenotypes (Fig. 1) was 49% for phenotype I, 40% for phenotype II, and 11% for phenotype III. Twenty-two patients died, 46% from phenotype I, 27% from phenotype II, and 27% from phenotype III. SCAI staging showed 2% at stage C, 72% at stage D, and 26% at stage E, with 37% of stage D patients belonging to phenotype I. The main etiology was decompensated HF (Fig. 2), and pharmacological treatment predominated, with only 7.6% receiving mechanical support.

**Relation between proportion of phenotypes and SCAI stages**

| Phenotype/SCAI stage | C | D | E | Total |
|---|---|---|---|---|
| I | 2% (1) | 37%( 24) | 10% (7) | 49% (32) |
| II | 0 | 32% (21) | 8% (5) | 40% (26) |
| III | 0 | 3% (2) | 8% (5) | 11% (7) |
| Total | 2% (1) | 72% (47) | 26% (17) | |

**Conclusions:** The variability in treatment response underscores the need for consensus on treatment choices based on severity scales and etiological classification. The main mortality in CS phenotype observed in our population differed from previous studies, potentially due to our population's prevalent etiology of decompensated chronic HF and the proportion of patients with obesity. This study is the first to examine phenotypes and their prognostic correlation in Mexican population, highlighting the necessity for prospective studies with larger cohorts in our country.

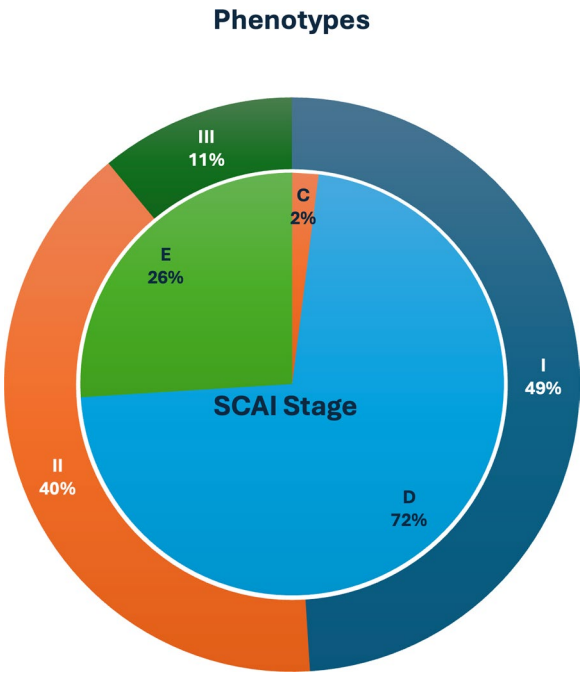


**Fig. 1 (abstract 000978)** Phenotypes and SCAI stage distribution

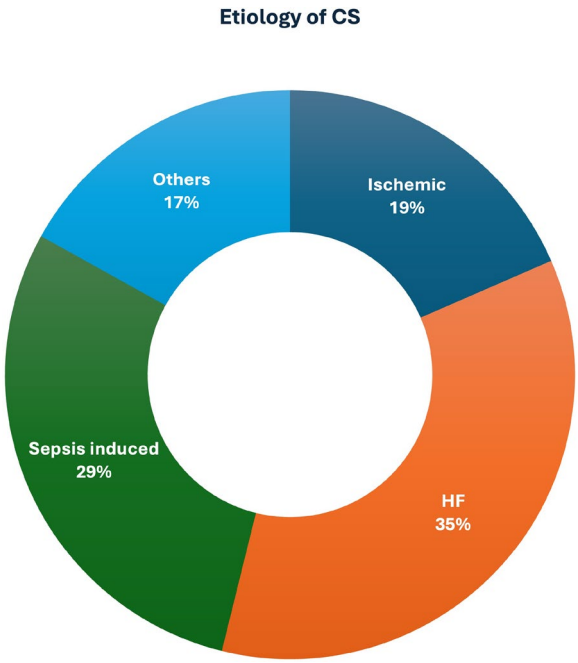


**Fig. 2 (abstract 000978)** Proportion of CS causes

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**Topic:** Cardiovascular issues in ICU

## 000980

### Mortality and medical resource utilization of COVID-19 infection in South Korea: nationwide cohort study

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**Introduction:** The COVID-19 pandemic has severely burdened healthcare system capacities in many parts of the world. Intensive care unit (ICU) resources, including mechanical ventilation, are crucial for long-term crisis management, especially emerging new respiratory virus infections. However, few studies have examined nationwide medical resource utilization and COVID-19 mortality with international comparisons.
**Objectives:** This study aimed to evaluate the mortality of COVID-19 confirmed patients in South Korea using nationwide cohort data and describe characteristics independently associated with mortality. We also analyzed the characteristics and distribution of COVID-19 patients in Korea and healthcare utilization across the country. We aim to check the current level and help establish policies to distribute medical resources and systems effectively when similar infectious diseases become prevalent in the future.
**Methods:** This study used a cohort of 577,626 COVID-19 confirmed cases from October 8, 2020, to December 31, 2021, which combined the data from Korea Disease Control and Prevention and the National Health Insurance Service Claim Data. We analyzed 28-day mortality and in-hospital mortality according to the type of hospital and application of treatments. The treatments included a mechanical ventilator, extracorporeal membrane oxygenation (ECMO), vasopressor, high-flow nasal cannula, continuous renal replacement therapy (CRRT), and oxygen supply. Multivariate analysis using Cox's proportional hazards model was performed to compare the mortality of patients with COVID-19 infection.
**Results:** Among 577,626 confirmed cases, 7203 patients were dead during the follow-up period. 28-day mortality is 0.4%, and in-hospital mortality is 0.9%. Mortality is higher in older age and lower-income groups and increased with the Charlson Comorbidity Index. Tertiary general hospitals had higher mortality than general hospitals. During the pandemic period, 5956 patients applied for mechanical ventilators in South Korea. 3236 patients were admitted to the Tertiary General Hospital, and others were treated in the General Hospital. 726 patients used ECMO, and 214 patients were on CRRT machines. 60,182 patients were on oxygen therapy and 10,141 applied High Flow Nasal Cannula device. 16,674 patients experienced vasopressor therapy. Among 5956 mechanically ventilated patients, 28-day mortality is 7.1%, and in-hospital mortality is 15.5%. Mortality is also higher in older age and lower-income groups and increases with the Charlson Comorbidity Index. However, after multivariate analysis, the mortality of mechanically ventilated patients is higher in general hospitals compared with tertiary hospitals.
**Conclusions:** The study aimed to assess COVID-19 mortality and evaluate the nationwide medical resource utilization in South Korea. Among 577,626 confirmed cases, overall mortality is 1.2%. 28-day mortality and in-hospital mortality are 0.4% and 0.9%, respectively. Mortality increased with age and comorbidities, aligning with existing research. Among 5956 mechanically ventilated patients, 28-day mortality is 7.1%, and in-hospital mortality is 15.5%. However, mortality in the mechanical ventilation group was lower than in previous studies in other countries and higher in the patients admitted to general hospitals.

**Topic:** Health services research and outcome

## 000981

### The association of nosocomial infections with clinical outcomes in patients with cardiogenic shock

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**Introduction:** There has been limited data regarding the association of nosocomial infections (NI) with clinical outcomes and its predictors in patients with cardiogenic shock.
**Objectives:** This study aimed to investigate the clinical pictures and the association of NIs with clinical outcomes in patients with cardiogenic shock.
**Methods:** We analyzed 879 adult patients with cardiogenic shock who were admitted to the cardiac intensive care unit (ICU) in the single tertiary center between 2012 and 2020. All of the positive microbiological cultures that were obtained within the index cardiac ICU stay period were evaluated. Based on the international guidelines, 4 NIs were diagnosed; pneumonia, catheter-related bloodstream infections (CRBSI), primary bacteremia, and catheter-associated urinary tract infection (CAUTI). The primary outcome was ICU mortality and we also assessed ICU stay and in-hospital mortality.
**Results:** Among 879 patients, 242 (27.5%) patients developed a NI. The most common type of NI was pneumonia, followed by CRBSI, primary bacteremia, and CAUTI. Patients with NI had more experience of cardiac arrest before ICU admission (38.0% vs 23.2%, $p<0.001$), higher vasoactive-inotropic score (35.0 [18.0–135.0] vs 19.0 [8.0–40.0], $p<0.001$), and higher rates of undergoing extracorporeal membrane oxygenation (ECMO) (30.6% vs 13.5%, $p<0.001$). Both ICU mortality (33.4% vs 15.7%, $p<0.001$) and length of ICU stay (11.9 days [5.3–20.0] vs 3.2 days [2.0–6.0], $p<0.001$) were higher in patients with NIs than those without NIs. In-hospital mortality was also higher in patients with NIs (38.4% vs 19.5%, $p<0.001$). On multivariable analysis, ECMO (adjusted OR 2.35, 95% CI 1.44–3.84, $p=0.001$), cardiac arrest before ICU (adjusted OR 1.56, 95% CI 1.02–2.38, $p=0.040$), and diabetes mellitus (adjusted OR 2.14, 95% CI 1.55–2.95), $p<0.001$) were independent predictors of NI.
**Conclusions:** NI was associated with an increase in ICU and in-hospital mortality and length of ICU stay in patients with cardiogenic shock. ECMO, cardiac arrest before ICU, diabetes mellitus were important predictors of NI development.

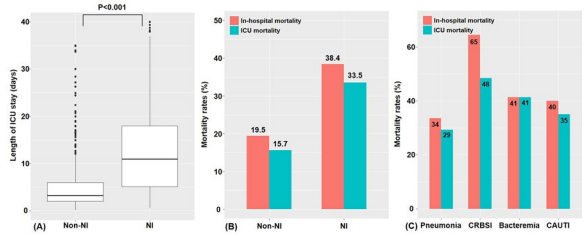


**Fig. 1 (abstract 000981)** A Box plot comparing the length of ICU stay in non-NI vs NI patients (3.20 [2.0–6.0] vs 11.9 [5.3–20.0], $p < 0.001$). B NI patients had higher in-hospital (38.4% vs 19.5%, $p < 0.001$) and ICU mortality (33.5% vs 15.7%, $p < 0.001$) than non-NI patients. C In-hospital mortality and ICU mortality according to NI types. Abbreviations: ICU, intensive care unit; NI, nosocomial infection; CRBSI, catheter-related bloodstream infection; CAUTI, catheter-associated urinary tract infection

**Topic:** Infections and prevention

## 000982

### Oxygenation assessment among patients with acute hypoxemic respiratory failure during noninvasive respiratory supports: a post hoc analysis of a multicenter randomized controlled trial

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**Introduction:** High-flow nasal cannula (HFNC) and continuous positive airway pressure (CPAP) are cautiously utilized in patients with acute respiratory distress syndrome (ARDS) because of potential risk of treatment failure. The new global definition of non-intubated ARDS allowed to be diagnosed even in patients receiving HFNC. However, the adequacy of oxygenation severity classification by partial arterial pressure of oxygen to fraction of inspired oxygen (P/F ratio) has not been well validated. We performed a post hoc analysis of the JaNP-Hi trial, a multicenter randomized controlled trial conducted in Japan, to investigate oxygenation in patients with HFNC and CPAP.
**Methods:** The JaNP-Hi trial included patients with P/F ration < 300 on CPAP at 5 cmH2O, assigning them to either HFNC or CPAP. The initial gas flow of HFNC and CPAP levels were set at 50 L/min and 10 cmH2O, respectively, and maintained for a minimum of 30 min. Patients were stratified into mild (P/F 200–299), moderate (P/F 100–199), and severe hypoxemia (P/F < 100) based on their oxygenation at CPAP at 5 cmH2O. The primary outcomes were treatment failure, defined as the need for intubation or death within 28 days across their oxygenation categories. Secondary outcomes included changes in oxygenation category and the agreement between P/F ratios measured at CPAP of 5 cmH2O and after 30 min of treatment allocation, using the Bland–Altman method.
**Results:** Among 85 analyzed patients, 47 (55%) received HFNC and 38 (45%) received CPAP. The median age was 75 years, with 61 (72%) male. The median P/F ratio was 173, with 31, 48, and 6 patients classified into mild, moderate, and severe hypoxemia, respectively. Treatment failure was observed in 16 (19%) patients, with intubation in 14 (21%) patients, and 28-day death in 8 (9%) patients. Treatment failure occurred more frequently in patients with moderate and severe hypoxemia compared with mild hypoxemia (1 (3%) mild vs. 12 (25%) moderate vs. 3 (50%) severe; $P = 0.045$). The HFNC group experienced 21 (45%) patients worsening oxygenation category after 30 min of allocation, contrasted with 1 (3%) patient in the CPAP group ($p < 0.001$). Fourteen of 19 (74%) mild patients managed with HFNC were classified into moderate, and 7 of 26 (27%) moderate patients were classified into severe. Bland–Altman analysis showed a mean bias of -45.4 (95% limits of agreement was -129.4 to 38.7) mmHg between P/F ratio at CPAP of 5 cmH2O and HFNC. Although 1 of 12 (8%) mild patients managed with CPAP was classified as moderate, oxygenation category worsened in no other patients. Bland–Altman analysis showed a mean bias of 21.2 (95% limits of agreement was − 67.9 to 110.3) mmHg between P/F measured at CPAP of 5 and 10 cmH2O.
**Conclusions:** Treatment failures were more frequently observed in patients with more severe hypoxemia under noninvasive respiratory support. These findings emphasize the importance of cautious oxygenation assessment, given the significant variability introduced by different respiratory support devices.

**Topic:** Acute respiratory failure and mechanical ventilation

## 000983

### Ventilation management and outcomes of COVID–19 ARDS versus ARDS caused by other pulmonary infections

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**Introduction:** It is unknown whether associations of certain aspects of invasive ventilation with outcomes found in ARDS caused by other pulmonary infections (CLASSIC-ARDS) also exist in COVID-ARDS. The number of studies that directly compared ventilation management of COVID-ARDS with CLASSIC-ARDS is limited (1,2). This study aimed to identify associations with outcomes to investigate potential differences in practice of ventilation.
**Objectives:** To identify independent associations with mortality and ventilator-free days at day 60 (VFD–60) between COVID-ARDS and CLASSIC-ARDS patients and to investigate differences in ventilation management.
**Methods:** Individual patient data analysis of COVID-ARDS and CLASSIC-ARDS patients in six observational studies of invasive ventilation, four studies were conducted during the COVID-19 pandemic (PRoVENT-COVID, EPICCoV, CIBERESUCICOVID and SATI-COVID–19)

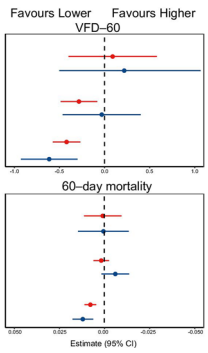
and two studies from before the COVID-19 pandemic (ERICC and LUNG SAFE) were included. Descriptive statistics were used to compare epidemiology and ventilation characteristics. Also, we performed a multivariable mixed–effects model to identify whether VT, PEEP and ΔP independent associations with 60-day mortality and the number of VFD-60.

**Results:** This analysis included 6702 COVID-ARDS patients and 1415 CLASSIC-ARDS patients. COVID-ARDS patients received lower median VT (6.6 [6.0 to 7.4] vs 7.3 [6.4 to 8.5] ml/kg PBW; $p < 0.001$) and higher median PEEP (12.0 [10.0 to 14.0] vs 8.0 [6.0 to 10.0] cm H2O; $p < 0.001$), a lower median ΔP (13.0 [10.0 to 15.0] vs 16.0 [IQR 12.0 to 20.0] cm H2O; $p < 0.001$) and higher median Crs (33.5 [26.6 to 42.1] vs 28.1 [21.6 to 38.4] mL/cm H2O; $p < 0.001$). After multivariable adjustment, higher ΔP had an independent association with higher 60-day mortality and less VFD-60 in both groups. Higher PEEP had an association with less VFD-60, but only in COVID-ARDS patients (Fig. 1).

**Conclusions:**

1 In COVID-ARDS a higher PEEP was independently associated with less VFD-60. This was not observed in CLASSIC-ARDS.
2 Our results show that key ventilator parameters significantly differ between COVID-ARDS and CLASSIC-ARDS. Patients with COVID-ARDS received a higher PEEP and lower tidal volumes.

| Parameter | Estimate (95%–CI) | p |
|---|---|---|
| VFD–60 | | |
| $V_T$, mL/kg PBW | | |
| COVID–ARDS | 0.1124 (-0.3773 – 0.6034) | 0.63 |
| Classic–ARDS | 0.2409 (-0.4789 – 1.0879) | 0.45 |
| PEEP, cm $H_2O$ | | |
| COVID–ARDS | -0.2613 (-0.4638 – -0.0575) | 0.01 |
| Classic–ARDS | -0.0082 (-0.4417 –0.4244) | 0.97 |
| ΔP, cm $H_2O$ | | |
| COVID–ARDS | -0.3985 (-0.5516 – -0.2454) | <0.001 |
| Classic–ARDS | -0.5910 (-0.9051 – -0.2767) | 0.002 |
| 60–day mortality | | |
| $V_T$, mL/kg PBW | | |
| COVID–ARDS | 0.0008 (-0.0096 – 0.0112) | 0.87 |
| Classic–ARDS | 0.0004 (-0.1362 – 0.0145) | 0.95 |
| PEEP, cm $H_2O$ | | |
| COVID–ARDS | 0.0017 (-0.0027 – 0.0059) | 0.45 |
| Classic–ARDS | -0.0061 (-0.0138 – 0.0015) | 0.12 |
| ΔP, cm $H_2O$ | | |
| COVID–ARDS | 0.0077 (0.0044 – 0.0110) | <0.001 |
| Classic–ARDS | 0.0119 (0.0061 – 0.0176) | 0.002 |




The estimate is the average effect of the predictor variable on the response variable, while controlling for the other variables in the model. A positive estimate suggests a proportional effect, whereas a negative estimate suggests an inversely proportional effect. Abbreviations: ARDS = acute respiratory distress syndrome; VFD = ventilator-free days and alive; IQR = interquartile range; N = number; CI = confidence interval; VT = tidal volume; PBW = predicted bodyweight; PEEP = positive end–expiratory pressure; ΔP = driving pressure

**Reference(s)**

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**Topic:** Acute respiratory failure and mechanical ventilation

## 000984

### An observational study of the use of external jugular cannulation for peripheral venous access

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**Introduction:** External jugular vein (EJV) is not commonly used for peripheral short-term cannulation in spite of its prominent location and access. We prospectively studied the usage of EJV for IV cannulation and its complications.
**Objectives:** The objective of the study is to assess the safety profile for external jugular vein cannulation for hyperosmotic and vesicants infusions, at the same time preventing CVC access only for such infusions.
**Methods:** From July 2023to September 2023, all adult patients (age > 18 yrs) in a Tertiary care medical and cardiac ICU in which EJV was cannulated for short-term vascular access were included in the study and were followed up till removal or patient discharge. The indications, the number of days and the reason of removal were noted. The conversion from EJV to central venous cannulation was also followed. The common problems encountered during cannulations were also recorded.
**Results:** The most common indications to put peripheral EJV was difficult IV access and the use of cordarone and other hyperosmolar medications.
The complications noted are as under:

| Complications | No. of patients | Percentage |
|---|---|---|
| Thrombophlebitis | 4 | 8 |
| Purulent at insertion site | 0 | 0 |
| Induration | 3 | 6 |
| Blockage | 7 | 14 |
| Pain | 1 | 2 |

**Conclusions:** EJV cannulation for short-term peripheral IV access seems to be a safe route to give vesicant and hyperosmolar medications with minimal side effects.

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2. 1.Chakravarthy M, Krishnamoorthy J, Nallam S, Kolur N, Faris A, Reddy K, et al. External jugular venous route for central venous access: our experience in 563 surgical patients. J Anesth Clin Res. 2011. 2(6):1–5. 2.Uvelin A, Kolak R, Putnik D. External jugular cannulation is irreplaceable in many situations. Resuscitation. 2010 Jun. 81(6):773.

**Topic:** Infections and prevention

## 000985

### Two-year outcomes following OHCA in New Zealand: pre-defined analysis of the TAME randomized clinical trial

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**Introduction:** The Targeted Therapeutic Mild Hypercapnia after Resuscitated Cardiac Arrest (TAME) Randomized clinical trial showed no difference in mortality or favourable neurological outcome at 6-months after out-of-hospital cardiac arrest (OHCA) 0.1 However, the longer-term outcomes of TAME trial participants are unknown.
**Objectives:** To determine the mortality, neurological, functional and cognitive outcomes in TAME trial patients from New Zealand at 2 years post randomization.
**Methods:** Pre-planned, follow-up study of New Zealand TAME trial participants. TAME compared targeted therapeutic mild hypercapnia (TTMH) to targeted normocapnia (TN) for 24 h after OHCA. We evaluated mortality, neurological (favourable GOSE, score 5–8), functional

(poor modified Rankin Scale (mRS), score 4– 6), health related quality-of-life (HRQOL) (EQ-5D-5L) and cognitive (Montreal Cognitive Assessment-Blind assessment) outcomes.
**Results:** Of the 1700 TAME patients, 200 patients (8.5%) were enrolled in New Zealand of which 194 (97%) had 2-year data. We found no difference in mortality, neurological, functional, health related QOL, or cognitive outcomes in New Zealand TAME patients allocated to TTMH compared to TN (Table 1).

**Table 1 (abstract 000985)** 2-year outcomes of New Zealand TAME trial patients

| | TTMH ($n=102$) | TN ($n=98$) | Relative risk/ median difference (95%CI), $p$ value |
|---|---|---|---|
| Mortality, no. (%) | 38/98 (38.8%) | 37/96 (38.5%) | RR, 1.01 [0.69 to 1.48], $p=0.975$ |
| Favourable GOSE, no. (%) *(GOS-E 5 to 8)* | 46/87 (52.9%) | 48/88 (54.5%) | RR, 0.97 [0.67 to 1.40], $p=0.869$ |
| Poor mRS *(mRS 4–6)* | 40/87 (46%) | 38/88 (43.2%) | RR, 1.06 [0.74 to 1.53], $p=0.734$ |
| EQ5D-5L, in survivors | 0.9 [0.9, 1.0] | 1.0 [0.9, 1.0] | MD, − 0.05 (− 0.14 to 0.04), $p=0.258$ |
| Cognitive dysfunction#, in survivors, no. (%) | 13/47 (27.7%) | 7/50 (14%) | RR, 1.98 (0.93 to 4.19), $p=0.076$ |

GOSE, Glasgow outcome scale extended; MD, mean difference; mRS, modified Rankin scale score. #Cognitive dysfunction assessed using the MOCA-Blind

**Conclusions:** Our study now provides longer-term data on mortality and health outcomes of OHCA patients in New Zealand.

**Reference(s)**

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2. Supported by a Health Research Council of New Zealand grant (no. 19/340).

**Topic:** Cardiac arrest

## 000986

## Nucleated red blood cells as a prognostic marker for mortality in critically ill septic patients: results from the prospective Comprehensive Sepsis Center Study Dresden-Kreischa

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**Introduction:** Nucleated red blood cells (NRBCs) in the peripheral blood of critically ill patients are associated with impaired outcome. The predictive value of NRBCs among the subgroup of critically ill patients with sepsis remains unanswered. The aim of the present analysis was to evaluate the predictive validity of NRBCs in septic patients.
**Methods:** This retrospective, observational study was conducted at the University Hospital Dresden, Germany. Data of critically ill septic patients were collected as part of the prospective Comprehensive Sepsis Center Study Dresden-Kreischa registry from 02/2020 to 11/2023. Daily NRBC values were recorded and their predictive validity on mortality was analyzed. A cut-off level based on the patient's maximum NRBC value during intensive care unit (ICU) stay was calculated using receiver operating curves (ROC)-analysis and Youden's method. Survival was depicted using Kaplan–Meier curves which were tested for significant differences with the log rank test.
**Results:** In total, 465 critically ill septic patients were analyzed. NRBCs were found in 93.1% of all patients. Patients who deceased had significantly higher NRBC values during their ICU stay compared to patients who survived (290/µl (60/2010) vs. 30/µl (10/170); $p<0.001$).
A cut-off of NRBCs of 100/µl was effectively dividing the study population into two groups with the most difference for ICU mortality (ROC area under the curve 0.75; 95% confidence interval (CI) 0.69–0.80; $p<0.0001$) (Fig. 1). Increased NRBC values of were found in 43.4% of all patients during the ICU stay and resulted in a fivefold risk of death (odds ratio 5.03; 95% CI 3.19–7.90; $p<0.0001$). Higher death rate of patients overshooting the determined cut-off during ICU-stay was confirmed using Cox proportional-hazards model (hazard ratio (HR) 2.39; 95% CI 1.62–3.59; $p<0.0001$).
NRBCs 100/µl were associated with a longer duration of ICU stay (31 (17; 51) vs. 21 (12; 34) days; $p<0.001$) and longer invasive ventilation (458 (224; 774) vs. 120 (30; 308) hours; $p<0.001$). Extracorporeal membrane oxygenation was significantly more often used in patients with increased NRBCs (30 (14.9%) vs. 3 (1.1%); $p<0.0001$). Patients with NRBC values below the threshold of 100/µl had a significant survival advantage (HR 0.43; 95% CI 0.30–0.62; log rank $p<0.0001$) (Fig. 2).
**Conclusions:** NRBCs predict mortality in critically ill septic patients with good prognostic power. Further studies are required to confirm the cut-off level of NRBCs and evaluate the clinical impact for prognostic enrichment.

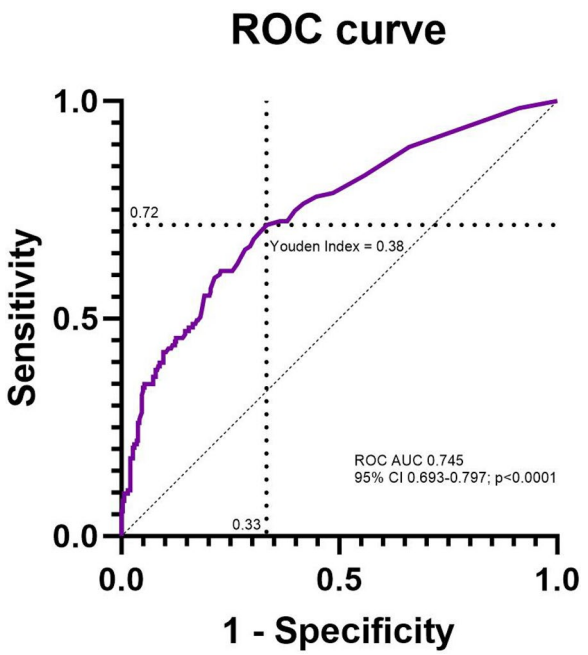


**Fig. 1 (abstract 000986)** Receiver operating curves (ROC) analysis for maximum nucleated red blood cells (NRBCs) values with the endpoint intensive care unit (ICU) mortality and analyzed Youden Index (0.38 at NRBCs 100/µl)

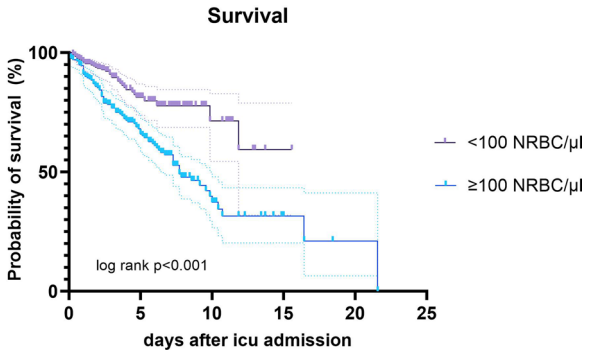


**Fig. 2 (abstract 000986)** Probability of survival depicted as Kaplan–Meier curves in patients with a maximum NRBC value of above or below 100/µl

**Reference(s)**
1. Funded by the Kurt Goldstein Institute, Germany (KGI-KochT-1–052019)

**Topic:** Sepsis

## 000987

### Correlation of resistance index and renal perfusion pressure with the severity of acute kidney injury

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**Introduction:** Acute kidney injury is a frequent complication in the intensive care unit (ICU) leading to prolonged stay and increased mortality; severity staging requires markers such as creatinine which is late and with multiple factors that bias its measurement and interpretation. Renal ultrasound has increased its use, mainly the resistive index, in addition, the evaluation of renal perfusion in post-surgical patients has been described, however, its relationship with severity in acute kidney injury has not been demonstrated.
**Objectives:** To establish the correlation of the resistive index and renal perfusion pressure with the severity of acute kidney injury in the intensive care unit.
**Methods:** Cross-sectional study in the intensive care unit; patients with acute kidney injury were included and severity was staged according to KDIGO criteria, and renal vascular ultrasonographic measurements were obtained. Statistical analysis was with Kendal's Tau-b test and linear regression analysis.
**Results:** Final population of 81 patients, the variable that correlated with severity was renal perfusion pressure ($r=0.62$, $p\leq0.001$) and diastolic velocity ($r=0.30$, $p=0.007$), however, the resistive index had no correlation ($r=0.135$, $p=0.314$). Similarly, renal perfusion pressure correlated with changes in creatinine ($r=-0.554$), BUN ($r=-0.480$) and bicarbonate ($r=0.331$).

**Table 2 (abstract 000987)** Correlation of renal flow measured with ultrasonography with the level of severity of acute kidney injury by KDIGO scale

| | Correlation | *p* |
|---|---|---|
| Right kidney | | |
| Resistance index | 0.14 | 0.214 |
| Systolic velocity, cm/s | 0.167 | 0.135 |
| Diastolic velocity, cm/s | **−0.321** | **0.012** |
| Average speed, cm/s | **0.219** | **0.049** |
| Renal perfusion pressure, mmHg | **−0.695** | **<0.001** |
| Left kidney | | |
| Resistance index | 0.108 | 0.722 |
| Systolic velocity, cm/s | 0.183 | 0.102 |
| Diastolic velocity, cm/s | **−0.29** | **0.026** |
| Average speed, cm/s | 0.123 | 0.239 |
| Renal perfusion pressure, mmHg | **0.63** | **<0.001** |
| Average | | |
| Resistance index | 0.134 | 0.315 |
| Systolic velocity, cm/s | 0.169 | 0.132 |
| Diastolic velocity, cm/s | **−0.301** | **0.006** |
| Average speed, cm/s | 0.198 | 0.077 |
| Renal perfusion pressure, mmHg | **−0.775** | <0.001 |

It is described by Kendal's Tau-b correlation, with statistical significance with $p\leq0.05$.
Finally, it was found that renal perfusion pressure was correlated with changes in creatinine ($r=-0.554$, $p=0.001$, **Fig. 2)**, changes in BUN ($r=-0.480$, $p=0.001$) and with bicarbonate (0.331, $p=0.003$).
**Conclusions:** No statistically significant results were found in relation to the resistive index, however, we found that the decrease in renal perfusion pressure correlates with greater severity of acute kidney injury in the intensive care unit.

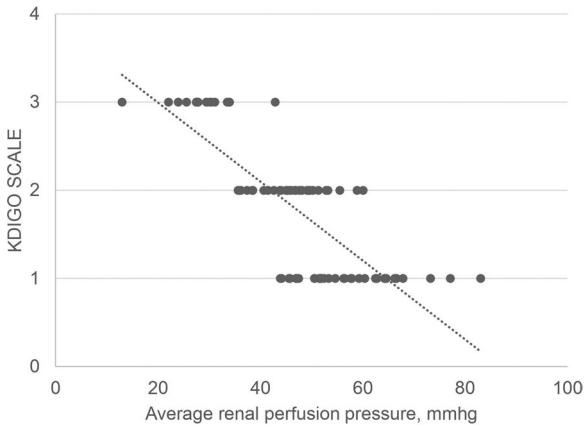


**Fig. 1 (abstract 000987)** Scatter diagram observing a negative correlation between the average renal perfusion pressure with the KDIGO scale ($r=-0.775$ 95% CI 0.644–0.883, $p\leq0.001$) as well as a relationship of $r^2=0.620$ $p\leq0.001$

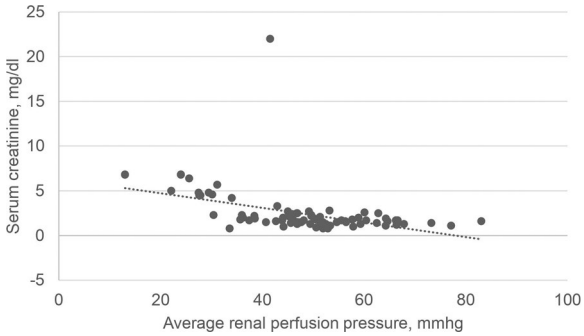


**Fig. 2 (abstract 000987)** Scatter diagram observing a negative correlation between average renal perfusion pressure with serum creatinine ($r = -0.408$ 95% CI 0.291–0.575, $p \leq 0.001$)

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2. Felipe

**Topic:** Acute kidney injury and haemofiltration

## 000988

## The high tidal volume variability is associated with worse outcomes in the acute respiratory distress syndrome: a retrospective cohort study

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**Introduction:** The impact of spontaneous breathing during mechanical ventilation on the outcome of acute respiratory distress syndrome (ARDS) has not been established. Spontaneous breathing of appropriate intensity and timing may improve atelectasis in the dependent lung regions, preserve diaphragm function, and thereby shorten the duration of mechanical ventilation. However, excessive spontaneous breathing, especially when lungs are vulnerable to injury, can induce patient self-inflicted lung injury or diaphragm injury, or exacerbate pre-existing lung injury.

**Objectives:** We hypothesized that higher tidal volume variability, reflecting excessive spontaneous breathing, would be associated with lung injury and worse outcomes in patients with ARDS. The aim of this study was to evaluate the effect of tidal volume variability on ventilator-free days in mechanically ventilated patients with ARDS using high-resolution tidal volume data collected through the patient monitor.
**Methods:** In this single-center, retrospective cohort study, adult ARDS patients who received mechanical ventilation in our medical intensive care unit between April 2018 and July 2019 were included. The study patients' expiratory tidal volume data during the first 7 days of mechanical ventilation were collected every 2 s from the patient monitors. The included patients were equally divided into three groups according to the coefficient of variation (CV) of all collected tidal volume values normalized by predicted body weight—low, intermediate, and high CV groups. The primary outcome was ventilator-free days within the first 28 days of mechanical ventilation.
**Results:** A total of 108 ARDS patients were categorized into the low, intermediate, and high CV groups (36 patients each). Baseline characteristics of the three groups were comparable except for a lower PaO2/FiO2 ratio in the low CV group (130 ± 50 mm Hg vs. 160 ± 57 mm Hg vs. 158 ± 50 mm Hg; P = 0.03). An average of 222,776 tidal volume data per patient were collected during the first 7 days of mechanical ventilation. The CV of the tidal volumes were 0.17 ± 0.03, 0.26 ± 0.02, and 0.38 ± 0.08 in each CV group, respectively. The number of ventilator-free days was significantly lower in the high CV group than in the intermediate CV group (0 [IQR, 0–2.5] days vs. 16 [IQR, 0–21.5] days; $P = 0.001$, statistically significant after Bonferroni correction). After adjustment for age, sex, body mass index, APACHE II score, and baseline PaO2/FiO2 ratio in the zero-inflated negative binomial model, high CV was significantly associated with more zero ventilator-free days compared with intermediate CV (odds ratio, 4.6; 95% CI [1.6–13.2]; $P = 0.005$).
**Conclusions:** Based on the high-resolution tidal volume data acquired from the patient monitor, high tidal volume variability during the first 7 days of mechanical ventilation in ARDS patients was associated with fewer ventilator-free days.

**Reference(s)**
1. None
2. None

**Topic:** Acute respiratory failure and mechanical ventilation

## 000989

### Evaluating the implementation of a nurse-led family support intervention from the perspective of ICU health care professionals (FICUS study): results of an embedded qualitative study

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**Introduction:** The FICUS hybrid study, initiated in 2021, aims to evaluate the effectiveness of a nurse-led interprofessional family support intervention (FSI) in intensive care units (ICUs), and tests whether active family support by a specialized family nurse in collaboration with the ICU team improves care quality and reduces negative effects on family members' mental health (Naef et al., 2022). In addition, integration of the FSI into real-world ICU contexts is also investigated (Oesch et al., 2023).
**Objectives:** To explore ICU team members' experiences with the FSI implementation.
**Methods:** Multicentre, qualitative evaluation using semi-structured focus group interviews ($n = 8$), conducted towards the end of the active implementation phase (September 2023 to January 2024). Overall, 65 ICU team members of the eight ICUs allocated to the intervention arm participated in the interviews with an average of eight participants per interview (range 6–11). Participants included ICU nurses, physicians, family nurses and leadership persons. Face-to-face interviews were conducted in hospital meeting rooms, with a median duration of 70 min (range 50–120 min). Interviews were audio-recorded, transcribed, and analysed using content analysis methods (Erlingsson & Brysiewicz, 2017; Graneheim et al., 2017).
**Results:** Findings indicated that FSI implementation in ICU teams was influenced by preexisting ICU implementation climate (team/organizational readiness, collaborative culture), capacity (staff and time resources), intervention adaptability, and the challenge of clinical study processes and requirements. Implementation was facilitated by clarifying responsibilities of the family nurse role, establishing FSI delivery structures and workflow, and by proactively engaging members of the team by implementation leaders (family nurse, ICU leadership persons). Participants perceived the FSI to provide valuable support for families to deal with uncertainty, emotional burden and information needs during ICU stay, and experienced a high need for post-ICU support. Overall, the FSI of the new family nurse role and family care pathway was experienced as a benefit to the ICU team, supporting their capacity to care for patients without neglecting families, and improving their interprofessional collaboration with families.
**Conclusions:** Team readiness and capacity, interprofessional leadership and implementation support, intervention adaptability, workflow redesign, and perceptions of benefit appeared to be essential to support successful FSI integration and delivery in intervention ICUs. Subsequent studies should explore implementation beyond a clinical trial context.

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**Topic:** Nursing care and physiotherapy

## 000995

### Prevalence of upper limbs peripheral nerve injuries in patients undergoing prone positioning: a systematic review with proportional meta-analysis

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**Introduction:** Prone positioning, a technique used since the 1970s to enhance oxygenation in adults with ARDS, gained widespread use during the COVID-19 pandemic. However, complications such as pressure ulcers, unplanned extubation, and nerve injuries like brachial plexopathy are well-documented. While the exact epidemiology of upper limb peripheral nerve injuries (PNI) related to prone positioning remains unclear, several cases have been documented during the

pandemic. Therefore, a meta-analysis of available studies on upper limb PNIs is proposed to address this gap in understanding.
**Methods:** This systematic review with proportional meta-analysis was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and Meta-analysis of Observational Studies in Epidemiology (MOOSE) reporting guidelines. Four electronic databases including PubMed, the Cumulative Index to Nursing and Allied Health Literature, The Cochrane Library, and EMBASE were searched from inception to January 2024.
**Results:** A total of 8 studies (511 patients) were pooled in the quantitative analysis. All studies had a low or moderate risk of bias in methodological quality. The overall proportion of patients with upper limbs PNI was 13% (95%CI 5% to 29%). Figure 1 presents the pooled prevalence estimates of the included studies using a forest plot. The overall effect size is not statistically different from zero ($P = 0.0287$). Furthermore, there is large evidence of between-study heterogeneity ($P < 0.001$): the 84.55% of the variability in the effect-size estimates is due to the differences between studies. The estimated between-study variance τ2 is 1.62: we then expect that in some 90% of all populations, the true prevalence will fall in the approximate range of 1% and 71%. All studies included in the meta-analysis reported enrollment during the first wave of the COVID-19 pandemic. A total of 3 studies detected upper limbs PNI during the follow-up period, while only 1 study conducted specific diagnostic investigations before ICU discharge. Only 2 studies reported that a dedicated multidisciplinary team (consisting of intensivists, nurses, and respiratory therapists) performed the prone positioning maneuver.
**Conclusions:** Prone positioning remains a life-saving maneuver, and the potential risks related to it should not be underestimated. The low prevalence of upper limbs PNI among patients undergoing prone positioning stress the challenges of diagnosing such nerve injuries in complex clinical settings and raises concerns about potential selective reporting of cases during the COVID-19 pandemic.

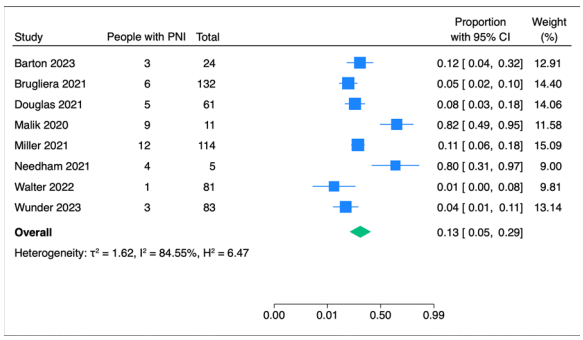


**Fig. 1 (abstract 000995)** The forest plot of the overall pooled prevalence of upper limbs PNI. A blue square is plotted for each study, with the size of the square being proportional to the study weight. The estimate of the overall effect size is depicted by a green diamond: its width represents the corresponding CI

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**Topic:** Nursing care and physiotherapy

## 000996

### Does extending the duration of oseltamivir beyond 5 days improve outcomes in critically ill patients with severe influenza infection?

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**Introduction:** Current WHO and CDC recommendations state that extending oseltamivir treatment duration is appropriate when the clinical course of influenza infection remains severe or progressive, despite 5 or more days of antiviral treatment; however, the evidence supporting this recommendation is limited.
**Objectives:** We aimed to describe the use of extended duration oseltamivir and evaluate differences in clinical outcomes based upon oseltamivir treatment duration in ICU patients with severe influenza.
**Methods:** This clinical effectiveness study utilized the Premier database and included ICU patients > 18 years old admitted to a US hospital between January 1, 2016 and December 31, 2021 who were treated with at least 2 days of oseltamivir therapy for a diagnosis of influenza. Patients were placed into standard duration (≤ 5 days) or extended duration (> 5 days) groups. The primary outcome was hospital mortality. Secondary outcomes included ICU and ventilation-free days, cost, and drug-related adverse events. A propensity-matched analysis, including matching for hospital length of stay, was used for evaluation of outcomes between groups.
**Results:** A total of 98,992 patients from 920 hospitals were evaluated: 23,699 (24%) in the extended duration and 75,293 (76%) in the standard duration oseltamivir group. At baseline, patients receiving extended duration therapy were more commonly receiving vasopressors (15.8% vs. 9.6%, $p < 0.01$), invasive mechanical ventilation (26.5% vs. 14.6%, $p < 0.01$), or non-invasive ventilation (31.3% vs. 21.4%, $p < 0.01$) compared to standard duration patients. After propensity matching ($n = 15,352$ per group), extended duration oseltamivir treatment was associated with reduced mortality (7.4% vs 8.9%, $p < 0.01$). This difference remained significant after adjusting for unbalanced covariates (OR 1.18; 95% CI 1.08–1.28; p < 0.01). Twenty-eight day ICU-free days (24 vs. 25 days, $p = 0.02$) and assisted ventilation-free days (25 vs. 25 days, $p =$ NS) were similar between treatment groups. No differences in potential oseltamivir related adverse effects ($p > 0.05$ for all) were observed between groups. Extended duration was associated with increased median hospital cost ($81,705 vs. $74,400, $p < 0.01$).
**Conclusions:** Extended duration oseltamivir was used in ~ 25% of ICU patients admitted with severe influenza. Utilization of extended duration oseltamivir therapy was associated with a trend towards improved mortality, suggesting that extending antiviral treatment beyond 5 days may be appropriate in certain critically ill patients with severe influenza.

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**Topic:** Infections and prevention

## 000998

### Intra-abdominal cytomegalovirus reactivation in acute necrotising pancreatitis patients

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**Introduction:** Recent studies demonstrate cytomegalovirus (CMV) reactivation in apparently non-immunosuppressed critically ill patients with incidence ranging from 25% to as high as 60% across various cohorts [1, 2]. However there is a lack of knowledge on incidence of CMV reactivation in patients with acute necrotising pancreatitis (ANP), a condition notorious for intra-abdominal infections (both bacterial and fungal) during their clinical course.
**Objectives:** To study the incidence of intra-abdominal CMV reactivation in critically ill acute necrotizing pancreatitis (ANP) patients.
**Methods:** After institutional ethics committee approval and trial registration (NCT05898048), this prospective study screened all adult ICU patients having the diagnosis of ANP with at least 2 week duration of illness with a peripancreatic drain in situ according to clinical indication. Exclusions were age < 18 years, expected survival < 72 h, pancreatitis duration > 10 weeks, recent antiviral use, known immune deficiencies, haematological malignancies, immunosuppressive medication, chemotherapy/radiotherapy, and pregnancy. Eligible patients, in whom anti-CMV IgG antibodies were present, samples from peripancreatic collections (drain in closest proximity of pancreas) were collected weekly until the 10th week of illness or ICU discharge (whichever comes first) to assess the CMV reactivation and its viral load kinetics. CMV reactivation was defined as viral load > 1000/cc, using CMV quantitative real time PCR.
**Results:** During the study period (Jun 2023-Feb 2024), 20 out of 39 ANP patients met eligibility criteria. At ICU admission, these 20 patients had median age 35 years (IQR 24–40); 90% males, Charlson's co-morbidity index 0 (IQR 0–1). On the day of study inclusion median SOFA score was 6 (IQR 5–9), median day of illness 29 (IQR 17–38) with CT scan severity index (CTSI) 10 (IQR 9–10). CMV reactivation was observed in 9 out of 20 patients (45%). Among the patients who had CMV reactivation, 55.5% ($n = 5$) had concurrent bacterial and 11.1% ($n = 1$) had fungal infection in peripancreatic intra-abdominal collections (Fig. 1). The median day of CMV reactivation was 50 (IQR 44–56), with median copies of 25750/cc (3150–18975) (Fig. 2). The clinical characteristics of patients having CMV reactivation vis-a-vis non-reactivation were: age 39 vs 33 ($p = 0.17$), Charlson's co-morbidity index 0 vs 0 ($p = 0.23$), SOFA 6 vs 6 ($p = 0.76$), CTSI score 10 vs 10 ($p = 0.33$), day of pancreatitis at inclusion 28 vs 29 ($p = 0.65$), duration of ICU stay 60 vs 20 ($p = 0.01$). The mortality at ICU discharge in CMV reactivation group was 55.6% compared to 45.5% in the non-reactivation group ($p = 0.97$).
**Conclusions:** In patients with ANP, intra-abdominal CMV reactivation occurs in almost half of the patients during their 6th to 8th week of illness, with higher crude mortality in comparison to patients who did not have CMV reactivation. These patients have longer duration of ICU stay in comparison to patients without CMV reactivation.

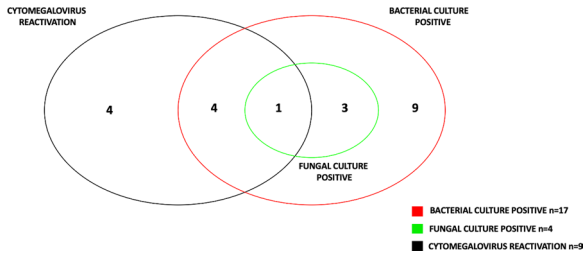


**Fig. 1 (abstract 0009987)** Venn diagram showing number of patients having CMV reactivation, bacterial and fungal infections in peri-pancreatic collection in acute necrotising pancreatitis patients

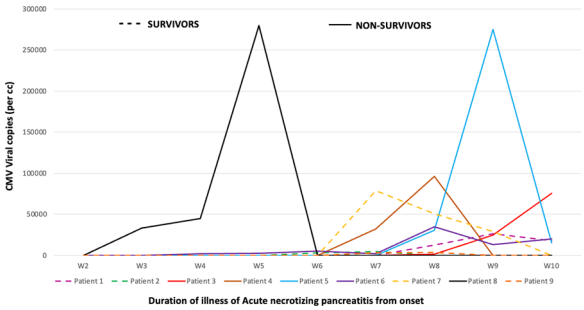


**Fig. 2 (abstract 000998)** CMV viral load kinetics of individual patients ($n = 9$) during their ICU stay

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**Topic:** Infections and prevention

## 000999

### Extracellular vesicles derived from human umbilical cord mesenchymal stem cells attenuate septic acute kidney injury by delivering miR-125a-5p and miR-125b-5p to inhibit inflammation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**000999

**Introduction:** Sepsis is a fatal disease with high morbidity and mortality, and acute kidney injury is a common complication. Recent studies have shown that excessive inflammatory response is a key mechanism for sepsis-induced acute kidney injury (SAKI). Extracellular vesicles derived from human umbilical cord mesenchymal stem cells (hucMSC-sEV) have the capacity for intercellular signaling communication, making them a novel therapeutic strategy for various diseases. Our previous study found that hucMSC-sEV has a protective effect on ischemia reperfusion-induced AKI. However, the use of hucMSC-sEV in SAKI has been rarely reported.
**Objectives:** To investigate the protective effect of hucMSC-sEV against SAKI and its potential mechanism.
**Methods:** hucMSC were extracted for culture and identification, and hucMSC-sEV were collected and characterized. SAKI model was

established by cecal ligation and puncture in vivo and HK-2 cells induced by LPS in vitro, and hucMSC-sEV was given. The weight change and survival rate of mice were counted daily. IVIS imaging systems assess the relationship between organ damage and sEV distribution. Serum levels of Scr, BUN, Cys-C and NGAL were measured to reflect renal function. The mRNA levels of Kim-1 and inflammatory markers (IL-1β, IL-6, TNF-a, MCP-1 and F4/80) were measured by qRT-PCR. HE and immunohistochemical/fluorescent staining were performed to assess tissue damage. RNA sequencing was used to explore the key effector molecules of SAKI. Analysis of protective molecules in sEV cargoes by exosome miRNA sequencing.

**Results:** We successfully isolated and characterized hucMSC-sEVs. hucMSC-sEV converge heavily on CLP-induced injury to the kidney, attenuate AKI by delivering miR-125a-5p and miR-125b-5p, miRNAs that are highly enriched in hucMSC-sEVs, and reduce mortality. miR-125a-5p and miR-125b-5p co-target to inhibit TNFR2 expression, which in turn inhibited the activation of NF-κB signaling pathway, reduced the level of inflammatory factors, and ameliorated kidney injury. Furthermore, hucMSC-sEV also significantly attenuated LPS-induced HK-2 cells injury in vitro. However, when miR-125a-5p and miR-125b-5p were knocked down in hucMSC, the protective effect of mucMSC-sEV against SAKI was reduced.

**Conclusions:** In SAKI, hucMSC-sEV may inhibit the inflammatory response and ameliorate renal injury by delivering miR-125a-5p and miR-125b-5p to co-regulate the TNFR2/NF-κB signaling pathway, thereby improving survival.

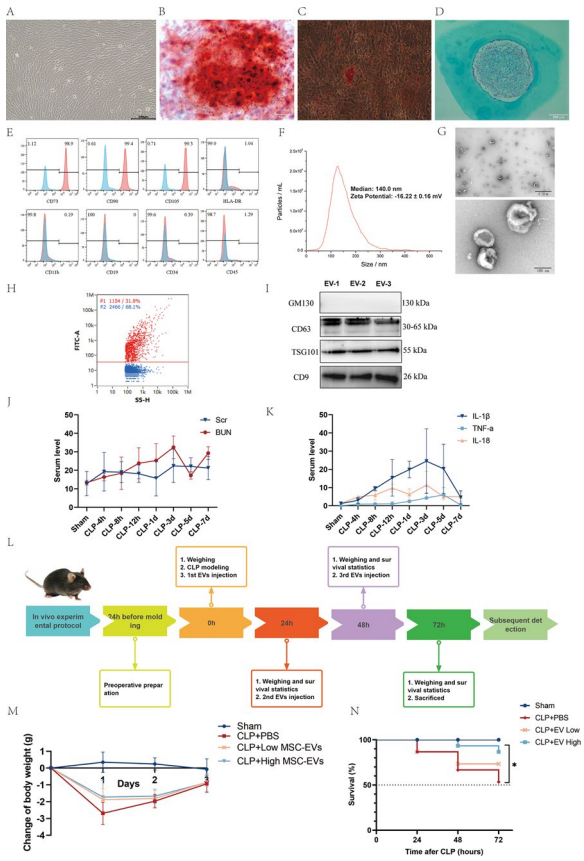


**Fig. 1 (abstract 000999)** Characterization of MSC-EVs and intervention in septic mice. (A) Growth morphology of MSC cells under light microscope. (B) MSC osteogenic differentiation map. (C) MSC adipogenic differentiation map. (D) MSC differentiation into cartilage. (E) MSC marker identification. (F) Nanoparticle tracing analysis results for MSC-EVs. (G)Representative transmission electron microscopic images of MSC-EVs. (H) CD63 nanoflow assay results for MSC-EVs. (I) Western blot analysis of MSC-EVs marker protein. (J) Changes in serum Scr at different time points after CLP. (K) Changes of serum inflammatory factors (IL-1β, TNF-a and IL-18) at different time points after CLP. (L) Experimental protocol of MSC-EVs intervention in sepsis mouse model established by CLP. (M) Daily weight changes of animals in each group. (N) Survival curves of animals in each group

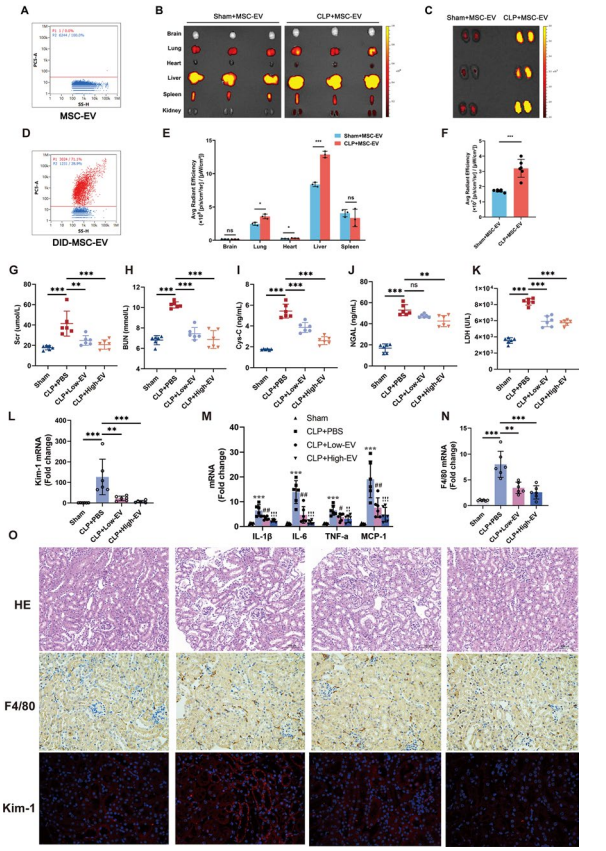


**Fig. 2 (abstract 000999)** Evaluation of the protective effects of MSC-EVs on septic mice. (A) Positive rate of MSC-EVs assessed by nanoflow. (B) Organ distribution of DID-MSC-EVs. (C) Renal distribution of DID-MSC-EVs. (D) Positive rate of DID-MSC-EVs assessed by nanoflow. (E) Semi-quantitative comparison of fluorescence intensity of DID-MSC-EVs in various organs. (F) Semi-quantitative comparison of fluorescence intensity of DID-MSC-EVs in kidney tissue. (G) Serum Scr level of mice in each group. (H) Serum BUN levels of mice in each group. (I) Serum Cys-C level of mice in each group. (J) NGAL levels in serum of mice in each group. (K) LDH level in serum of mice in each group. (L-N) qRT-PCR was used to detect the mRNA expression of Kim-1, IL-1b, IL-6, TNF-a, MCP-1 and F4/80. (O) Representative images of HE staining, F4/80 immunohistochemistry, and Kim-1 immunofluorescence of kidney tissue. Data are presented as mean ± SD, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$, one-way ANOVA

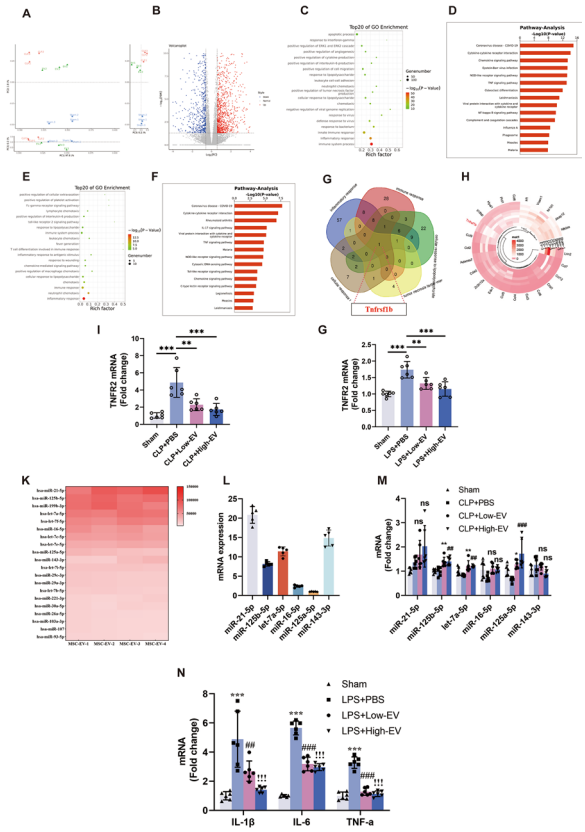


**Fig. 3 (abstract 000999)** The mechanism of MSC-EVs in septic mice. (A) Principal component analysis results of RNA sequencing. (B) Volcano map of differentially expressed genes between CLP and Sham groups. (C) GO analysis results of the differential gene Top20 up-regulated in CLP group. (D) Pathway enrichment results of differentially up-regulated genes in CLP group. (E) GO analysis results of differential gene Top20 downregulated after MSC-EVs intervention. (F) Pathway enrichment results of downregulated genes after MSC-EVs intervention. (G) BP cross-analysis results of differentially expressed genes associated with immune inflammation. (H) Heat map of genes associated with TNF signaling pathway. (I) TNFR2 mRNA levels in kidney tissues of each group. (G) TNFR2 mRNA expression level in HK-2 cells of each group. (K) Top 20 for miRNA sequencing in MSC-EVs cargo. (L) qRT-PCR to detect miRNAs in MSC-EVs content. (M) qRT-PCR was used to detect miRNA levels in kidney tissues of each group. (N) qRT-PCR was used to detect the mRNA expression of inflammatory factors in the in vitro model. Data are expressed as mean ± SD, $^{**}p < 0.01$, $^{***}p < 0.001$, one-way ANOVA

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4. None

**Topic:** Acute Kidney Injury and haemofiltration.

## 001000

### Analysis of acute poisoning in the ICU of a second-level hospital over two years

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001000

**Introduction:** Severely intoxicated patients are a common admission to UCI in case they do not respond to initial treatment in the emergency room. This can be accidental or intentional exposure to drugs of abuse, known or not, resulting in additional difficulties involved in their management until the identification of the causative toxin.
**Objectives:** Our main goal is to describe the epidemiology, and to establish whether there is a correlation between the patients' previous dependency status, and the development of intra-ICU complications, length of stay, days of mechanical ventilation and mortality.
**Methods:** This is a retrospective, observational study conducted in the ICU, during 2 years by systematic review of the medical records. Demographic data were collected, APACHE II score, toxicity causing SAI, intubation, days of mechanical ventilation, morbidity, need for dialysis, days of ICU stay. Mortality was not included due to the low mortality rate. Statistical analysis was performed using SPSS, using the $\chi 2$ test for normally distributed variables and the Mann–Whitney U test for non-normal variables, considering $p < 0.05$ the level of statistical significance.
**Results:** 31 subjects were included. Among the males, 88.2% had a history of previous dependence, of which 17.6% were homeless and 11.8% were institutionalized. The mean age was 45. The mean length of stay was 6 days. The APACHE score with previous dependence was 23.27 while in non-dependent patients it was 17.57. The most frequent intoxication was due to drugs of abuse 48.4%, followed by pharmaceuticals 45.2% and of these, up to 80.6% were caused by a combination of toxics. Complications included seizures, rhabdomyolysis, acidosis, subarachnoid hemorrhage, long QT, cardiac arrest and death, which globally accounted for 41.9% of all complications, followed by infection in up to 25.8%; delirium and withdrawal syndrome occurred in 6% of patients with previous dependence. Orotracheal intubation was required in 90.3% of patients, with no significant differences between the group with prior dependency and the group without it. The need for re-intubation after initial extubation was similar in the two groups but for different causes, with agitation predominating in patients with previous dependence. The need for dialysis was 12.9% overall and 28.6% among patients without previous dependence, mostly related to drug intoxication, which was statistically significant.
**Conclusions:** Most were male, with SAI due to combinations mostly including benzodiazepines. Intoxication by drugs of abuse predominates in patients with previous drug dependence as opposed to drug intoxication, which predominates in patients without dependence, although this was not statistically significant. Most patients (90.3%) required orotracheal intubation, with no significant differences between patients with and without previous dependence, with similar mean length of stay. In our sample there are no difference in terms of intra-ICU evolution between patients with and without prior dependency, which is counterintuitive, but could be explained by the good evolution of these patients in general. The need for dialysis was 12.9% overall and 28.6% among patients without previous dependence, mostly related to drug intoxication, which was statistically significant ($p = 0.032$). This is due to the fact that dialysis is part of the treatment of many drug intoxications and its use responds more to elimination treatment than to the development of acute renal failure.

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**Topic:** Poisoning/Toxicology/Pharmacology

## 001001

### Development and evaluation of an artificial intelligence-based decision support system to optimise mechanical ventilation in acute respiratory failure

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**Introduction:** Finding an individualised mechanical ventilation (MV) strategy to ensure gas exchange while avoiding ventilator-induced organ damage is challenging in acute respiratory distress syndrome (ARDS).

**Objectives:** We aimed to develop a reinforcement learning-based decision support system (IntelliLung DSS) to dynamically suggest optimised ventilator settings using historic patient data and evaluate its performance in a porcine ARDS model.

**Methods:** Following approval of the institutional review board at the Medical Faculty Dresden (BO-EK-423082021), data from invasively ventilated adult patients with ARDS or pneumonia admitted to the intensive care units (ICU) of the University Hospital Dresden were used to develop the IntelliLung DSS. We randomly selected 80% of the data for training and 20% for the clinical evaluation. We used a discrete batch-constrained deep Q-learning (BCQ) approach to suggest optimised settings for positive end-expiratory pressure (PEEP), inspiratory oxygen fraction (FIO2) and respiratory rate (RR). The patient state was described using 12 variables of MV, gas exchange, haemodynamics and lab results as multidimensional time series in 10-min time steps. The rewards function of the algorithm was defined as ICU mortality and short-term pulmonary and physiological rewards within safe ranges. For prospective performance evaluation four pigs were anaesthetised after approval (AZ: 25-5131/522/24) and sequential lung injury was induced using surfactant depletion (LAVAGE), injurious MV (VILI) and continuous intravenous lipopolysaccharide infusion (LPS). A fixed tidal volume of 6 ml/kg was used throughout the experiment. PEEP, FIO2 and RR were set in each lung injury block in randomised order according to either the IntelliLung DSS or ARDS network protocol (ARDSnet, low PEEP table for PaO2/FIO2 > 175 mmHg and high PEEP table for PaO2/FIO2 < 175 mmHg at the respective baseline)[1] for 180 min each (cross-over design). Respiratory and haemodynamic variables were recorded every 15 min. Statistical analysis was performed with SPSS using a general linear model for repeated measurements (mean ± standard deviation).

**Results:** Data from 942 patients (653 male, 289 female; 64 ± 16 years, ICU mortality 25%, year of admission: 2010–2020) were used for algorithm development and clinical evaluation. In the clinical evaluation, the IntelliLung DSS more frequently suggested lower FIO2 (≤ 40%) and PEEP (≤ 10 cmH2O) and more frequently RR ≤ 18 /min compared to the clinician. In the animal study, RR was not significantly different between IntelliLung DSS (30 ± 2 $min^{-1}$) and ARDSnet (31 ± 4 $min^{-1}$, $P = 0.757$) (Fig. 1). In the LAVAGE block, FIO2 according to IntelliLung DSS was higher than during ARDSnet (43 ± 22 vs 37 ± 21%, $P = 0.038$), whereas in VILI and LPS blocks there was no significant difference between IntelliLung DSS and ARDSnet strategy (Fig. 1). In the VILI block, PEEP according to IntelliLung DSS was higher compared to ARDSnet (7.4 ± 1.3 vs 5.2 ± 0.7 cmH2O, $P < 0.001$), whereas in LAVAGE and LPS block there was no significant difference between IntelliLung DSS and ARDSnet (Fig. 1). In the LAVAGE block, the ratio of peripheral oxygen saturation (SpO2) to FIO2 was significantly lower during IntelliLung DSS than during the ARDSnet strategy, but not in the VILI and LPS block (Fig. 2). There was no significant difference in mechanical power (Fig. 2), mean arterial pressure (Fig. 2), cardiac output and arterial pH between IntelliLung DSS and ARDSnet strategy regardless of the lung injury block.

**Conclusions:** The IntelliLung DSS was applicable both clinically and experimentally. In the retrospective clinical evaluation, IntelliLung DSS proposed a ventilation strategy with lower FIO2 and PEEP values compared to the clinician. In the animal study, IntelliLung DSS allowed the individualisation of MV similar to the ARDSnet settings, avoiding extreme PEEP values.

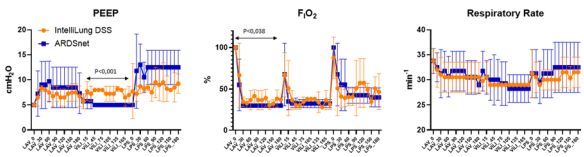


**Fig. 1 (abstract 0001001)** Mean and standard deviation. IntelliLung DSS, mechanical ventilation according to the IntelliLung decision support system; ARDSnet, mechanical ventilation according to the ARDS network protocol; PEEP, positive end-expiratory pressure; FIO2, inspiratory oxygen fraction; LAV, lung injury induced by surfactant depletion; VILI, lung injury induced by injurious mechanical ventilation; LPS, lung injury induced by intravenous lipopolysaccharide infusion; ns, not significant

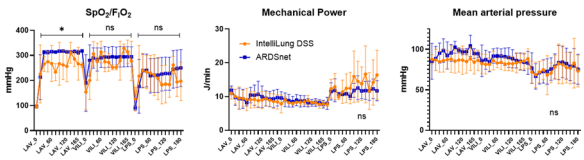


**Fig. 2 (abstract 0001001)** Mean and standard deviation. IntelliLung DSS, mechanical ventilation according to the IntelliLung decision support system; ARDSnet, mechanical ventilation according to the ARDS network protocol; SpO2, peripheral oxygen saturation; FIO2, inspiratory oxygen fraction; LAV, lung injury induced by surfactant depletion; VILI, lung injury induced by injurious mechanical ventilation; LPS, lung injury induced by intravenous lipopolysaccharide infusion; ns, not significant; *$P < 0.05$

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2. This work was supported by an institutional grant of the EKFZ FOR DIGITAL HEALTH at the Medical Faculty Carl Gustav Carus Dresden, Germany

**Topic:** Acute respiratory failure and mechanical ventilation

## 001002

### Early dynamics of metabolic profile in multiple trauma patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001002

**Introduction:** Multiple trauma patients present a particular nutritional risk, since they exhibit high nitrogen demands and associated nutritional therapy challenges, caused by repeated surgical intervention or multiple imagistic procedures. Current published data regarding metabolic profile in the early acute phase are rather contradictory. However, there is currently a lack of clear data regarding metabolic profile description, especially in the early acute phase.
**Objectives:** This prospective observational randomized study aims to personalize energy and protein intake for severe multiple trauma patients by utilizing continuous monitoring of their metabolic profile.
**Methods:** This single-center pragmatic study was conducted at the Trauma Center of the Clinical Emergency Hospital of Bucharest. It included all patients with multiple trauma (Injury Severity Score (ISS) > 18) who were mechanically ventilated upon admission to the ICU or within the first 24 h of admission, and remained ventilated for at least 48 h. Patients excluded from the study were those under 18 years old, not intubated or not receiving mechanical ventilation, only on non-invasive ventilation, with contraindications to enteral feeding 48 h after admission, those who had undergone recent gastrointestinal surgical intervention, on chronic corticosteroid therapy and pregnant women. Indirect calorimetry was initiated within the initial 6 h of ICU admission to continuously evaluate the metabolic profile and energy needs using E-sCOVX® module paired with Carescape Monitor B450® (GE Healthcare, Helsinki, Finland). Nutritional support was started 48 h after admission or shock control, using a ramped fashioned approach. Statistical analysis of the database was performed using GraphPad Prism 10. Normality of data distribution was tested with the D'Agostino–Pearson test. Both descriptive data analysis and Pearson correlation coefficient were examined.
**Results:** Out of 38 patients with multiple trauma admitted to our unit, 29 were included in the final group study after applying the exclusion criteria. The median age in the study group was 43 (22–82) and 20 patients were male. BMI calculation, revealed a median value of 26,3 kg/m$^2$. Mean blood sugar level was 162.33 mg/dL (SD = 48.4). Trauma severity assessment revealed a median ISS score of 40 (18–66). Indirect calorimetry measurements in the first 6 h after admission revealed a mean VO2 (oxygen consumption) of 320.8 ml/min (SD = 77.59) and for rest energy expenditure (REE), the mean value was 2094 kcal/day (SD = 472.4). The high standard deviation value indicates increased variation in energy expenditure among patients. Furthermore, the range of REE values, from 1322 to 3167, highlights a broad spectrum of energy expenditure levels among multiple trauma patients, potentially influencing muscle loss, nutritional strategies, and rehabilitation outcomes. No significant correlation was observed between traumatic injuries (brain injuries, thoracic trauma or abdominal trauma) and metabolic profile. There was also no direct correlation observed between the SOFA and APACHE II scores and the metabolic profile data.
**Conclusions:** This study suggests the importance of real-time monitoring of the metabolic profile in multiple trauma patients to gain a deeper understanding of the acute injury's impact. The significant variation in REE within our cohort study and the absence of any correlation between traumatic assessment and severity scores, suggests that metabolic status should be assessed individually. We consider that the original metabolic response described (early/late flow phase) may not accurately identify nutritional needs and the true catabolic impact of trauma.

**Reference(s)**
1. Partially supported by Danone Nutricia Research, Nutricia Advanced Medical Nutrition

**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001003

### Robotic-assisted active mobilization in the intensive care unit: the ROBI randomized clinical trial

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001003

**Introduction:** Active mobilization of critically ill patients reduces the development of intensive care unit-acquired weakness and improves patient outcome. (1, 2) However, active mobilization outside of clinical trials often remains inadequate. (3) Robotic assisted active mobilization might facilitate frequent and safe mobilization and can serve as a tool for precise control of mobilization intensity. VEMOTION (Reactive Robotics, Munich, Germany) enables robotically assisted in-bed patient mobilization, combining verticalization and gait-like leg movement.
**Objectives:** We therefore studied whether robotic assisted mobilization increases the total duration of mobilization when compared to a conventional mobilization strategy.
**Methods:** In this single center, prospective randomized clinical trial, we studied patients admitted to a Weaning Intensive Care Unit (ICU). Patients were randomized to receive either robotic assisted mobilization plus standard treatment, or standard mobilization alone. Predefined primary endpoints were the average minutes of mobilization per day and the total duration within 14 days. Secondary endpoints included the highest level of active mobilization as well as safety and feasibility of the intervention.
**Results:** Overall, 40 patients (13 women, mean age 64 ± 14 years) were analyzed. Daily duration of robotically assisted mobilization was significantly longer than standard active mobilization (65.3 ± 84.7 min vs 52.2 ± 73.3 min; $p = 0.009$) but not total duration in 14 days (intervention: 914.3 ± 629.8 min; control: 730.3 ± 433.8 min, $p = 0.534$). The overall level and frequency of mobilization were higher in the intervention group (Fig. 1).
**Conclusions:** A robotic assisted patient mobilization did not result in a significant increase of the total duration of mobilization in the 14 days after admission.

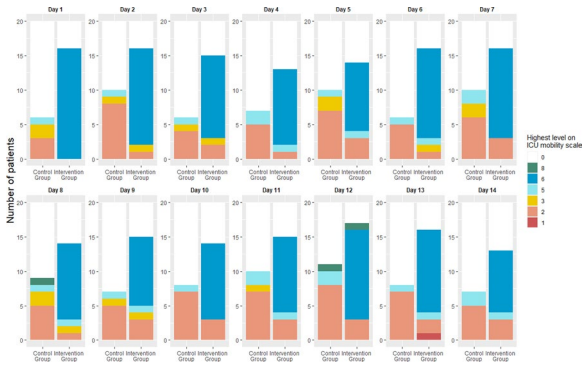


**Fig. 1 (abstract 0001003)** Highest level of mobilization according to the ICU Mobility Scale
ICU Mobility Scale: 0 (lying in bed), 1 (sitting and exercising in bed), 2 (passive movement from bed to chair, no standing), 3 (sitting on edge of bed), 4 (standing), 5 (transferring from bed to chair), 6 (marching in place at bedside), 7 (walking with assistance of two or more people), 8 (walking with assistance of one person), 9 (walking independently with gait aid), and 10 (walking independently without gait aid). Robotic mobilization was classified in category 6.

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**Topic:** Nursing care and physiotherapy

## 001004

### Early exposure to hyperoxia and 28-day mortality in adult patients with cardiogenic shock supported by veno-arterial extracorporeal membrane oxygenation: an analysis of nationwide CSECLS database in China

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001004

**Introduction:** Limited data are available on hyperoxia during early VA-ECMO support management.
**Objectives:** To evaluate the association between hyperoxia and 28-day mortality in adult patients with CS receiving VA-ECMO.
**Methods:** Adult patients diagnosed with CS receiving VA-ECMO support in the Chinese Society of ExtraCorporeal Life Support Registry database were included. Hyperoxia was defined as a PaO2 greater than 150 mmHg (mild:150 < PaO2 < 200, moderate: 200 ≤ PaO2 < 300 and severe: PaO2 ≥ 300). The primary outcome was 28-day mortality and the second outcome was renal replacement therapy (RRT), in-hospital mortality and successful weaning of VA-ECMO. Logistic regression model was used to examine the association between hyperoxia and outcomes by adjusting confounders.
**Results:** A total of 2351 patients were included in the final analysis. 28-day all-cause mortality was 39.0% and 48.5% patients received RRT while on ECMO course. 37.7% of patients with CS receiving VA-ECMO support were classified as hyperoxia, among which 319 patients were mild hyperoxia, 311 patients were moderate hyperoxia and 256 patients were severe hyperoxia. Hyperoxia (adjusted OR 1.523, 95%CI 1.157–2.006, $P=0.003$) was independently associated with higher 28-day mortality after adjusting confound factors. When the patients were divided into four groups according to different level of hyperoxia, moderate (adjusted OR 1.740, 95%CI 1.146–2.643, $P=0.009$) and severe (adjusted OR 2.049, 95%CI 1.324–3.173, $P=0.001$) hyperoxia was significantly related with 28-day mortality. Compared with normoxia, mild hyperoxia (adjusted OR 1.514, 95%CI 1.008–2.273, $P=0.046$), moderate hyperoxia (adjusted OR 1.788, 95%CI 1.218–2.858, $P=0.020$) and severe hyperoxia (adjusted OR 1.969, 95%CI 1.248–3.108, $P=0.004$) were independent risk factors of RRT.
**Conclusions:** Exposure to hyperoxia during early VA-ECMO support management was significantly associated with increased 28-day mortality and the requirement of RRT.

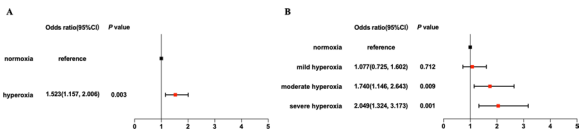


**Fig. 1 (abstract 001004)** Forest plot of risk-adjusted odds ratios of hyperoxia and 28-day mortality in patients with CS receiving VA-ECMO support. (A) Patients were divided into normoxia and hyperoxia groups. (B) Patients were divided into normoxia, mild hyperoxia, moderate hyperoxia, and severe hyperoxia groups. CS, cardiogenic shock; VA-ECMO, venoarterial extracorporeal membrane oxygenation

**Topic:** Cardiovascular issues in ICU

## 001005

### Impact of prolonged hemoperfusion therapy using a polymyxin B-immobilized fiber column for patients with septic shock requiring high-dose norepinephrine: a multicenter prospective cohort study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001005

**Introduction:** Septic shock is associated with poor prognoses in intensive care units (ICUs)1). Although the effects of PMX-HP for septic shock patients is still controversial 2), PMX-HP therapy had been performed for longer than 2 h in Japan 3).
**Objectives:** The best available treatment for septic shock (BEAT-SHOCK) registry examined whether there was an association with PMX-HP and patients' prognosis for several subgroups using data from a registry study about severe septic shock which requires high-dose norepinephrine (≥ 0.2 μg/kg/min) in Japan.
**Methods:** The primary outcome was defined as the 28-day mortality rate, and the secondary outcomes were the 90-day mortality rate, the 28-day ICU-free days, 28-day vasopressor-free days and changes in blood pressure and vasoactive-inotropic score (VIS) within 48 h after ICU admission. In addition, subgroup analyses were performed on age, APACHEII and SOFA at ICU admission, lactate level, type of infection and VIS.

**Results:** In the registry, 309 patients' data were analyzed and the average age and APACHEII were 70.8 years old and 26.9. 82 patients were received PMX-HP therapy and the average length of PMX-HP therapy was 1016 min. The 28-day mortality rate was similar between groups (PMX group: 17.1%, non-PMX group: 18.9%, $P=0.71$). The 90-day mortality did not differ between groups (PMX group: 23.5%, non-PMX group: 27.1%, Log-rank $P=0.62$). The median 28-day ICU-free days in PMX group was significant shorter than non-PMX group (PMX group: 16, non-PMX: 18, $P=0.03$). In PMX group, blood pressure was significantly higher within 48 h after ICU admission, though no significant difference was observed in VIS reduction. In subgroup of lower VIS than 30, the 90-day mortality rate was significant lower in the PMX group (adjusted HR (95%CI): 0.21 (0.05–0.86)).
**Conclusions:** Prolonged PMX-HP was not associated with better prognosis, though PMX-HP provided higher blood pressure in acute phase. Further prospective trials of prolonged PMX-HP are needed to save severe septic shock patients.

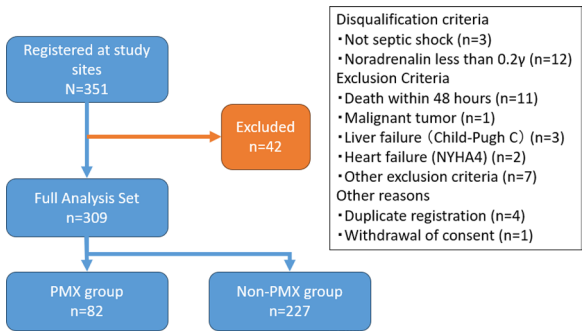
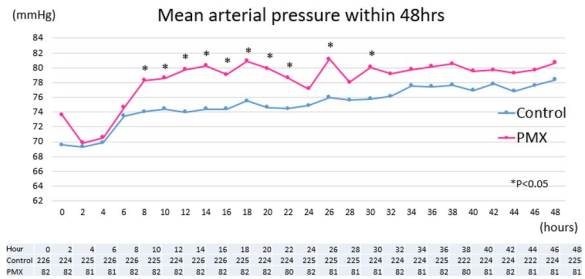
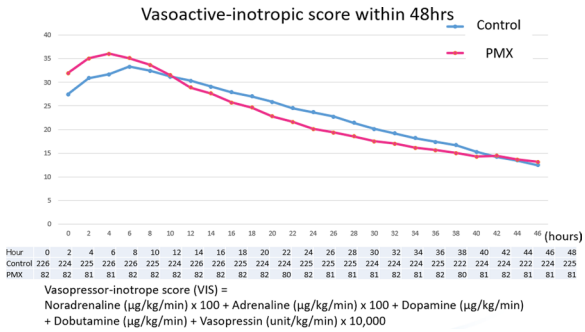



**Fig. 1 (abstract 0001005)** Study flowchart



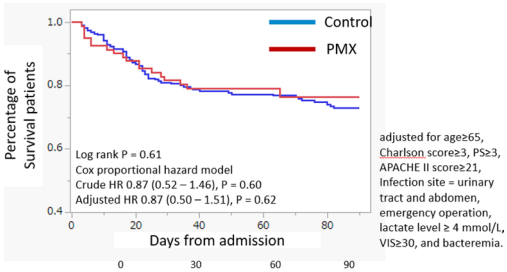

| Hour | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | 226 | 224 | 225 | 226 | 226 | 225 | 224 | 226 | 226 | 225 | 224 | 224 | 225 | 225 | 225 | 224 | 224 | 224 | 225 | 222 | 224 | 224 | 222 | 224 | 225 |
| PMX | 82 | 82 | 81 | 81 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 80 | 82 | 81 | 81 | 81 | 82 | 81 | 82 | 80 | 81 | 82 | 81 | 81 | 81 |

**Fig. 2 (abstract 0001005)** Mean arterial pressure within 48 h
We illustrated changes of mean arterial pressure within 48 h after ICU admission. We used t-test at each comparison. Two-sided *p*-values < 0.05 were considered statistically significant.




| Hour | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | 226 | 224 | 225 | 226 | 226 | 225 | 224 | 226 | 226 | 225 | 224 | 224 | 225 | 225 | 225 | 224 | 224 | 224 | 225 | 222 | 224 | 224 | 222 | 224 | 225 |
| PMX | 82 | 82 | 81 | 81 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 80 | 82 | 81 | 81 | 81 | 82 | 81 | 82 | 80 | 81 | 82 | 81 | 81 | 81 |

**Fig. 3 (abstract 0001005)** Vasoactive-inotropic score within 48 h
We illustrated changes of vasoactive-inotropic score within 48 h after ICU admission. We used t-test at each comparison. Two-sided p-values < 0.05 were considered statistically significant.




| Days | | 0 | 30 | 60 | 90 |
|---|---|---|---|---|---|
| Control | N at risk | 227 | 178 | 160 | 149 |
| | Cum events | | 43 | 51 | 60 |
| | Cum incidence | | 18.94% | 22.71% | 27.11% |
| PMX | N at risk | 82 | 65 | 61 | 56 |
| | Cum events | | 15 | 17 | 19 |
| | Cum incidence | | 18.29% | 20.89% | 23.48% |

**Fig. 4 (abstract 0001005)** Kaplan–Meier curve of 90-day mortality
We illustrated Kaplan–Meier curve of 90-day mortality after ICU admission. We used the log rank test and the Cox proportional hazard model to perform multivariate analysis.

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**Topic:** Sepsis

## 001006

### Study of incidence, risk factors and outcome of new onset cardiac arrhythmias in medical intensive care unit of a tertiary care hospital

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001006

**Introduction:** Arrhythmias are a frequent occurrence in intensive care unit (ICU) patients. The incidence of arrhythmias in ICU has been documented up to 40%, especially in presence of sepsis and respiratory failure. Accurate identification of different arrhythmias is important for timely and appropriate treatment. Correct therapeutic option will be life saving and can also improve the quality of life of the patient.
**Objectives:** To study the incidence of various New Onset Cardiac Arrhythmias (NOCA) in medical intensive care unit. To study the risk factors associated with NOCA and the clinical outcome of NOCA in terms of ICU length of stay and in-hospital mortality.
**Methods:** A prospective observational study was conducted in adult Medical ICU of a 38 bedded multidisciplinary critical care unit of a tertiary care hospital. The study was conducted from August 2021 to July 2022. Patients diagnosed with NOCA were included in the study. Patients were diagnosed using American Heart Association guidelines 2015 and 2017. They were followed until ICU discharge or in hospital death. Incidence of NOCA, risk factors, frequency of different types of NOCA and outcome was assessed.
**Results:** A total of 1909 patients admitted to medical ICU from August 2021 to July 2022 were screened for NOCA and 49 patients were diagnosed with NOCA. The incidence of NOCA came out to be 2.56% with atrial fibrillation being the most common (34/49, 69.3%) NOCA followed by paroxysmal supraventricular tachycardia (5/49, 10.2%).

Age ≥ 60 years (32/49, 65.3%), male gender (36/49, 73.5%), sepsis as the cause of ICU admission (35/49, 71.4%), hypokalemia (23/49, 46.9%), acidosis (20/49, 40.8%) were the most common risk factors associated with NOCA. Hypertension was the most common comorbidity observed (25/49, 51%). 61% (30/49) of patients with NOCA got discharged while 31% (15/49) died and 8% (4/49) left against medical advice. Atrial fibrillation (10/15, 66.6%) was the most common NOCA associated with mortality.

**Conclusions:** Arrhythmias continue to be a serious complication in ICU patients. Identification and timely management of correctable risk factors can help decrease the incidence of arrhythmias and prevent morbidity and mortality.

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**Topic:** Cardiovascular issues in ICU

## 001007

### Automated registry of administrative data related to sepsis in Catalonia: RADAR-sepsis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001007

**Introduction:** Sepsis is defined as an infection that results in one or more organ failures due to a dysregulated immune response (1). The incidence of sepsis has been steadily increasing in recent years, with rates ranging from 250 to 500 cases per 100,000 inhabitants per year. The overall mortality rate for sepsis is as high as 38% (2). In Catalonia, the average annual incidence stands at 264.1 cases of sepsis per 100,000 inhabitants per year (3, 4).

Sepsis morbidity and mortality are linked to both non-modifiable patient-dependent factors such as sex, age, and comorbidities, non-modifiable episode-dependent factors, such as the site of infection, source of acquisition, responsible microorganism, and immune response; and modifiable healthcare-related factors such as early detection and appropriate sepsis bundle performance. Comparative monitoring of outcomes for patients treated for septic shock could help to identify centers who needs improvement measures for sepsis code implementation.

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**Objectives:** To compare hospital length of stay and adjusted mortality rates among patients with septic shock in the Catalan Health Service (CatSalut) centers.

**Methods:** We defined cases as adult hospital discharges from 2018 to 2022 period with a diagnosis of septic shock (R6521: Severe sepsis with septic shock or T8112XA: Post-procedure septic shock). We collected data from the CMBD registry of CatSalut. We used demographic data, pre-existing comorbidity, episode-related (infection foci, organ failures and organ support treatments), and outcome data (inhospital or mortality and hospital length of stay) to create a risk-adjusted mortality and efficiency predictive model. We applied the predictive model to the cases of 2022. Finally, we ranked hospitals based on adjusted mortality and hospital stay.

**Results:** During the study period, we identified 25,298 cases of septic shock. 60.1% of the cases were male (with a median age of 68.6 years) and 39.9% were female (with a median age of 70.1 years). According to the Adjusted Morbidity Groups of CatSalut, 83% of patients had comorbidities with moderate or high associated risk. The most frequent site of sepsis were urinary, respiratory, and abdominal. Renal and respiratory system were the most common associated organ failure (50.6% and 25.5%, respectively). Overall hospital mortality was 37.9% (34.9% if shock was present upon admission and 49.1% if it was developed during hospitalization). When we applied the predictive model for the cases in 2022 period, we observed that 3 hospitals had lower mortality rates while 5 hospitals had higher mortality rates than expected, with statistically significant values (ROC curve of 0.74; confidence interval from 0.728 to 0.754). Regarding hospital stays, we did not find a statistically significant difference.

**Conclusions:** Constructing a predictive mortality model for septic shock helps to create a comparative analysis of mortality and efficiency. This can be useful for developing quality and safety programs related to sepsis management.

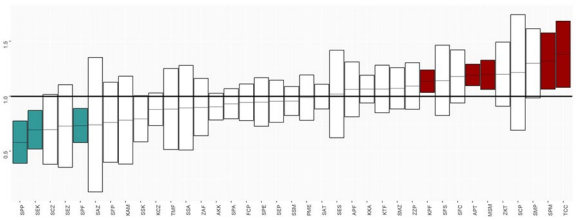

**Fig. 1 (abstract 0001007)** Adjusted hospital mortality (ROC 0.74; 0.728–0.754)

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**Topic:** Sepsis

## 001008

### Current status of end-of life care in intensive care unit: a pilot study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001008

**Introduction:** As South Korea transitions into a super-aged society, interest in life-sustaining treatments and end-of-life care has increased. Despite this, many patients admitted to intensive care units (ICUs) lack prior discussions about end-of-life care, leading to insufficient advance care planning due to the rapid progression of acute illnesses.
**Objectives:** This study aims to examine the current status of end-of-life care in ICU and understand guardians' perspectives and factors influencing life-sustaining treatments through a survey.
**Methods:** This study was conducted as a single-center, prospective pilot study. It included patients admitted to the medical intensive care unit (ICU) receiving treatments like vasopressors, mechanical ventilation, and hemodialysis. Surveys were conducted among the main guardians and medical staff during end-of-life care discussions and POLST (Physician Orders for Life-Sustaining Treatment) documentation. Electronic medical records (EMR) were also reviewed to collect patients' demographic information, hospitalization length, and intensive care details.
**Results:** From November 2023 to January 2024, 14 patients were included. Of those, eight patients (57.1%) were male, with a median age of 78. The median length of hospital stay was 25 days, with a median ICU stay of 13 days. POLST discussions with medical staff typically occurred around six days after ICU admission. Five patients (35.7%) died during ICU stay. Eight patients (57.1%) received mechanical ventilation; two patients received cardiopulmonary resuscitation (CPR) and cardioversion. Six patients (42.9%) were admitted to the ICU using a high-flow nasal cannula. Among the 14 patient's guardians, nine were patients' children, three were spouses, and in two cases, both spouses and children participated in the POLST discussion. Seven (50%) answered that they lived with the patients. The median value of the clinical frailty scale for the patients was 5, mainly indicating mild frailty. Four patients had previously completed advance care planning; nine had not, and one guardian was unsure. Regarding life-sustaining treatments, five patients (35.7%) had expressed a desire not to pursue them, another five (35.7%) had indirectly expressed their opinions, three (21.4%) had never considered it, and one desired life-sustaining treatments.
Among the participating guardians, ten (72.4%) answered well-informed and understood the prognosis of the patient's illness. Regarding the improvement of patients' condition, five (35.7%) guardians estimated it to be less than 25–50% of prior condition, while six (42.9%) believed it to be 0–25% for recovery. Six guardians (42.9%) wanted to discontinue intensive care immediately, citing disagreement with the patient's previous wishes or low chances for improvement. Despite eight guardians (57.1%) answered to continue treatment, half were unsure about additional treatment duration.

**Conclusions: Many elderly patients, often with chronic illnesses, experience rapid health deterioration due to acute illnesses. While patients with cancer or specific terminal diseases may have considered advance care planning before, many elderly do not document or express preferences regarding life-sustaining treatments. Sometimes, the patient's autonomy is not fully considered, and intensive care begins. In this study, over half of the patients (71.4%) expressed direct or indirect preferences regarding life-sustaining treatment. Guardians tend to respect the patient's pre-existing opinions or consider the likelihood of recovery and may discontinue intensive care.**
However, due to this study's small sample size, further statistical analysis or identifying trends is challenging. Further research into end-of-life care discussions in the ICU can not only address social costs, but also contribute to a dignified death.

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**Topic:** Ethics and end of life care

## 001010

### Extracorporeal removal of CO2 in acute respiratory distress syndrome due to SARS-COV-2 pneumonia

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001010

**Introduction:** During the COVID-19 pandemic, many patients experience severe illness and high mortality due to respiratory failure and multiple organ dysfunction1. Measures like Extracorporeal Carbon Dioxide Removal Therapy (ECCO2R) have been utilized to enhance lung ventilation in acute respiratory distress syndrome (ARDS) patients. ECCO2R aids in maintaining protective mechanical ventilation (MV) and correcting respiratory acidosis, offering a less invasive alternative to extracorporeal membrane oxygenation (ECMO)2.
**Objectives:** Evaluate the efficacy, evolution, and complications related to ECCO2R in severe ARDS due to SARS-CoV-2 pneumonia.
**Methods:** This observational retrospective study analyzes ARDS patients admitted to a tertiary hospital's polyvalent ICU from 03/2020 to 01/2023, requiring ECCO2R therapy due to SARS-CoV-2.
Collected data include demographic variables and adjunctive treatments. Patients eligible for ECCO2R therapy exhibited respiratory acidosis (pH < 7.25, PaCO2 > 60) and/or driving pressure (DP) > 15 despite optimized MV and adjunctive therapies. Those meeting ECMO support criteria were excluded.
ECCO2R efficacy was assessed based on achieving pH > 7.25, PaCO2 < 60, and DP < 15. pH, PaCO2 and DP were measured at 0,2,24,48 and 72 h post-ECCO2R initiation to evaluate efficacy. Complications, including thrombotic, hemorrhagic, and infectious events, were recorded. Hospital mortality and its relationship with goal attainment was analyzed.
Results are presented as percentages and means ± standard deviation (SD). The Mann–Whitney test was employed for independent samples and quantitative variables.
**Results:** Twenty-four patients were analyzed. 83% were males with a mean age of 62 ± 9 years.
ECCO2R was indicated: 20% of cases for respiratory acidosis, 25% for DP > 15cmH2O, 55% for meeting both criteria.
The combined efficacy objective was achieved in 71% of patients at 48h and in 50% at 72h. Acidosis control was achieved within the first 24 h in 96% of cases. A DP < 15 was achieved in 66% at 24h and in 71% at 48h.
50% of ECCO2R patients had complications: 50% had circuit-related thrombotic events, 29% had non-severe hemorrhages, and 20% developed pneumonia. No catheter infections were observed.

Hospital mortality was 54.2%. Mortality rates were 71% for those not achieving combined efficacy within 24 h and 100% if not achieved within 48 h.
**Conclusions:** ECCO2R therapy effectively controlled acidosis and DP in ARDS patients with SARS-CoV-2 infection. Early acidosis control was observed, but significant outcomes relied on DP improvement within 48 h. Complications were frequent but generally not severe. In our study, failure to meet the 48-h objective was linked to 100% mortality.

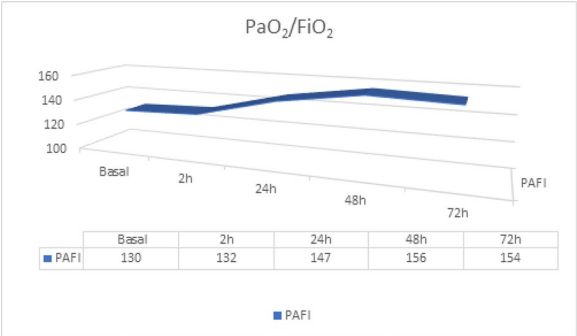


**Fig. 1 (abstract 0001010)** Pa02/FiO2 variation with ECCO2R therapy

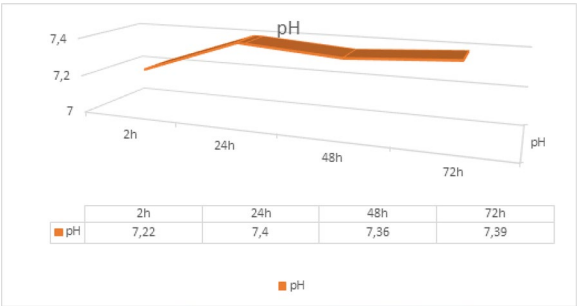


**Fig. 2 (abstract 0001010)** pH variation with ECCO2R therapy

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3. Sociedad Española de Medicina Intensiva Crítica y Unidades Coronarias (SEMICYUC)

**Topic:** Acute respiratory failure and mechanical ventilation

## 001011

### Evaluation of the impact of a stay in a critical care unit on the morbi-mortality of patients with ANCA vasculitis: search for prognostic factors (IREVA study)

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001011

**Introduction:** Patients with ANCA vasculitis are frequently admitted to the intensive care units (ICUs). The impact of these admissions to the ICU on the course of their disease and their future outcomes is not yet fully known.
**Objectives:** We aimed to assess the characteristics at ICU admission and the consequences of an ICU stay in terms of morbidity and mortality in patients with ANCA vasculitis.
**Methods:** Retrospective observational study based on data collected from medical charts in two French Academic hospitals. The data from all adult patients with a diagnosis of ANCA vasculitis (defined according to the international criteria) admitted to medical wards or to the ICU, were extracted. We assessed the impact of ICU admission on 12-months mortality (primary outcome) and on renal function 12 months after admission.
**Results:** We included 143 patients who were hospitalized in participating centers between 2007 and 2022: 48 admitted to the ICU and 95 in hospitalized in conventional wards. Most patients were men (56, 6%), and their mean age was 64 (16) years. The vasculitis was most frequently microscopic polyangiitis (71, 49.7%). The reason for hospitalization was vasculitis flare in 90.2% and among those, 20.9% had pulmonary-renal syndrome.
Patient characteristics are described in Table 1. In the subgroup of 107 patients with a newly diagnosed vasculitis (30 (28%) in the ICU group and 77 (72%) in the conventional ward group), the mean BVAS score at admission was higher in the ICU group (21.6 ± 8.2 vs. 14.7 ± 6.0, $p < 0.001$) and decreased at 12 months from admission values by, respectively, a median [IQR] of − 15 [− 19;− 12] in the ICU group and − 12 [− 17;− 7] in the non-ICU group ($p = 0.039$).
Twelve months mortality was 9.2% ($N = 13$). ICU-patients had higher 12-month mortality (20.9% vs. 4.2%, $p = 0.004$), as well as higher rates of persisting kidney dysfunction (74.3% vs. 36.2%, $p < 0.001$) and infectious complications (27% vs. 15%, $p = 0.004$). Non-survivors were older (77 ± 11 vs. 62 ± 15 years, $p < 0.001$), with a higher rate of microscopic polyangiitis than survivors (92.3% vs. 46.4%, $p = 0.004$). The vasculitis was already known before admission in half of them (54% vs. 21% in patients alive at 12 months, $p = 0.014$) and there was no difference in the BVAS score at baseline (15.7 ± 7.17 in survivors vs. 17.6 ± 7.31 in non-survivors $p = 0.387$). There was no difference in the cause of first hospital admission, but non-survivors had higher SOFA (4.2 ± 2.4 vs. 2.1 ± 2.6, $p = 0.009$), IGS2 (44 ± 14 vs. 23 ± 14, $p < 0.001$) and APACHE2 (19 ± 6 vs.10 ± 6, $p < 0.001$) scores, and a more severe kidney dysfunction at admission with higher levels of serum creatinine and urea (401 ± 263 vs. 209 ± 210, $p = 0.023$ and 27 ± 11 vs. 13 ± 11, $p = 0.001$, respectively).
**Conclusions:** In patients with ANCA vasculitis, an ICU stay was associated with higher 12-month mortality and kidney dysfunction. Higher mortality was expected in these more severe patients. The next step of this study will be to assess the long-term impact of ICU admission on kidney function and disease activity adjusting on confounders.

**Table 1 (abstract 0001011)** Patient characteristics at admission

| | ICU group N = 48 | Conventional care group N = 95 | p-value |
|---|---|---|---|
| Admission SOFA score (med [IQR]) | 4.00 [3.00;5.00] | 1.00 [0.00;2.00] | <0.001 |
| Admission IGS2 score (mean, SD) | 40.3 ± 15.2 | 18.6 ± 10.1 | <0.001 |
| Admission APACHE2 score (mean, SD) | 17.4 ± 5.98 | 8.21 ± 5.47 | <0.001 |
| Charlson score (med [IQR]) | 4.00 [2.00;6.00] | 3.00 [1.00;4.00] | 0.010 |
| Medical history of diabetes n (%) | 16 (34.0%) | 10 (10.5%) | 0.001 |
| Medical history of vasculitis n (%) | 18 (37.5%) | 18 (18.9%) | 0.027 |
| Rapidly progressive glomerulonephritis at admission n (%) | 31 (64.6%) | 38 (40.0%) | 0.009 |
| Alveolar hemorrhage at admission n (%) | 17 (35.4%) | 8 (8.42%) | <0.001 |
| ENT symptoms at admission n (%) | 13 (27.1%) | 45 (47.4%) | 0.031 |
| Flare of vasculitis responsible for admission n (%) | 38 (79.2%) | 91 (95.8%) | 0.005 |
| Pulmonary-renal syndrome responsible for admission n (%) | 17 (35.4%) | 10 (10.5%) | 0.001 |

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**Topic:** Systemic diseases

## 001012

## Worldwide transfusion practices in the elderly ICU population

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**Introduction:** Twenty-five percent of all intensive care patients receive one or more red blood cell (RBC) transfusion during their intensive care unit (ICU) stay (1). An increasing number of studies suggest that a restrictive transfusion policy is non-inferior or even superior to a liberal policy (2). Few studies have focused specifically on the elderly ICU population. In old age, reduced physiological reserves and frailty may hypothetically change the risk–benefit profile of transfusion. Risk factors for transfusion-related complications are more common in the elderly, potentially outweighing benefits. Uncertainty about the appropriate transfusion threshold in old age could result in different transfusion decisions for these patients. It is unknown whether elderly ICU patients are treated similarly to younger patients with respect to transfusion.

**Objectives:** To assess transfusion practices for elderly ICU patients and compare these practices to younger patients.
**Methods:** This is a substudy of the International Point Prevalence Study of Intensive Care Unit Transfusion Practices (InPUT), an international, multicenter, prospective, observational cohort study evaluating worldwide transfusion practices in the ICU (1). All patients aged 18 years or older admitted to the ICU during predefined weeks were included. Outcomes included the occurrence rate of RBC transfusion, the used transfusion thresholds and the main indications for RBC transfusions. For this sub-study, these outcomes were compared between patients of different age categories: < 65 years, 65–75 years, 75–85 years and > 85 years.
**Results:** In total 3643 patients from 233 centers across 30 countries were included. Among them, 53% ($N = 1942$) were younger than 65 years, 26% ($N = 935$) were 65–75 years, 17% ($N = 615$) were 75–85 years and 4% ($N = 151$) were older than 85 years. The occurrence rate of RBC transfusions did not differ between the age categories and ranged from 23 to 26% ($P = 0.99$). The hemoglobin threshold was higher in patients of 85 years and older (median 10.0 g/dL, IQR 8.0–10.0 g/dL) compared to those younger than 85 years (median 8.0 g/dL IQR 7.0–9.0 g/dL; $P < 0.001$). The stated reasons for RBC transfusion differed between age categories (Fig. 1). In patients 85 years or older, "*age of patient*" was more often stated as reason for transfusion (14.3%; $P < 0.001$) compared to 75–85 years (5.2%), 65–75 years (2.0%) and < 65 years (0.4%). *"To improve general state"* was also more often stated as reason for transfusion (17.6%, $P < 0.001$) in patients 85 years or older compared to 75–85 years (6.8%), 67–76 years (3.2%) and < 65 years (4.1%). *"Coronary ischemia"* was more often a reason for RBC transfusion in the patient group of 65–75 years (4.4%; $P < 0.001$) compared to > 85 years (2.2%), 75–85 years (3.3%) and < 65 years (1.0%).
**Conclusions:** Different transfusion strategies are applied in elderly patients compared to younger patients. It is unknown if this is a favorable practice.

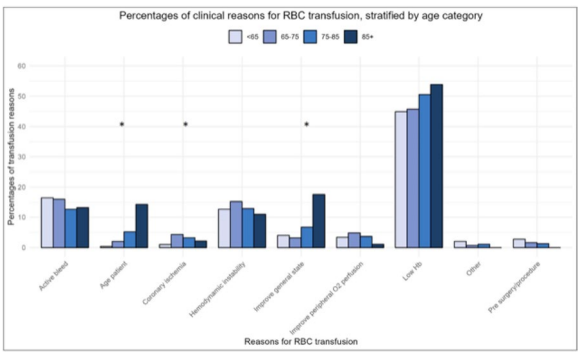


**Fig. 1 (abstract 0001012)** Overview of the percentage of clinical reasons stated for RBC transfusion, stratified by age category. Asterisks (*) indicate significant differences between age categories

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**Topic:** Transfusion and haemostasis disorders

**001014**

## Quality of death in surgical ICUs: a preliminary investigation of medical staff perspectives

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001014

**Introduction:** In the context of varying intensive care unit (ICU) characteristics, scarce investigations have delved into how medical personnel perceive death in Republic of Korea. This study aims to fill this gap by examining the perception of death among medical staff primarily in surgical ICUs, crucial for enhancing end-of-life care quality.
**Methods:** A preliminary prospective study was conducted from June 2023 to February 2024. The attending doctors and nurses responsible for the deceased patients were asked to participate in Quality of Dying and Death (QODD) questionnaire within 48 h after patient death. Higher score of QODD (20 questions, total score range 0 to 100) indicated a better quality of death.
**Results:** Findings from 61 completed questionnaires, representing 35 ICU staff members (18 doctors and 17 nurses) who cared for 23 deceased patients were analyzed. Doctors, compared to nurses, provided better QODD scores (21.6 ± 7.8 vs. 15.4 ± 9.0; $P = 0.008$, Fig. 1) despite less experience with patient death ($r = -0.43$, $P = 0.001$). Discussions about patient wishes and applying appropriate sedation correlated positively with better death quality, respectively ($r = 0.72$, $P = 0.01$; $r = 0.68$, $P = 0.01$). Additional findings revealed that despite advanced care planning and end-of-life decision documentation (82.6%), 21.7% received cardiopulmonary resuscitation within 24 h before death (Table 1).

**Table 1 (abstract 0001014)** Baseline characteristics of deceased patients ($N = 23$)

| Variables | |
|---|---|
| Age (year) | 64.9 ± 13.8 |
| Male | 10 (43.5) |
| Malignancy | |
| APACHE II score | 32.5 ± 8.9 |
| SOFA score | 13.8 ± 3.8 |
| Length of ICU stay (days) | 17.7 ± 17.8 |
| Length of hospital stay (days) | 32.3 ± 24.6 |
| Life-support equipment at the time of death | |
| Mechanical ventilator | 20 (87.0) |
| Continuous renal replacement treatment | 18 (78.3) |
| Extracorporeal membrane oxygenation | 0 |
| Others | 0 |
| Medication within 24h of death | |
| Sedatives | 10 (43.5) |
| Analgesics | 12 (52.2) |
| Inotropes | 22 (95.7) |
| GCS within 24h before death | 6.5 ± 3.8 |
| Cardiopulmonary resuscitation within 24 h before death | 5 (21.7) |
| DNR documentation | 2 (8.7) |
| End-of-Life decision documentation | 19 (82.6) |

Continuous data are expressed in mean ± SD or as n (%). APACHE II, acute physiology and chronic health evaluation II; SOFA, Sequential Organ Failure Score; ICU, intensive care unit; GCS, Glasgow Coma Scale; DNR, do not resuscitate.

**Conclusions:** Previous studies were predominantly conducted in medical ICUs, and in comparison, the quality of death scores in surgical ICUs were relatively lower. This preliminary report underscores the need for enhanced education, advanced care planning, and further research to improve end-of-life quality for both patients and medical staff.

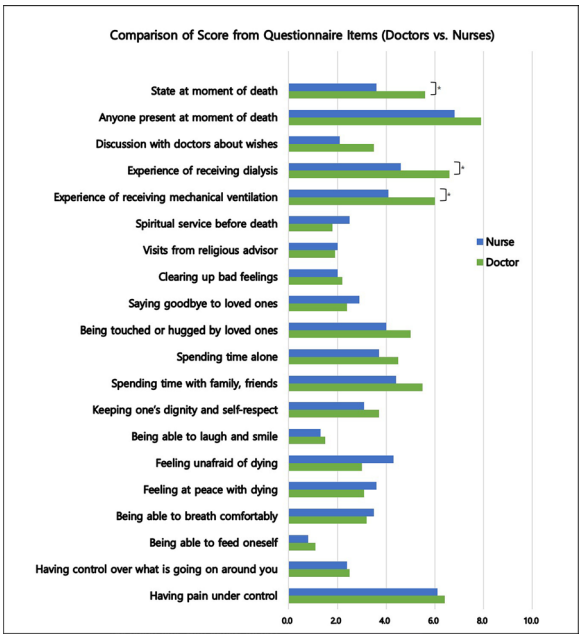


**Fig. 1 (abstract 0001014)** Individual score for each questionnaire items. *$P < 0.05$

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**Topic:** Ethics and end of life care

## 001015

### Kinetics of renin–angiotensin system circulating peptides following angiotensin-(1–7) administration in COVID-19 ICU patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001015

**Introduction:** The renin–angiotensin system (RAS) plays an important role in the pathogenesis of COVID-19 (1). In this context, modulation of the RAS using different drugs has yielded encouraging results (2). A recent randomized trial using continuous infusion of exogenous Angiotensin-(1–7) has just been completed.
**Objectives:** Analysis of the RAS circulating components (Angiotensin I, II, (1–7) and (1–5)) kinetics following Angiotensin-(1–7) administration in patients with COVID-19.
**Methods:** Secondary per-protocol analysis of a multicenter investigator-initiated, seamless phase 1–2 randomized clinical trial conceived to test the safety and efficacy of continuous short-term intravenous administration of Angiotensin-(1–7) in COVID-19 patients admitted to two intensive care units (ICU). Between August 2020 and July 2021, when the study was prematurely stopped due to low recruitment rate, 105 patients were included in both phases (28 in phase 1, open label and 77 in phase 2, double blind) and randomized to receive either intravenous Angiotensin-(1–7) for a maximum of 7 days or until ICU discharge or placebo. Blood from included patients was sampled at Baseline, 3, 24, 72 h and after 7 days. A chaotropic agent to arrest plasmatic proteases was added to the vials and circulating RAS peptides were measured using mass spectrometry-tandem liquid chromatography, and compared using a general linear mixed model fitted for restricted maximum likelihood (REML).
**Results:** Ang-(1–7), Ang-(1–5), Ang II and Ang I were measured in 49 patients in phase II (30 in the control group and 19 in the Ang-(1–7) group). Concerning canonical RAS, despite an increase in Ang-II levels in the treated group between baseline and T3, no overall differences were found between the groups ($p = 0.37$ for interaction, $p = 0.06$ for group at T3), similarly to what was observed in Ang-I levels ($p = 0.93$ for interaction). For the non-canonical RAS, there was no difference during the observations (for the interaction in the Ang-(1–5), $p = 0.33$ and in the Ang-1(1–7), $p = 0.62$). Overall, no significant difference in circulating Ang I, Ang II, Ang-(1–5) and Ang-(1–7) were observed between groups during Phase 2, as shown in Fig. 1.
**Conclusions:** In this study, intravenous Angiotensin-(1–7) administration did not significantly impact on RAS peptides kinetics of COVID-19 patients. The relatively small size of Angiotensin-(1–7) group and the possible increase in pulmonary tissue metabolism could explain these findings.

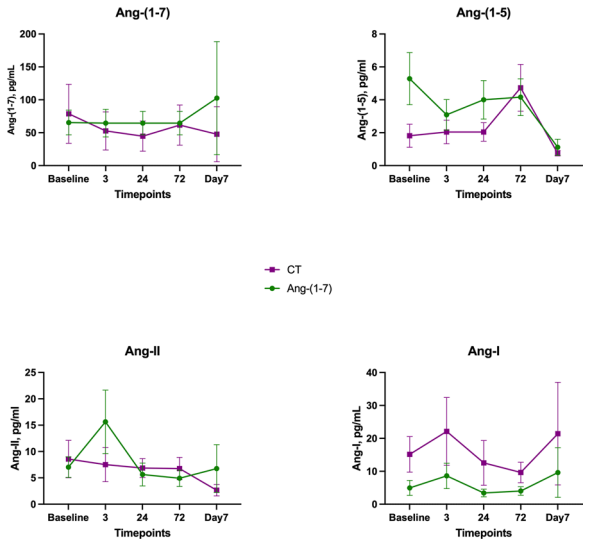


**Fig. 1 (abstract 0001015)** Time evolution of RAS peptides. Mean values and standard error means

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3. The study was conducted with the support of the Université Libre de Bruxelles (ULB) grant for COVID-19 (Research Number 5C06G000010) and by FAPEMIG – Fundação de Amparo à Pesquisa do Estado de Minas Gerais (Reference Number APQ-00325–20).

**Topic:** Acute respiratory failure and mechanical ventilation

## 001017

### Expansion of multiresistant enterobacteria in the postpandemic period

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001017

**Introduction:** The dissemination of Gram-negative bacteria resistant to carbapenems is a public health issue that has experienced an exponential growth after the COVID pandemic.
**Objectives:** The purpose of our study is to describe the distribution of these pathogens in our health care settings between 2021 and 23 in order to define the local epidemiology, and better control and antidissemination strategies.
**Methods:** A retrospective and descriptive study about infections and colonizations due to carbapenemase producing enterobacteria (CPE). Isolates from both hospital and primary health care settings were included. The characterization of strains and their drug sensitivity was

determined by MALDI Biotyper and Microscan Walkaway 96 according to EUCAST. For the discrimination of carbapenemases, the immunoassay NG-Test/CARBA-5 was used.

**Results:** During this period a total of 171 strains of CPE were isolated, of which 105 in men and 66 in women. Culture samples were mainly collected in the hospital setting (150 in hospital vs 21 in primary care). The mean age of patients was 73,64 years (CI 95% 61.17–86.12). Hospital admission was required for 135 patients (40 of them needing ICU). The mean APACHE II score at the time of admission was 18.47 (CI 95% 8.99–27.96). We found a mean length of stay of 50.98 days (CI 95% 18.89–83.08); Fig. 1. The 70.1% had been hospitalized in the previous five months, 50% in the case of ICU patients. As well as an accelerating growth in the isolation of CPE throughout the three years that we collected data, there were only three cases of culture positivity for CPE in 2021 in contrast to 41 cases in 2022 and 127 in 2023; Fig. 2.

The CPE most frequently observed was *K. pneumoniae* with a total of 136 positive cultures (79.5%), followed by *Citrobacter freundii*, seen in 12 (7%). The main sites of bacterial growth for CPE (Fig. 3) were urine cultures, 67 (39.1%), colonization screenings for multiresistant bacteria 55 (32.2%), aerobic cultures from tissue exudates and abscesses 36 (21%) and blood cultures 13 (7.6%).

Twelve of the strains of CPE detected had two different carbapenemases: 6 VIM + KPC, 4 OXA48 + NDM, 1 OXA48 + KPC and 1 OXA48 + VIM.

Antibiotics most frequently used were: fosfomycin 28.4%, trimethoprim/sulfamethoxazole 14.5%, meropenem/vaborbactam 12.7%.

**Conclusions:** In the post-pandemic period CPE have spread globally. In our setting, the most frequently found enterobacteria is *K. pneumoniae* and the predominant carbapenemase is KPC.

The analysis and active search for patients colonized or infected by CPE and patient follow-up until microbiological eradication is of crucial importance in order to provide a comprehensive clinical management. This includes targeted antibiotic treatment and other relevant measures like strict compliance of healthcare staff and visitors to infectious disease preventive rules, rational use of broad-spectrum antibiotics during shorter periods and the avoidance of unnecessary invasive procedures.

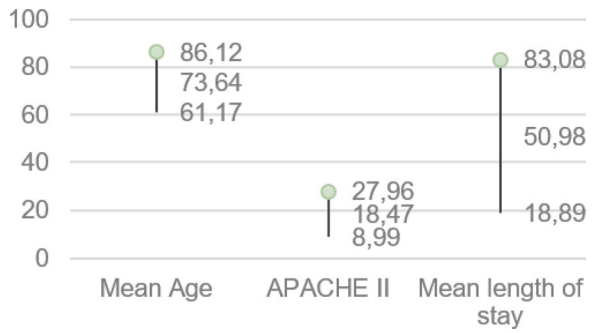
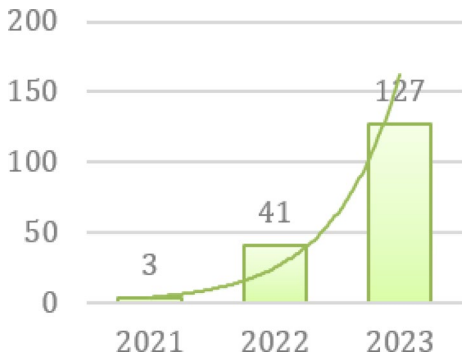



**Fig. 1 (abstract 0001017)** .

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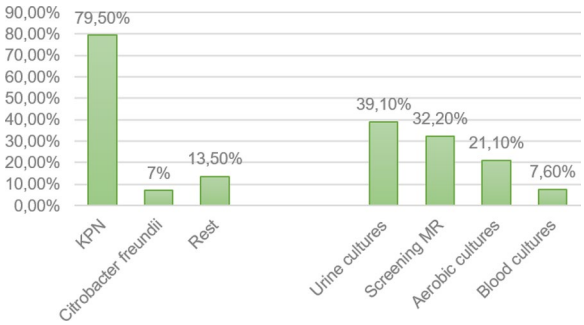


**Fig. 3 (abstract 0001017)** .

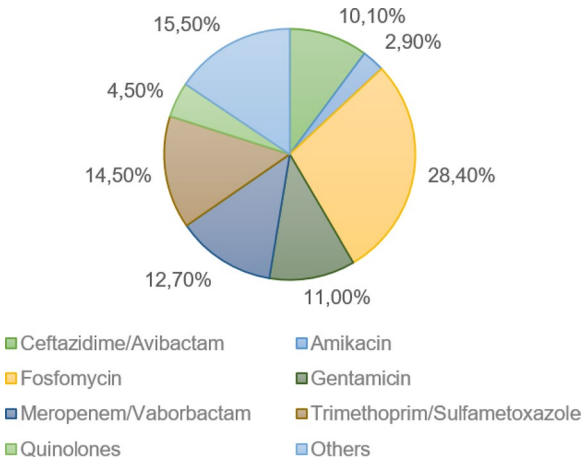


**Figure AB (abstract 0001017)** .

**Reference(s)**

1. Das S. The crisis of carbapenemase-mediated carbapenem resistance across the human–animal–environmental interface in India. Infect Dis Now. 2023 Feb;53(1):104628. https://doi.org/10.1016/j.idnow.2022.09.023. Epub 2022 Oct 12. PMID: 36241158.
2. Íñigo M, Del Pozo JL. Treatment of infections caused by carbapenemase-producing Enterobacterales. Rev Esp Quimioter. 2022 Oct;35 Suppl 3(Suppl 3):46–50. https://doi.org/10.37201/req/s03.11.2022. Epub 2022 Oct 24. PMID: 36285858; PMCID: PMC9717464

**Topic:** Infections and prevention

## 001018

### Feasibility of multimodal data collection and characterization of circulatory arrest timing during withdrawal of life-sustaining measures

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001018

**Introduction:** Death determination is central to organ donation practices and is defined by the absence of brain function and circulation. Organ donation following circulatory arrest after withdrawal of life-sustaining measures has increased donation opportunities worldwide, but key research questions remain pertaining to the precise timing of death determination with a brain-based definition and whether neuromonitoring can aid in the timing of death determination.
**Objectives:** Following WLSM in critically ill humans, we aimed to (1) demonstrate feasibility of multimodal data collection of simultaneous cerebrovascular and cardiovascular physiologic data elements, and (2) describe the specific timing of cessation of cerebral circulation in the context of systemic circulatory arrest.
**Methods:** We conducted a single-center prospective interventional cohort study on critically ill patients to characterize circulatory arrest physiology during WLSM. Cerebrovascular monitoring consisted of middle and posterior cerebral artery blood velocities (MCAv, PCAv), jugular venous bulb oximetry (SjvO2), and regional cerebral oxygen saturation (rSO2). Cardiovascular monitoring consisted of mean arterial pressure (MAP) monitoring, telemetry, pulmonary artery catheter oximetry, and pulse oximetry. Serum and plasma bio-specimens were collected from the radial artery and jugular venous bulb before WLSM and after the systolic blood pressure reached below 60 mmHg. Brain, heart and spinal cord autopsies were conducted following death determination. Timing data for WLSM are reported as median [range].
**Results:** From May 2023 to February 2024, 25 patients were enrolled and completed data collection. Continuous MAP, MCAv, telemetry, and pulse oximetry from WLSM until death declaration or discharge from intensive care was collected in all patients. PCAv, SjvO2, and rSO2 were collected in 92%, 92% and 72% of patients, respectively. Pulmonary artery catheter oximetry was conducted in in 40% of patients. Serum and plasma bio-specimens were collected in 92% of cases. Brain, heart, and spinal cord autopsies were performed in 92%, 64%, and 24% of cases, respectively. The time from WLSM to < 5 mmHg pulse pressure was 45 [4, 405] min. The time difference between cessation of MCAv/PCAv and < 5 mmHg pulse pressure was + 65 [-3, + 2128] s and + 133 [+ 5, + 3545] s, respectively, with 8 patients having a difference > 4 min.
**Conclusions:** Following WLSM, simultaneous monitoring of cerebrovascular and cardiovascular data elements was feasible. There was considerable heterogeneity of time to death determination. Cessation of cerebral circulation preceded radial pulse pressure being < 5 mmHg. This highlights a temporal discordance between the cerebral and systemic circulation with implications for the timing of death determination and its impact on warm ischemic times in organ donation.

**Topic:** Brain death, organ donation and transplantation

## 001019

### Effects of hypertonic sodium lactate infusion on brain functions in a refractory cardiac arrest model using extracorporeal cardiopulmonary resuscitation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001019

**Introduction:** Extracorporeal cardiopulmonary resuscitation (ECPR) is increasingly used as a treatment for cardiac arrest (1). While hypertonic sodium lactate (HSL) has shown benefits in cardiac arrest models (2, 3), its effectiveness during ECPR has not been reported yet.
**Objectives:** To evaluate the effects of HSL infusion on brain functions in an experimental model of ECPR.
**Methods:** Twelve mixed-sex pigs underwent 5 min of untreated ventricular fibrillation (no-flow), followed by 25 min of conventional CPR (low-flow) and defibrillations. Veno-arterial extracorporeal membrane oxygenation was initiated at 30 min of resuscitation, where animals were randomly assigned to receive either balanced crystalloid (control group, $n = 6$) or hypertonic sodium lactate (HSL) infusion (HSL group, $n = 6$). Brain oxygen pressure (PbtO2) and intracranial pressure (ICP) were recorded during the whole experiment. Cerebral microdialysis (CMD) sampling was performed at baseline and every hour till the end of the experiment. Fluid resuscitation and norepinephrine were administered to maintain adequate hemodynamics. Twelve hours after return of spontaneous circulation, the animals were killed by an intracardiac potassium injection.
**Results:** In the HSL group, there was a trend toward lower norepinephrine requirement over time ($p = 0.1$). Blood lactate was not significantly different between the two groups ($p = 0.12$). PH, sodium and bicarbonate concentrations were significantly higher in HSL group ($p = 0.001$, $p < 0.0001$, $p < 0.0001$, respectively). While brain oxygenation values were similar between groups, ICP was significantly lower in HSL group compared to controls ($p = 0.01$) throughout the experiment. No significant differences in cerebral interstitial metabolites measured by cerebral microdialysis were observed between groups. Furthermore, transaminases and troponin I levels were comparable in both groups.
**Conclusions:** In this experimental model of ECPR, the infusion of HSL was associated with a significant reduction in ICP. No other significant effects on brain oxygenation and metabolism were observed.

**Reference(s)**

1. 1. Belohlavek J, Smalcova J, Rob D, et al. Effect of Intra-arrest Transport, Extracorporeal Cardiopulmonary Resuscitation, and Immediate Invasive Assessment and Treatment on Functional Neurologic Outcome in Refractory Out-of-Hospital Cardiac Arrest: A Randomized Clinical Trial. JAMA. 2022;327(8):737–747.
2. 2. Stevic N, Argaud L, Loufouat J, et al. Molar Sodium Lactate Attenuates the Severity of Postcardiac Arrest Syndrome: A Preclinical Study. Crit Care Med. 2022;50(1):e71-e79.
3. 3. Annoni F, Su F, Peluso L, et al. Hypertonic sodium lactate infusion reduces vasopressor requirements and biomarkers of brain and cardiac injury after experimental cardiac arrest. Crit Care. 2023;27(1):161.
4. AM and FST were supported by the Fonds Erasme pour la Recherche Médicale.

**Topic:** Cardiac arrest

**001020**

**Taurine attenuates sepsis-induced skeletal muscle atrophy by modulating mitochondrial synthesis**

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001020

**Introduction:** Up to 90% of severe sepsis patients have muscle atrophy that hinders weaning from ventilatory support, prolongs hospitalization and is associated with an increased risk of death. Various factors such as inflammation, oxidative stress, and mitochondrial dysfunction have been identified to be associated with sepsis-induced skeletal muscle atrophy. Previous studies showing taurine as an antioxidant with a role in protecting against oxidative stress in the mitochondria. Taurine depleted mouse are reported to develop muscular dystrophy. Besides, taurine supplementation can improve exercise endurance in rats and healthy humans.
**Objectives:** This study was conducted to explore whether taurine attenuates sepsis-induced skeletal muscle atrophy in mice and its underlying mechanisms.
**Methods:** A mouse sepsis model was constructed by cecal ligation and puncture. Taurine was administered intravenously for three consecutive days prior to surgery, and mice were executed on the first and 14th postoperative days. Blood was collected for analysis of serum biochemistry and inflammatory factors. Quadriceps femoris was used for mitochondrial synthesis signaling pathway examination and electron microscopy analysis. Tibialis anterior and gastrocnemius muscles were separated from each group of mice and used for HE staining.
**Results:** Compared with the CLP group, the taurine-treated group attenuated the liver and kidney injury, reduced the serum levels of IL-1β, TNF-a, and IL-6, and significantly increased the mRNA level of PGC1a in quadriceps femoris on the first day after CLP. Meanwhile, scanning electron microscopy of quadriceps muscle revealed a significant reduction in the number of mitochondria, a decrease in intramitochondrial cristae, and rupture of mitochondrial membrane after CLP while the number of mitochondria in the taurine-treated group was relatively increased. On postoperative day 14, the cross-sectional area of tibialis anterior and gastrocnemius muscles of mice in the taurine-treated group was increased compared to the CLP group.
**Conclusions:** Taurine can ameliorate sepsis-induced skeletal muscle atrophy, and the underlying mechanism may be related to the promotion of mitochondrial biogenesis.

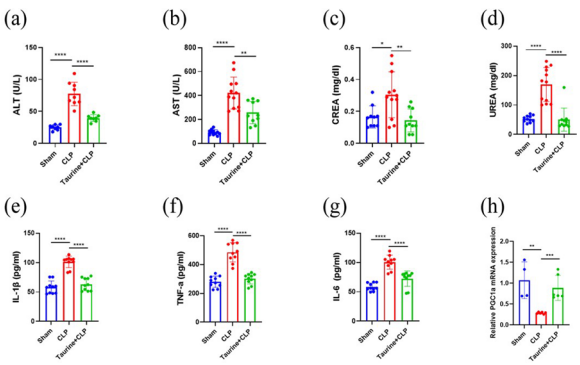


**Fig. 1 (abstract 0001020)** On the first postoperative day, taurine attenuates hepatic and renal injury, reduces serum inflammatory factor levels, and increases PGC1a mRNA expression in quadriceps femoris muscle in septic mice. "*" represents $P<0.05$, "**" represents $P<0.01$, "***" represents $P<0.001$, "****" represents $P<0.0001$

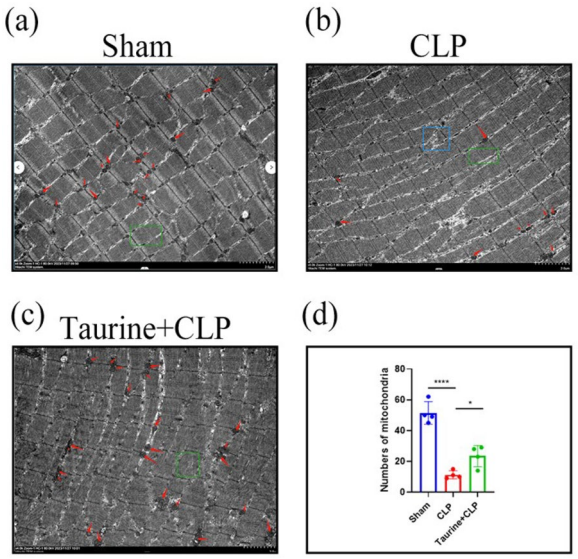


**Fig. 2 (abstract 0001020)** On the first day after CLP, scanning electron microscopy suggested a significant reduction in the number of mitochondria in the quadriceps femoris, a decrease in mitochondrial cristae, and a rupture of the outer mitochondrial membrane. Taurine significantly increased the number of mitochondria in the quadriceps muscle of septic mice. Scale bar = 2 μm "*" represents $P<0.05$, "****" represents $P<0.0001$

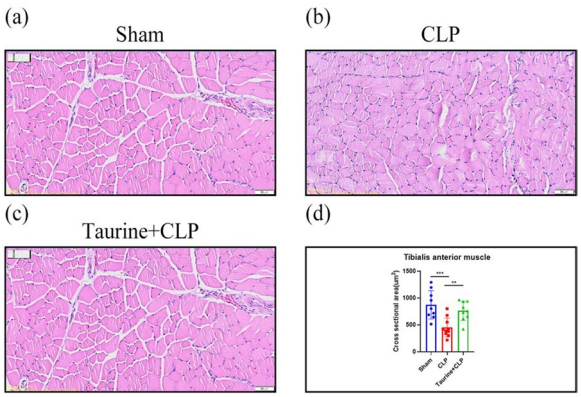


**Fig. 3 (abstract 0001020)** Taurine increases the cross-sectional area of the tibialis anterior muscle in septic skeletal muscle atrophy mice on day 14 after CLP. Scale bar = 50 μm."**" represents $P<0.01$, "***" represents $P<0.001$

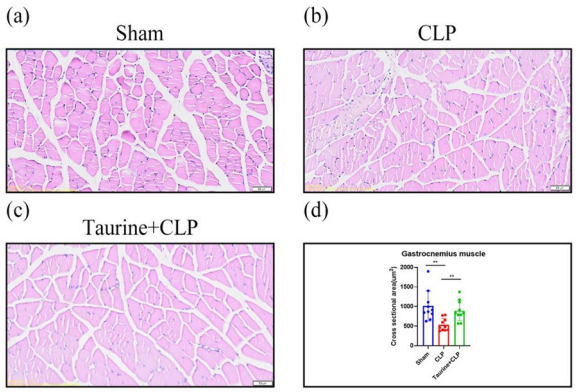


**Fig. 4 (abstract 0001020)** Taurine increases the cross-sectional area of gastrocnemius muscle in septic skeletal muscle atrophy mice on day 14 after CLP surgery. Scale bar = 50 μm. "**" represents $P < 0.01$

**Topic:** Sepsis

## 001021

### Epidemiology of endotracheal tube blockage in intensive care unit: a prospective observational study

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**Introduction:** Endotracheal tube blockages (ETB) are not uncommon in ICU (1). ETB can be due to many reasons and clinical presentation is non-specific. Ventilator pressure alarms are inaccurate and hypoxia is a late sign of ETB. This can lead to life threatening complications if not intervened early. Prospective studies describing epidemiology of ETB in ICU are lacking.

**Objectives:** To determine the incidence and factors contributing to ETB.
**Methods:** 369 consecutive endotracheal tubes of ICU patients aged > 18 years were assessed post-extubation. The tube was initially assessed virtually through naked eye and later cut at the level of maximum blockage. An image of the tube was captured through a dedicated 12-megapixel mobile camera. The percentage of ETB was analyzed using SketchAndCalc application with a digital image processing algorithm (2) (Fig. 1). This trial is registered with the Clinical Trial Registry-India (CTRI/2023/10/058184 on 3/10/2023).
**Results:** Out of 369 tubes assessed, Cardiothoracic ICU (CICU) patients were almost twice that of the Medical ICU (MICU) patients (240 vs 129). 102 tubes (27.64%) had 0% obstruction. Overall incidence of overt ETB (defined as ETB of 10% or more) was 212.74 and was more in CICU patients (218.68 vs 204.78 per 1000 ventilator days). Overt ETB was seen more in males (81.66% in CICU and 65.89% in MICU) and open suction practice (218.68 vs 204.78 per 1000 ventilator days). Most common site of block observed in overt ETB was distal to the cuff (147 vs 40) and mixed secretion (blood with mucous) was more common (99 vs 88) (Fig. 2 and 3). Monitoring mechanism trigger (defined as ventilator peak airway pressure > 30 cmh20) was not breached in majority of the patients with overt ETB (4/10 in 90–100% ETB, 2/2 in 80–90% ETB, 2/2 in 60–70% ETB, 6/8 in 50–60% ETB, 12/15 in 40–50% ETB) (Fig. 4). Incidence of severe ETB (defined as ETB of 50% or more) was seen more in MICU patients (39.89 vs 13.91 per 1000 ventilator days) and with closed suction practice (39.89 vs 13.91 per 1000 ventilator days). Severe ETB was seen more in presence of coagulopathy (50.92 vs 16.59 per 1000 ventilator days). Coagulopathy (defined as platelet count < 75,000/mm3 and/or INR > 1.5 and/or APTT > 45 s) was present in 6/10 in 90–100% ETB, 2/2 in 80–90% ETB, 1/2 in 60–70% ETB, 2/8 in 50–60% ETB, 4/15 in 40–50% ETB. Emergency tube removal was seen in 22/369 patients (10/10 in 90–100% ETB, 0/2 in 80–90% ETB, 0/2 in 60–70% ETB, 1/7 in 50–60% ETB and 3/12 in 40–50% ETB). Mixed secretion (15/22) at the distal end (11/22) was more common. Emergency tube removal was mostly on the 4th ventilator day (VD) followed by 2nd VD and 1st VD (7 vs 5 vs 4).
**Conclusions:** Overt ETB was observed more in CICU patients and open suction practice. Severe ETB was observed more in MICU patients and closed suction practice. ETB are highly unpredictable and ventilator peak airway pressure alarms do not correlate with the degree of ETB. Duration of ventilation has poor correlation with the degree of ETB.

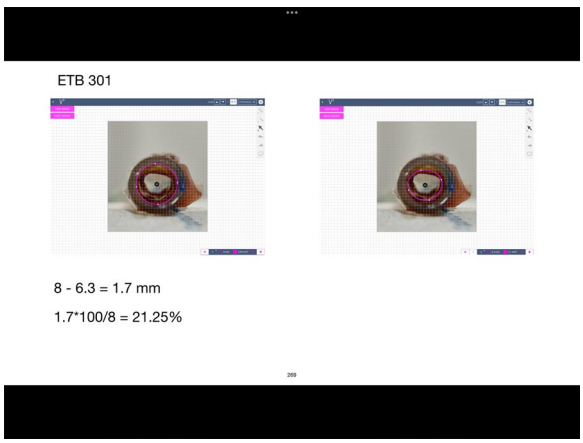


**Fig. 1 (abstract 0001021)** Method measuring ET tube block using image analyser

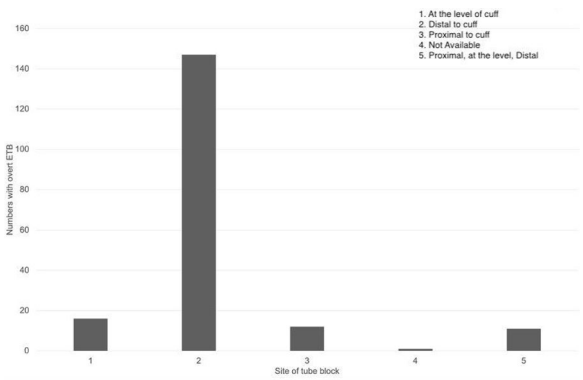


**Fig. 2 (abstract 0001021)** Site of obstruction

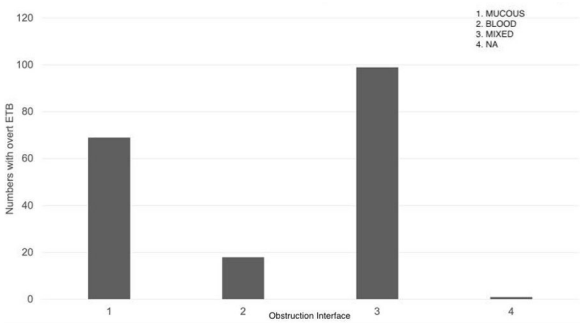


**Fig. 3 (abstract 0001021)** Characteristics of secretions

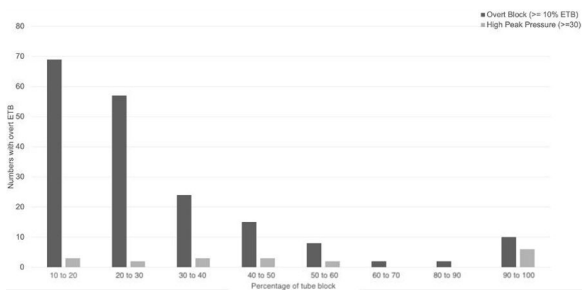


**Fig. 4 (abstract 0001021)** Incidence of monitoring mechanism trigger breach (P Peak > 30) in each category of tube block percentage with range of 10% block

**Reference(s)**
1. 1) Aparna c, saeeda i, divatia jv. Airway accidents in an intensive care unit. Indian j crit care med 2004;8:36 9.
2. https://www.sketchandcalc.com
3. None

**Topic:** Acute respiratory failure and mechanical ventilation

## 001022

### De novo atrial fibrillation is not influenced by noradrenaline peak dose in patients with septic shock

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001022

**Introduction:** De novo atrial fibrillation (DNAF) is defined as occurrence of a new episode of atrial fibrillation in patients without previous history, which is a common complication in critically ill septic patients, 1 and is associated to higher risk of adverse outcomes 2. The need for vasopressor appears to be an independent predictor of DNAF3. To our knowledge, no study has explored the correlation between noradrenaline (NA) peak dose and DNAF in septic shock patients.
**Objectives:** To assess the relationship between NA maximum dose and DNAF in patients with septic shock.
**Methods:** This is a single-center retrospective study enrolling adult patients admitted in the Intensive Care Unit (ICU) of Erasme University Hospital between 1/01/2016 and 30/09/2023, requiring NA tartrate infusion for septic shock of any origin. Anonymized data were retrieved from electronic records. Univariate and multivariate analyses to identify potential predictor of DNAF occurrence were performed. The occurrence of DNAF and its association with ICU mortality and of ICU length of stay (LOS) were also assessed. For all tests, the null hypothesis is rejected for $p$ values < 0.05.
**Results:** A total of 506 patients were enrolled, with a median Sepsis Organ Failure Assessment score (SOFA) on admission of 10 (8–13) and lactate level on admission of 3.6 (2.1–6.4) mmol/L; 59.5% ($n = 301$) patients were on mechanical ventilation. Infections source was abdominal in 46.2% ($n = 234$) and respiratory in 25.7% ($n = 130$) of patients. The median NA peak dose was 0.57 (0.23–1.29) mcg/Kg*min, with a median time to peak of 10 (3–25) hours since introduction of NA. Overall, 97 (19.2%) patients presented at least one episode of DNAF. No correlation was found between NA dose and the occurrence of DNAF occurrence ($p = 0.48$). DNAF occurrence was significantly associated with age ($p = 0.05$), SOFA score on admission ($p = 0.04$), history of heart failure with reduced ejection fraction ($p = 0.04$), weight at admission ($p = 0.02$) and time to NA weaning from peak dose ($p = 0.01$). DNAF occurrence was significantly associated with longer ICU stay ($p < 0.01$), but not with higher probability of ICU mortality ($p = 0.53$).
**Conclusions:** In this study, the occurrence of DNAF was not associated with the peak NA dose in patients with septic shock. The impact of DNAF on patients' significant outcomes remains limited.

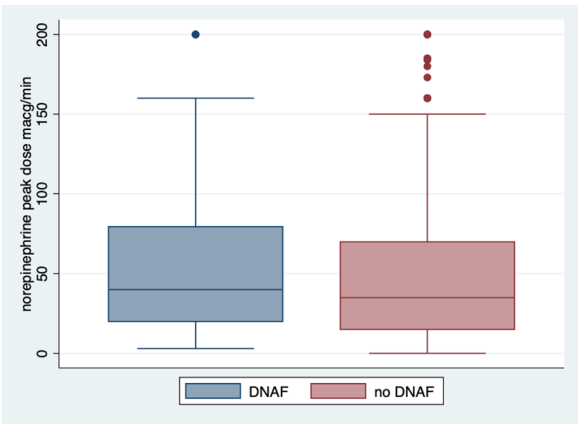


**Fig. 1 (abstract 0001022)** Norepinephrine peak doses in septic shock patients with our without de novo atrial fibrillation

**Table 1 (abstract 0001022)** Logistic regression of variables associated to the occurrence of de novo atrial fibrillation

| | Coef. | S.E. | OR | p value | 95% CI |
|---|---|---|---|---|---|
| Time to norepinephrine weaning from peak dose | 0,001 | 0,001 | 0,83 | 0,41 | - 0,01; 0,03 |
| HRrEF | 0,686 | 0,386 | 1,78 | 0,08 | - 0,07; 1,44 |
| Age | 0,038 | 0,013 | 3,01 | 0,003 | 0,01; 0,06 |
| Weight | 0,007 | 0,004 | 1,69 | 0,09 | -0,001; 0,014 |
| SOFA score at shock onset | 0,080 | 0,050 | 1,60 | 0,11 | - 0,017; 0,177 |

**Reference(s)**
1. 2. Walkey AJ, Wiener RS, Ghobrial JM, Curtis LH, Benjamin EJ. Incident stroke and mortality associated with new-onset atrial fibrillation in patients hospitalized with severe sepsis. JAMA 2011; 306:2248–2254.
2. 1. Seemann A, Boissier F, Razazi K et al. New-onset supraventricular arrhythmia during septic shock: prevalence, risk factors and prognosis. Ann Intensive Care 2015; 5:27.
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**Topic:** Cardiovascular issues in ICU

## 001023

### VEntilator Settings in Pediatric patients––a European Registry (VESPER)

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001023

**Introduction:** Critically ill pediatric patients frequently require ventilatory support (1), a potential life-saving therapy, however not without its associated risks. Studies on practice of ventilatory support in critically ill pediatric patients remain scarce, and those studies performed thus far show variation in practice (2–4). It should be noted that most studies date back from over ten years ago. Ventilation practice may have changed since then as new strategies and interventions have been introduced (5), and variance in practice could be substantial.
**Objectives:** The objectives of this study are to describe the practice of ventilatory support in critically ill pediatric patients across European centers, and to explore variance in key ventilator settings.
**Methods:** VESPER is a prospective, international, multicenter, observational study. Patients were included in hospitals throughout Europe, for a predefined 2-week period. Patients were eligible if: (1) aged ≤ 12 years; (2) admitted to the pediatric ICU of a participating hospital; (3) for ventilatory support expected to last more than 12 h. Patients admitted to a neonatal or adult ICU or patients that received ventilatory support because of a perinatal-related condition were excluded. Local investigators captured data on demographics and baseline characteristics at admission. Ventilator settings were collected on daily basis for a maximum of 7 days.
**Results:** A total of 131 patients were eligible for analysis of which the majority of patients were male (53%). The median age was 10 months [IQR: 2.0, 41.0]. The most common reason for admission was respiratory disease (43%). The most commonly used ventilation mode was pressure control ventilation (51%). Ventilator settings varied among patients and across different age groups (see figure).
**Conclusions:** VESPER gives insight into ventilation practice in critically ill pediatric patients receiving ventilatory support for at least 12 h. In this cohort, ventilator settings varied between patients and across different age groups. However, more patients are needed to investigate associations between ventilation practice and clinical outcome. A larger upcoming study will consider this, investigating ventilation practice in critically ill children worldwide, and exploring associations between practice and outcome.

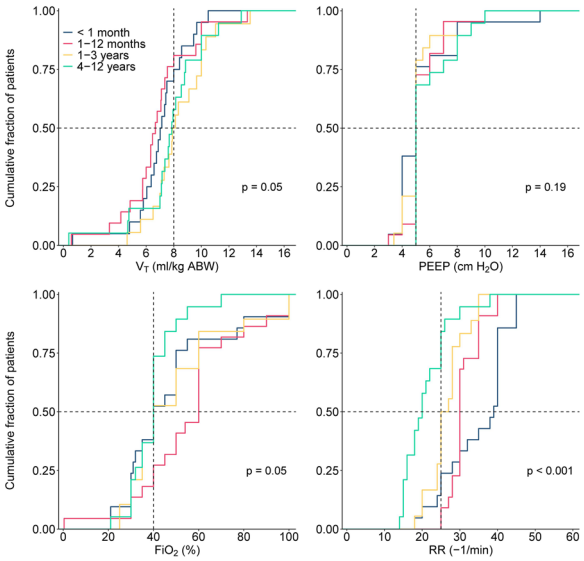


**Fig. 1 (abstract 0001017)** Cumulative frequency distribution of VT; PEEP; FiO2; and RR at day 0 for different age groups: < 1 month ($n = 21$), 1 to 12 months ($n = 22$), 1 to 3 years ($n = 20$), and 4 to 12 years ($n = 19$). Horizontal dotted lines represent the median for each variable, and vertical dotted lines represent the ideal cutoff for each parameter. Abbreviations: fraction of inspired oxygen (FiO2); positive end–expiratory pressure (PEEP); respiratory rate (RR); and tidal volume (VT)

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001026

### Characterization of cerebrovascular physiology during circulatory arrest in humans

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001026

**Introduction:** Central to circulatory arrest is the cessation of the brain's circulation and subsequent function thereafter leading to death. However, how the brain responds to stressors of progressive

hypotension and hypoxemia during circulatory arrest has not been described in humans despite it underpinning key concepts in the functioning of the human body and having relevance to resuscitation sciences and death determination.
**Objectives:** Following withdrawal of life-sustaining measures (WLSM) in critically ill humans, we aimed to determine the relationships between cerebrovascular physiology indices in response to progressive hypotension during circulatory arrest.
**Methods:** We conducted a single-center prospective interventional cohort study investigating the cerebrovascular physiology of circulatory arrest following WLSM in 25 humans. Prior to WLSM, multimodal neuromonitoring was implemented consisting of middle and posterior cerebral artery blood velocities (MCAv, PCAv) using transcranial Doppler, jugular venous bulb oximetry (SjvO2) and bilateral near-infrared spectroscopy for continuous frontal lobe regional oxygen saturation (rSO2). Mean arterial pressure (MAP) was monitored via an in situ radial arterial catheter. Relationships between cerebrovascular physiologic variables and MAP were assessed visually and relationships were model fit when appropriate.
**Results:** MCAv was linearly related to MAP with marked inter-individual variability of response ($n=21, =0.07, =0.91$, $P=0.02$). Similarly, PCAv and MAP responses were linearly related ($n=21, =0.07, =0.90$, $P=0.005$). There was a steeper slope response to a given change in MAP for MCAv compared to PCAv (0.42 cm/s/mmHg vs 0.30 cm/s/mmHg; $P<0.001$). SjvO2 had a variable downward curvilinear relationship with MAP ($n=19$). There was no discernible relationship between rSO2 and MAP ($n=15$).
**Conclusions:** Cerebral artery blood velocities and MAP slope responses were linear but heterogeneous between-individuals and between intracranial vessels, suggesting possible regional differences between the anterior and posterior cerebral circulation. The curvilinear relationship between SjvO2 and MAP was not replicated by rSO2.

**Topic:** Brain death, organ donation and transplantation

### 001027

**Intention of ICU nurses to leave intensive care**

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**001027

**Introduction:** Nurse turnover magnifies the problem of nurse shortage, now considered a global health emergency. High rates of intention to quit are reported among nurses, especially those working in Intensive Care Units (ICU).
One of the factors involved is job satisfaction, together with others such as moral distress, burnout syndrome, age, etc.
**Objectives:** The main objective of this study was to analyse the factors associated with the intention to leave among ICU nurses.
**Methods:** Cross-sectional descriptive study in which nurses from 3 ICUs in Gran Canaria participated. An electronic questionnaire was distributed, which included questions on socio-demographic and work variables, the validated Font Roja job satisfaction questionnaire and a final question on the participant's own intention to quit.
**Results:** ($n=152$). The ICU nurses' turnover intention found was 55,92% ($n=85$). Although the turnover intention in the paediatric ICU was higher, this was not statistically significant (60.8% vs. 55%, $p=0.604$). Overall job satisfaction was good (3.37/5) and was lower within those with intention to leave (3,97 vs 2,91, $p=0,000$).
**Conclusions:** There is a high turnover intention among ICU nurses, although no significant differences were found among the different ICUs. An inverse relationship was found between the intention to leave and job satisfaction.

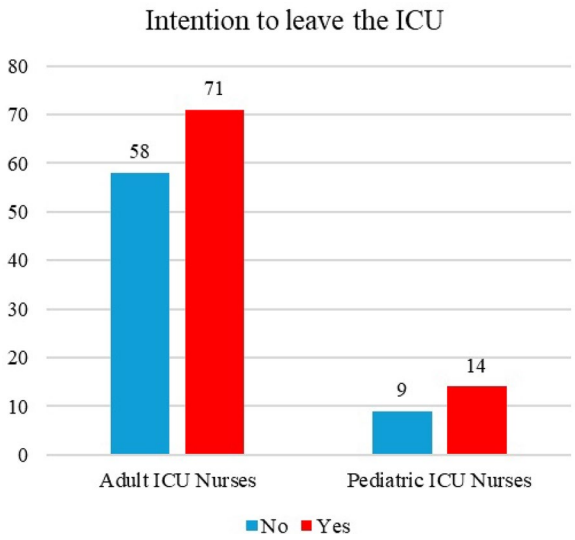


**Fig. 1 (abstract 001027)** Intention to quit (Yes or No) among Adult and Pediatric ICU nurses

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**Topic:** Nursing care and physiotherapy

### 001029

**Navigating respiratory failure: ventilatory management strategies for managing remote ICUs through tele-medicine in resource-limited settings**

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**001029

**Introduction:** Addressing acute and critical illness in low-middle income countries (LMICs) is challenging due to limited healthcare resources, including shortages of oxygen systems, ventilators, and skilled professionals. Respiratory failure, a common Intensive Care Unit (ICU) admission cause, is particularly problematic in remote areas. To optimize patient outcomes, healthcare providers must adapt treatment strategies to work within these resource constraints.
**Objectives:**
1 To describe the clinical course, outcomes, and risk factors associated with mortality among patients with respiratory failure.
2 To assess the relationship between ventilatory support, oxygenation, and survival in patients using a tele-consultation service in remote resource-limited ICUs.

**Methods:** The Tele-ICU service at the Aga Khan University Hospital (AKUH) provided consultations to physicians treating patients in ICUs and High Dependency Units (HDUs) nationwide. A retrospective cohort study involving patients obtaining tele-consultations in remote ICUs between July 2020 and August 2021 was conducted. Our cohort consisted of severe and critically ill patients diagnosed with severe or critical SARS-Cov2 by RT-PCR. Analyses included descriptive statistics, univariate and multivariate regression models to assess factors influencing patient outcomes. Additionally, logistic regression models examined the impact of ventilatory support on survival, with patient outcome as the dependent variable and pO2 levels as the independent variable, while controlling for the effect of respiratory support levels. Finally, we generated a ROC curve using the lowest measured pO2 of each patient to identify the optimal inflection point for survival prediction.
**Results:** 197 patients were part of our cohort out of which 68 (34.5%) did not survive. Non-survivors had a slightly higher median age compared to survivors (67.5 vs 65 years). Symptoms at presentation included shortness of breath (77.7%), fever (73.6%), and dry cough (56.3%), with hypertension (47.1%) as the most common comorbidity. Diabetes mellitus (OR = 1.99, $p = 0.044$) and antiviral use (OR = 5.36, $p = 0.014$) were significantly associated with increased mortality on univariate and multivariate regression, respectively. Patients requiring Invasive Mechanical Ventilation (IMV) exhibited significantly higher mortality compared to nasal cannula and nasal prongs (OR = 26.89, 95%CI 1.50–483.24, $p = 0.026$). In contrast, there was no increase in mortality with the use of non-rebreather mask (NRM) (OR = 0.29, 95% CI 0.01–16.95, $p = 0.554$), high-flow nasal cannula (HFNC) (OR = 13.23, 95% CI 0.01–20,650.46, $p = 0.491$), CPAP (OR = 1.02, 95% CI 0.01–184.88, $p = 0.995$), and BiPAP (OR = 4.97, 95% CI 0.44–56.72, $p = 0.197$). The ROC curve identified a predictive pO2 cutoff of 49.6, with patients having almost 4.50 times higher odds (OR = 4.49) of survival at or above this level.
**Conclusions:** The study highlights the importance of respiratory support in navigating respiratory failure within resource-limited remote settings. Surprisingly, our findings challenge conventional assumptions, indicating that individuals may possess a greater resilience to hypoxia than previously thought. Moreover, the preferential use of non-invasive ventilation over invasive mechanical ventilation in such constrained environments may offer a potentially more effective treatment approach. These insights emphasize the imperative for tailoring appropriate therapeutic strategies and healthcare delivery to address the unique challenges seen in LMICs.

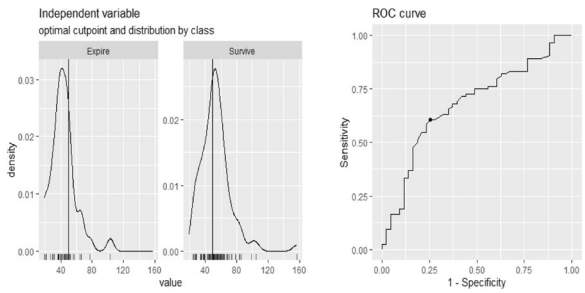


**Fig. 1 (abstract 0001029)** Using the ROC curve, the optimal cut-off oxygen level to predict survival was determined to be a pO2 of 49.6. The corresponding AUC value was 0.67, with sensitivity at 0.61, specificity at 0.74, PPV at 0.82, NPV at 0.49, and accuracy at 0.65. The odds ratio and risk ratio for the identified cut-off oxygen level of 49.6 were calculated as 4.49 and 2.37, respectively

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001031

### The influence of transfusion on the neurovascular unit in pediatric patients during correction of congenital heart defects

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001031

**Introduction:** A wide range of factors destructive to the brain in pediatric patients undergoing correction of congenital heart defects (CHD) increases the relevance of developing new methods of cerebroprotection. One such method could be limiting the use of transfusion, considering that components of donor blood can initiate a systemic inflammatory response and neuroinflammation leading to subsequent cerebral damage. To investigate the impact of transfusion on the development of cerebral injury during surgical correction of congenital heart defects in children under conditions of cardiopulmonary bypass (CPB) using a cellular model of the neurovascular unit (NVU).
**Methods:** For the experimental part of the study, a cellular model of the NVU was formed and incubated with serum from patients undergoing correction of septal CHD under CPB conditions (containing high interleukin concentrations) in different oxygen conditions with the fixation of transendothelial resistance as an indicator of NVU functional activity. Serum samples were collected after completion of CPB.
**Results:** When culturing the cellular model of the NVU with patient serum and without it under different conditions, with oxygen concentrations ranging from 1 to 4%, it was found that the transendothelial resistance in the 4% oxygen group did not differ from the control group throughout the 24-h observation period. At the same time, when culturing the NVU with patient blood serum, transendothelial resistance was significantly reduced after only 4 h and recovered to only 90% of normal after 24 h.
**Conclusions:** Considering that incubation with the serum simulated the effect of systemic inflammation on the brain, it can be concluded that the influence of transfusion (as a factor initiating systemic inflammation) can lead to NVU destruction. At the same time, avoiding transfusion, which essentially leads to chemical hypoxia, has a significantly lesser impact on the brain.

**Reference(s)**

1. This research was funded by the scientific grant of the Russian Science Foundation No. 22- 15-00258, "Investigation of damage markers and methods of neurovascular unit protection in pediatric patients in cardiac surgery", https://rscf.ru/project/22-15-00258/

**Topic:** Sedation, analgesia and delirium

## 001032

### Noradrenaline dose and mortality in septic shock

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001032

**Introduction:** Septic shock is still a frequent cause of morbidity and mortality worldwide1. According to international guidelines noradrenaline is the first-line vasopressor of choice. Incremental doses of noradrenaline are associated with a higher risk of mortality2.
**Objectives:** To assess the correlation between noradrenaline (NA) dose and mortality in patients with septic shock.
**Methods:** This was a single-center retrospective study, including patients treated for septic shock between 2016 and 2022 in the Intensive Care Unit (ICU) at the Erasme Hospital, Brussels, Belgium. Demographics, clinical, hemodynamic laboratory data and severity scores, Acute Physiologic Assessment and Chronic Health Evaluation Scoring System II (APACHE II) and sepsis-related organ failure assessment (SOFA) scores were collected. NA doses were collected on admission, at peak dose, as well as time to halving and time to NA wean. Logistic regression was used to estimate the risk of death in intensive care in terms of NA levels. Optimal binning was used to create NA levels based on major changes in ICU mortality percentages. Unadjusted and adjusted ORs and their 95% CIs were estimated.
**Results:** A total of 506 patients were enrolled, with a median sepsis-related organ failure assessment score (SOFA) on admission of 10 (8–13) and lactate level at admission 3.6 (2.1–6.4) mmol/l. 59.48% ($n = 301$) of patients were on mechanical ventilation. ICU mortality was 36.2% ($n = 183$) In-hospital mortality was 44.5% ($n = 225$), average ICU length of stay was 6 (3–11) days. In hospital mortality was associated with older age ($p = 0.046$), the presence of atrial fibrillation ($p = 0.01$), diabetes mellitus ($p = 0.04$) and liver cirrhosis ($p = 0.005$), as well as high APACHE II ($p < 0.001$) and SOFA scores ($p < 0.001$), both on admission. NA peak dose also was associated with mortality ($p < 0.001$). From 0.29 to 0.69 mcg/kg/min of peak NA tartrate dose, the probability of death linearly increased when compared to the lowest NA ranges (e.g. 0.05–0.29 mcg/kg/min—25% mortality). However, mortality rates remained stable among a wide range of NA doses (Fig. 1). After correcting for confounders, the odds ratio for mortality in this group was 2.8 (95% CI 2.5–3.2) compared to the lowest range. Only for NA peak dose $\geq 3$ µg/kg/min, mortality rose again to 90%.
**Conclusions:** In this study, noradrenaline peak dose showed a ladder association with mortality. Noradrenaline doses higher than 3 µg/kg/min correspond to mortality higher than 90%.

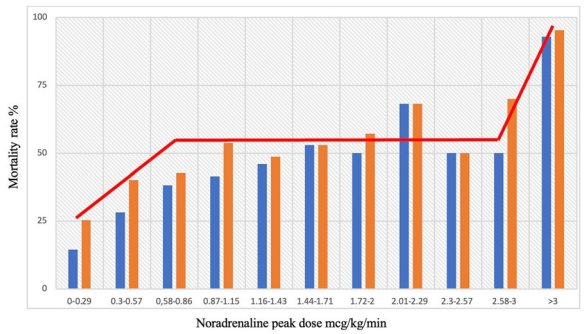


**Fig. 1 (abstract 0001032)** Noradrenaline peak dose and mortality. Blue bar: ICU mortality; orange bar: in-hospital mortality; red line: adjusted mortality risk

**Table 1 (abstract 0001032)** Vasoactive drugs kinetics

| Vasoactive drugs kinetics | | | | |
|---|---|---|---|---|
| | **All patients (n=506)** | **Alive (n=322)** | **Dead (n=184)** | **p value** |
| NA initial dose (mcg/kg/min), median (IQR) | 0.14 (0.04-0.36) | 0.1 (0.03-0.25) | 0.21 (0.06-0.57) | **< .001** |
| NA peak dose (mcg/kg/min), median (IQR) | 0.57 (0.23-1.29) | 0.36 (0.2-0.86) | 1.14 (0.57-2.29) | **< .001** |
| NA time to peak (h), median (IQR) | 10 (3;25) | 6 (2;17) | 20 (8;48) | **< .001** |
| T peak to ½ dose (h), median (IQR) | 7 (3;13,5) | 7 (4;14) | 6 (3;12) | 0.43 |
| T to NA weaning (h), median (IQR) | 46 (27;79,5) | 44,5 (26,2;76) | 67 (30;134) | **0.017** |
| Still in shock at 24 h, n (%) | 379 (75) | 210 (65) | 169 (92) | **< .001** |
| Added vasopressor, n (%) | 29 (6) | 9 (3) | 20 (11) | **< .001** |
| Inotropes, n (%) | 119 (24) | 55 (17) | 64 (35) | **< .001** |
| Hydrocortisone, n (%) | 208 (41) | 102 (32) | 106 (58) | **< .001** |

NA: noradreanline; T: time; h: hours; IQR: interquartile range

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**Topic:** Cardiovascular issues in ICU

## 001034

### Role of intravenous aviptadil in sepsis-related acute respiratory distress syndrome

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001034

**Introduction:** Acute respiratory distress syndrome (ARDS) includes spectrum of conditions with different etiologies, pulmonary and extrapulmonary. Vasoactive intestinal peptide (VIP) is a hormone localized in the lungs. It has protective functions in lung. Aviptadil is a synthetic VIP and has been studied in various respiratory disease. Recently clinical trials have been conducted for the use of Aviptadil in ARDS associated with COVID-19 which showed reduction in mortality and hospital stay. We have used Aviptadil in patients with ARDS other than COVID-19.
**Objectives:** This study investigated the utility of intravenous Aviptadil in patients with acute respiratory distress syndrome (ARDS) not associated with COVID-19.
**Methods:** Patients aged more than 18 years, admitted to ICU with moderate to severe ARDS prespecified on the Berlin definition, P/F ratio of < 150 were included after taking consent from the guardian.

Pregnancy, chronic organ failure and end stage malignancies were the exclusion criteria. Aviptadil was administered intravenously over three days via an escalating dose regimen: 0.166 mcg/kg/h on day one, 0.332 mcg/kg/h on day two, and 0.489 mcg/kg/h on day three. The drug was given for 12 h each day using an infusion pump. All clinical parameters, adverse effects, arterial blood gases and imaging were noted.

**Results:** Of the 10 patients who received Aviptadil, 8 were males. Mean age was 36.6 years. Two patients had moderate while 8 had severe ARDS with mean P/F ratio was 94 ± 8. All patients had sepsis related ARDS. 5 patients had pulmonary cause for ARDS, all of them admitted with community acquired pneumonia with causative agent of influenza A virus in four patient while no pathogen was found in 1 patient, 3 patients had scrub typhus, one had sepsis with Fournier gangrene and one had sepsis with necrotizing fascitis of abdominal and chest wall.

Two patients had diabetes. One patient had history of ischaemic heart disease. Six patients were mechanically ventilated while one was managed with high flow nasal oxygen therapy.

Seven patients were started with Aviptadil within 24 h of admission while 3 were started after 72 h. Two patients received only two doses due to adverse event, one had hypotension while other had intracranial bleed. Rest eight patients received all three doses.

Five patients developed septic shock. Four had features of multiorgan dysfunction syndrome, three of which succumbed to death making mortality 30%. One patient who was on HFNO was weaned over next 3 days and discharged from ICU, while other three patients who were ventilated, were gradually weaned from ventilator with mean time of 4 ± 2 days and extubated. Radiological resolution was observed over 6 ± 2 days. Factors contributing to death were severity of ARDS, septic shock, and AKI.

**Conclusions:** This preliminary study suggests that Aviptadil may offer potential therapeutic benefits for non-COVID-19 ARDS, though larger trials are warranted to confirm efficacy, optimize dosing, and further investigate safety profiles and patient selection.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001035

## Characterization of the proteomic profile in sepsis compared to non-infectious systemic inflammatory response syndrome (NISIRS)


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**Introduction:** Sepsis represents a high percentage of ICU admissions. One of the challenges that clinicians face is knowing how to differentiate septic processes from other non-infectious inflammatory processes.

**Objectives:** To identify potential protein biomarkers of differential expression between sepsis and non-infectious systemic inflammatory response syndrome (NISIRS).

**Methods:** Prospective observational study of a cohort of septic patients activated by the Sepsis Code and patients admitted with NISIRS, during the period 2016–2017. Samples were stored in the Sepsis Biobank. Demographic and analytical variables, organ dysfunction (SOFA), and hospital mortality were analyzed. Proteins were separated using multidimensional chromatography and identified by mass spectrometry. Recursive Feature Elimination (RFE) was used to select proteins that best classified patients with sepsis versus patients with NISIRS—Support Vector Classification (SVC) algorithm. Data are expressed as frequency (%) for categorical variables and mean (standard deviation) for quantitative variables. Tests used: McNemar (sensitivity, specificity, and accuracy) and trapezoidal rule (AUC). The study was approved by the Ethics Committee (PR(AG)11 2016, PR(AG)336 2016, PR(AG)210 2017), and patients or their relatives provided informed consent.

**Results:** A total of 277 patients (141 with sepsis and 136 with NISIRS) were included. Demographic and clinical data of patients are shown in Table 1. In the sepsis group, the most frequent infection foci were urinary 49 (34.8%), respiratory 47 (33.3%), and abdominal 44 (31.2%). All patients had positive cultures. The NISIRS group consisted of 107 (78.67%) patients in immediate postoperative cardiac surgery, 13 (9.55%) in immediate postoperative lung transplant, 5 (3.67%) patients in immediate postoperative liver transplant, 4 (2.94%) patients with hemorrhagic shock, and 3 (2.20%) patients with other pathologies (1.50%). After RFE, 31 proteins showed statistical differences between sepsis and NISIRS with an accuracy of 0.49 ± 0.035, precision of 0.967 ± 0.037, specificity of 0.910 ± 0.103, sensitivity of 0.964 ± 0.035, and AUC of 0.937 ± 0.053. The analyzed proteins (Table 2) include 12 involved in proteolysis regulation, 9 in innate immune response, 5 in complement activation, 5 in lipopolysaccharide response, 4 in coagulation, 2 in lipid metabolism, and eight proteins with other functions (Fig. 1). Of these proteins, PPBP, V1RL, C5, vWF, and SERPINA4 show a greater association with sepsis than NISIRS (Fig. 2).

**Conclusions:** Proteomic analysis allows for the identification of differential proteins between sepsis and NISIRS that may suggest new diagnostic and therapeutic targets.

**Table 1 (abstract 0001035)** Demographic characteristics of the study population

| Parameters | Total (n=277) | Sepsis (n=141) | NISIRS (n=136) | p |
|---|---|---|---|---|
| Men, n (%) | 162 (58.48) | 85 (60.28) | 77 (56.61) | 0.53 |
| Age, years (m±SD) | 63.3±15.61 | 63.9±15.67 | 62.1±15.58 | 0.54 |
| SOFA, median (25,75) | 5(3,7) | 7(5,8) | 3(2,6) | <0.05 |
| Norepin, n (%) | 121 (43.68) | 76 (53.90) | 45 (33.08) | <0.05 |
| ICU admission, n (%) | 206 (74.4) | 70 (49.64) | 136 (100) | <0.05 |
| Mech Vent, n (%) | 177 (63.9) | 41 (29.07) | 136 (100) | <0.05 |
| W cell x 106 (m±SD) | 14118.51±9149.92 | 13501.75±11021.54 | 14757.94±661.85 | 0.25 |
| Plat x109, median (25,75) | 130.85 (116.0,227.5) | 184.00 (114.0,278.5) | 157.00 (119.5, 195.2) | <0.05 |
| Lactate mmol/L, median (25,75) | 1.9 (1.4, 3.1) | 2.5 (1.8, 4.1) | 1.5 (1.0, 1.9) | <0.05 |
| RCP mg/dL, (m±SD) | 38.96±21.89 | 72.02±30.37 | 4.68±1.09 | <0.05 |
| Mortality, n (%) | 35 (12.6) | 33 (24.2) | 2 (1.4) | <0.05 |

**Table 2 (abstract 0001035)** Proteins analyzed and associated with sepsis

| Proteins associated to sepsis | |
|---|---|
| **C5** - Complement C5 alpha' chain | **PPBP** - Connective tissue-activating peptide III |
| **C6** - Complement component C6 | **SERPINA4** - Kallistatin |
| **APOE** - Apolipoprotein E | **VWF** - Von Willebrand antigen 2 |
| **C1RL** - Complement C1r subcomponent-like protein | **COL1A1** - Collagen alpha-1 chain |
| **FCN3** - Ficolin-3 | **FN1** - Fibronectin |
| **GSN** - Gelsolin | **CA1** - Carbonic anhydrase 1 |
| **C3** - Complement C3c alpha' chain fragment 1 | **LUM** - Lumican |
| **SERPINA3** - Alpha-1-antichymotrypsin | **PRDX2** - Peroxiredoxin-2 |
| **LBP** - Lipopolysaccharide-binding protein | **SERPINA6** - Corticosteroid-binding globulin |
| **SERPINF1** - Pigment epithelium-derived factor | **LRG1** - Leucine rich alpha-2-glycoprotein 1 |
| **ITIH3** - Inter-alpha-trypsin inhibitor heavy chain H3 | **F12** - Coagulation factor XIIa heavy chain |
| **CD14** - Monocyte differentiation antigen CD14 | **BTD** - Biotinidase |
| **ITIH1** - Inter-alpha-trypsin inhibitor heavy chain H1 | **SAA1** - Serum amyloid protein A |
| **RBP4** - Plasma retinol-binding protein | **AFM** - Afamin |
| **ORM1** - Alpha-1-acid glycoprotein 1 | **APOB** - Apolipoprotein B-100 |

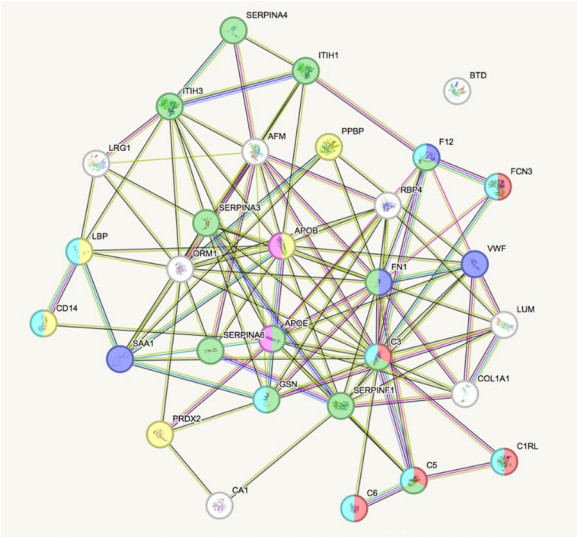


**Fig. 1 (abstract 0001035)** Relationship among proteins (strings)

**Topic:** Sepsis

## 001036

### A study to find the minimum effective volume of 0.5% ropivacaine for ultrasound guided costoclavicular block

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001036

**Introduction:** Brachial plexus block is an effective method for providing anaesthesia and analgesia to the upper limb. The plexus can be blocked at multiple sites depending upon the indication, procedure to be performed and patient characteristics. There are various approaches to brachial plexus at the infraclavicular level. These include para-coracoid approach, parasagittal approach and costoclavicular approach. The conventional para-coracoid approach aimed to deposit the drug dorsal to axillary artery in the lateral infraclavicular fossa. The brachial plexus in costoclavicular fossa is superficial, clustered together and has a consistent relationship to each other and axillary artery. So drug can be deposited using single injection with rapid onset. We hypothesise that brachial plexus block using ultrasound guided costoclavicular approach will have local anaesthetic sparing effect. So, we undertook this study to find the minimum effective volume of 0.5% ropivacaine for costoclavicular approach of brachial plexus block (CCB).
**Objectives:** Primary objective—to find the minimum effective volume of 0.5% ropivacaine in 90% patients (MEV 90) for ultrasound guided costoclavicular approach of brachial plexus block.
Secondary objectives: 1. To assess the onset of block using a composite score of 14/16 or above up to 30 min of the block. 2. To assess the success rate of the block. 3. To assess the block performance time. 4. To assess the adverse events associated with the block like vessel puncture, pleural puncture, paraesthesia or local anaesthetic toxicity.
**Methods:** This was a prospective observational study that included 52 ASA I/II patients in the age group of 18–65 years with BMI of 18–35 kg/$m^2$ posted for upper limb surgery. Ropivacaine 0.5% was administered using "Biased coin design up and down sequential method." Initial volume used was 20 ml of 0.5% ropivacaine for USG-guided CCB. In case of successful block, the next patient received 18 ml of drug. In case of failure, the same volume was used as 20 ml was decided to be the maximum volume. This continued till there was a successful block. After that, the volume was increased or decreased by 2 ml depending upon the response of the patient. This continued till 30 patients were recruited. Next 20 patients received the same volume of the drug.
**Results:** We observed that the mean age of patients was $28.5 \pm 11.42$ years. Out of 52 patients, 46 (88.5%) were males. Mean BMI was found to be $23.9 \pm 4.1$ kg/$m^2$. The imaging time (time between contact of probe and acquisition of satisfactory picture) was $2.65 + \pm 1.8$ min. Needling time (start of skin wheel to end of LA injection) was $5.50 \pm 2.6$ min. anaesthesia onset time was $29.2 \pm 7.9$ min. The minimum effective volume of 0.5% ropivacaine in 90% patients using isotonic regression plot was found to be 15.69 ml. We also observed that musculocutaneous nerve had the fastest onset of sensory block followed by median, ulnar and radial nerves. The motor block onset was also the fastest for musculocutaneous nerve T 10 min, followed by radial, median and ulnar at 20 min. The patients who did not have a composite score of 14/16 were considered a failure of block. The block was successful in 32 patients (61.5%) at 30 min and failure was noted in 20 patients (38.5%). Eleven patients required general anaesthesia at the end of 30 min while 9 had a delayed onset. None of the patients had any complications.
**Conclusions:** We concluded that the minimum effective volume of 0.5% ropivacaine in 90% patients (MEV 90) for ultrasound guided CCB was 15.69 ml using biased coin up and down method.

**Reference(s)**

1. Karmakar MK et al. Benefits of costoclavicular space for ultrasound-guided brachial plexus block: description of costoclavicular approach. Reg Anesth Pain med.2015;40(3):287–8

**Topic:** Trauma

## 001038

### Neuronal-specific enolase at 48 h as a prognostic marker in patients with recovered cardiac arrest

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**Introduction:** Neuronal-specific enolase (NSE) is the most studied biomarker for post-cardiac arrest coma prognostication. Currently, its practical clinical use involves measuring the serial kinetics of NSE during the first 72 h following the acute event. However, differences between this approach and the single or serial determination of NSE up to 48 h have not been studied.
**Objectives:** To determine if NSE at 48 h has similar sensitivity and specificity to that at 72 h for predicting outcomes in patients following recovered sudden cardiac arrest (SCA-R).
**Methods:** Retrospective observational study of patients admitted to intensive care units (ICUs) from November 2018 to November 2022

after experiencing out-of-hospital (OHCA) or in-hospital cardiac arrest (IHCA). Study variables: Age, sex, cardiopulmonary resuscitation (CPR) times, NSE values measured at 24, 48, and 72 h from the cardiac arrest, and hospital and ICU mortality. Qualitative variables were expressed as percentages, and quantitative variables as means with standard deviation or medians with ranges, depending on their distribution. Chi-square or Student's t-test were used for analysis, depending on the compared variables ($p < 0.001$). ROC curves were used to analyse the discriminative capacity of NSE measurements at 24, 48, and 72 h compared with patient mortality in the ICU.

**Results:** 206 patients were included, 75% male, with a mean age of 58 ± 14 years. 69.4% experienced OHCA and 27.2% experienced IHCA. Of the total, 71.4% progressed to mortality. Two groups were formed, ICU mortality versus ICU survival. Both CPR times and NSE measurements at 24, 48, and 72 h differed significantly between the two groups (Table 1). ROC curves were generated with NSE at 24, 48, and 72 h with an AUC of 0.809, 0.892, and 0.872, respectively (Fig. 1).

**Table 1 (abstract 0001038)** Distribution of patients according to their evolution in intensive care unit (ICU) towards survival or mortality following an SCA

| | | ICU survival | ICU mortality |
|---|---|---|---|
| Age | | 56 ± 15 | 59 ± 13 |
| Gender | Female | 16,4% | 26,5% |
| | Male | 83,6% | 73,5% |
| Place of SCA | OHCA | 61,8% | 74,1% |
| | IHCA | 38,2% | 23,8% |
| CPR Time (min) | Without CPR | 1,9 ± 2,9 | 3,1 ± 4,8 |
| | BLS | 4,9 ± 5,6 | 5,3 ± 5,6 |
| | ALS | 13,8 ± 11,7 | 19,2 ± 14,8 |
| | Total | 19,4 ± 12,5 | 24,7 ± 16 |
| NSE 24 h | | 29,5 (21,2–50) | 72 (39–117) |
| NSE 48 h | | 29 (17–40,5) | 131,0 (53,5–296,5) |
| NSE 72 h | | 27 (16,7–50,5) | 151 (59–324) |

Comparison based on qualitative variables, expressed as percentages, and quantitative variables, expressed as mean with standard deviation or median with range according to their distribution or non-parametric nature

ICU: Intensive Care Unit. SCA: sudden cardiac arrest. OHCA: out-of-hospital cardiac arrest. IHCA: in-hospital cardiac arrest. CPR: cardiopulmonary resuscitation. BLS: basic life support. ALS: advanced life support. NSE: neuronal-specific enolase

**Conclusions:** The determination of vital prognosis in patients who experience recovered sudden cardiac arrest is complex and requires the combination of several techniques. Single or serial determination of NSE up to 48 h may be sufficient to establish a poor long-term vital prognosis.

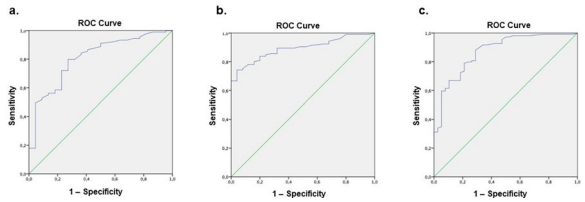


**Fig. 1 (abstract 0001038)** Neuronal-specific enolase at: (a) 24 h. AUC 0.809. Standard error 0.05. 95% CI (0.711–0.908). (b) 48 h. AUC 0.892. Standard error 0.028. 95% CI (0.838–0.947). (c) 72 h. AUC 0.872. Standard error 0.033. 95% CI (0.807–0.936)

**Reference(s)**

1. Kurek K, Swieczkowski D, Pruc M, Tomaszewska M, Cubala WJ, Szarpak L. Predictive Performance of Neuron-Specific Enolase (NSE) for Survival after Resuscitation from Cardiac Arrest: A Systematic Review and Meta-Analysis. J Clin Med. 2023 Dec 13;12(24):7655.
2. Mochetti MM, Silva EGP, Correa AAF, Cabette MR, Perissinotti IN, E Silva LOJ, Pessoa AS, de Oliveira RC, da Silva LFF, de Souza HP, de Alencar JCG. Neuron-specific enolase at admission as a predictor for stroke volume, severity and outcome in ischemic stroke patients: a prognostic biomarker review. Sci Rep. 2024 Feb 1;14(1):2688
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4. Chung-Esaki HM, Mui G, Mlynash M, Eyngorn I, Catabay K, Hirsch KG. The neuron specific enolase (NSE) ratio offers benefits over absolute value thresholds in post- cardiac arrest coma prognosis. J Clin Neurosci. 2018 Nov;57:99–104.

**Topic:** Cardiac arrest

## 001040

### Concordance of different non-invasive neuromonitoring tools

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**Introduction:** Several non-invasive neuromonitoring tools can provide a reasonable estimate of invasive intracranial pressure (ICP), especially when used in a multimodal combination (1). However, few data are available on the correlation among these different tools.

**Objectives:** To evaluate the concordance of four non-invasive neuromonitoring tools, commonly used to assess ICP.

**Methods:** This is a secondary analysis of previously published prospective data collected in adult intensive care unit (ICU) patients with traumatic brain injury (TBI), subarachnoid hemorrhage (SAH) or intracerebral hemorrhage (ICH), in whom invasive ICP monitoring had been initiated and different neuromonitoring tools simultaneously assessed (1). In particular, we compared the optic nerve sheath diameter (ONSD), the pulsatility index (PI) and estimated ICP (eICP) using transcranial Doppler, as well as the neurological pupil index (NPI) obtained via an automated pupillometry. ONSD values were considered abnormal if ≥ 6.0 mm; PI was considered abnormal if > 1.2, NPI was considered abnormal if < 3.0. Correlation and concordance between variables were assessed using the Pearson's r and Cohen's k coefficients, respectively.

**Results:** We studied 100 patients (TBI = 30; SAH = 47; ICH = 23) with a median age of 52 years. We observed a weak correlation between ONSD and PI ($r = 0.24$), ONSD and NPI ($r = -0.33$) and PI and NPI ($r = -0.28$); a moderate correlation between ONSD and eICP ($r = 0.54$) and PI and eICP ($r = 0.41$); a strong correlation between eICP and NPI ($r = -0.71$; $p < 0.05$ for all). We observed a poor concordance between ONSD and eICP ($k = 0.20$); a fair concordance between ONSD and PI ($k = 0.27$), eICP and NPI ($k = 0.30$) or between ONSD and NPI ($k = 0.29$); a moderate concordance between PI and NPI ($k = 0.46$); a good concordance between PI and eICP ($k = 0.69$).

**Conclusions:** We observed variable correlation and concordance among different non-invasive neuromonitoring tools, commonly used to estimate ICP. These tools are therefore not interchangeable.

**Topic:** Neurointensive care

## 001041

### Nucleated red blood cells as a prognostic marker for mortality in patients with COVID-19 induced ARDS: an observational study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001041

**Introduction:** The presence of nucleated red blood cells (NRBC) in the peripheral blood of critically ill patients is associated with poor outcome. Evidence regarding the predictive value of NRBCs among patients with COVID-19-induced acute respiratory distress syndrome (ARDS) remains elusive. Therefore, the aim of the present study was to evaluate the predictive validity of NRBCs in these patients.
**Methods:** This retrospective study was conducted at the University Hospital Dresden, Germany. All adult patients with COVID-19-induced ARDS admitted to the intensive care unit (ICU) between 03/2020 and 03/2022 were analyzed. Daily NRBC values were assessed and their predictive validity on mortality was statistically evaluated.
A cut-off level based on the patient's maximum NRBC value during ICU stay was calculated using receiver operating curves (ROC)-analysis and further specified according to Youden's method. Independent predictors of mortality were identified with multiple logistic and COX regression analyses. Survival was depicted using Kaplan–Meier curves which were tested for differences using the log-rank test; $p < 0.05$ was considered statistically significant.
**Results:** In total, 413 critically ill patients with COVID-19-induced ARDS were analyzed. NRBCs were found in 97.6% of these patients. Patients who did not survive had significantly higher NRBC values during their ICU stay compared to patients who survived (1090/µl [310; 3883] vs. 140/µl [20; 500]; $p < 0.0001$). Patients with severe ARDS ($n = 374$) had significantly higher NRBC values during ICU stay compared to those with moderate ARDS ($n = 38$) (490/µl [120; 1890] vs. 30/µl [10; 476]; $p < 0.0001$).
A cut-off level of NRBC ≥ 500/µl was determined to best stratify risk (Fig. 1A) and was associated with a longer duration of ICU stay (12 [8; 18] vs. 18 [13; 27] days; $p < 0.0001$) and longer duration of mechanical ventilation (10 [6; 16] vs. 17 [12; 26] days; $p < 0.0001$). Extracorporeal membrane oxygenation (ECMO) was significantly more often implemented in patients above this threshold (52 [23.85%] vs. 126 [64.6%] patients; $p < 0.0001$). Logistic regression analysis with multivariate adjustment showed NRBCs ≥ 500/µl to be an independent risk factor of mortality (Odds ratio (OR) 4.72; 95% confidence interval (CI) 2.95–7.62; $p < 0.0001$). Patients with NRBC values below the threshold of 500/µl had a significant survival advantage than patients above the threshold (median survival 32 [95% CI 8.7–43.3] vs. 21 days [95% CI 18.2–23.8]; log-rank test, $p < 0.05$) (Fig. 1B).
Patients who once reached the NRBC threshold of ≥ 500/µl during their ICU stay had a significantly increased long-term mortality (median survival 489 days, log-rank test, $p < 0.01$, hazard ratio (HR) 3.2, 95% CI 1.2–8.5).
**Conclusions:** NRBCs predict mortality in critically ill patients with COVID-19 induced ARDS with high prognostic power. Further studies are required to confirm the clinical impact of NRBCs to eventually enhance decision-making and improve patient outcomes.

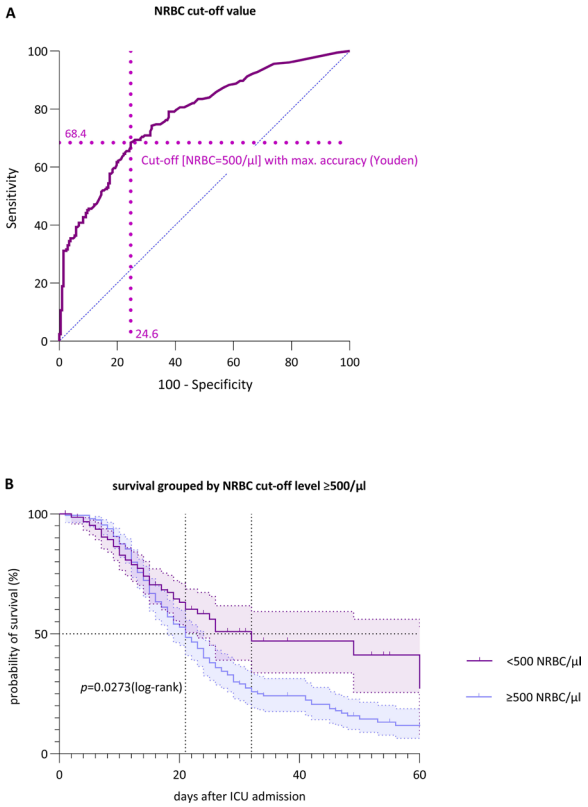


**Fig. 1 (abstract 0001041)** A receiver operator curve (ROC) for the determination of predictive validity of NRBC measurements. The highest sum of sensitivity and specificity was used for calculating a cut-off value. ROC area under the curve (AUC): 0.7793; 95% CI 0.7354–0.8233; $p < 0.0001$. B Probability of survival depicted as a Kaplan–Meier curve of patients with COVID-19 induced ARDS grouped by NRBC cut-off level of ≥ 500 NRBC/µl from ROC analysis.Log-rank test, *$p < 0.05$, $n = 413$, median survival < 500/µl: 32 days, ≥ 500/µl: 21 days

**Topic:** Acute respiratory failure and mechanical ventilation

## 001042

### Sepsis and septic shock registry: RSIXS—a pilot study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001042

**Introduction:** Sepsis is defined as an infection that leads to one or more organ failures due to dysregulated immune response (1). In Catalonia, the average annual incidence of sepsis is 264.1 cases per 100,000 habitants per year that is increasing from 2005 to 2019 (3). Among sepsis cases admitted in Catalonia, 24% presented septic shock, with an associated mortality of 20% (2, 4).
In managing sepsis and its associated morbidity and mortality, there are both non-modifiable patient or episode-dependent factors, and modifiable healthcare-related factor (early detection, appropriate treatment for sepsis management). The effectiveness of initial sepsis management is time-dependent, requiring tools to facilitate screening and treatment of episodes. Monitoring and tracking the management process and patient outcomes for sepsis could help us to identify potential improvements in the sepsis care pathway.
**Objectives:** To describe the adherence to European guidelines (SSC) for sepsis and septic shock within the Catalan Healthcare System, based on key process indicators related to screening, goal directed therapies, and outcomes.
**Methods:** We performed an observational, retrospective, multicenter pilot study. It includes patients admitted to the Intensive Care Unit (ICU), with community-acquired sepsis in acute care hospitals in Catalonia over a 15-day period. We generated a data collection matrix with 11 key process indicators based on treatment-bundles for the 1 h, 3 h and 6 h. We collected data using the RedCap database.
**Results:** We obtained a sample of 41 patients from seven acute care hospitals, with a mean age of 61 years (65% male). In 24.39% of cases, sepsis detection occurred in a hospital without an ICU. The most common site of sepsis were respiratory (34.15%), biliary (21.95%), and urinary (17.07%). The mean APACHE II score was 18 (12–24) and the mean SOFA score was 8 (5–11). In 34% of cases, the time to activation criteria was less than 1 h. Blood cultures were performed before antibiotic therapy administration in 70.7% of patients with an antibiotic adequacy of 62.5%. In 42.8% of cases, the time for source control was less than 6 h. In 80% of cases, lactate monitoring was performed in the first hour and the sixth hour. Antibiotic treatment adjustment occurred in only 25.64% of cases. The sepsis in-hospital mortality rate stands at 19.51%. Finally, we compared the results from the 7 hospitals and we divided into quartiles based on adherence to the recommendations.
**Conclusions:** The RSiXS serves as a centralized registry for monitoring the care process of sepsis in the Catalan territory. It could be applicable to all types of hospitals. The bundles emphasize timely intervention and serve for improving patient outcomes during sepsis and septic shock. The registry allows the generation of individual and collective report for monitoring the care process of sepsis management and subsequent quality analysis of sepsis management in Catalonia.

| Decription | N = 41 (7H) |
|---|---|
| Mean Age | 61 +/- 10 |
| Sex | M: 65%<br>F: 35% |
| Comorbidity | 80,49% |
| Detection | Hospital with ICU: 3,17%<br>Hospital without ICU: 24,39%<br>Extra-hospital: 2,44% |
| Site of Infection | Respiratory: 34,15%<br>Abdominal/Biliary: 21,95%<br>Urinary: 17,07%<br>Unknown: 12,20% |
| APACHE II | 18 +/- 6 |
| SOFA score | 8 +/- 3 |

| Key Process Indicator | |
|---|---|
| KPI 1 (T0 to activation <1h) | 14 (34%) |
| KPI 2 (blood culture before ATB) | 29 (70,7%) |
| KPI 3 (T0 to ATB) | < 1h: 9 (21,9%)<br>< 3h: 18 (43,9%)<br>Before T0: 6 |
| KPI 4 (ATB adequacy) | 62,5% |
| KPI 5 (T0 to source control <6h) | 3/7 (42,8%) |
| KPI 6 (Lactate H0) | 80,49% |
| KPI 7 (Lactate H6) | 85,37% |
| KPI 8 (NE use <6h) | 85,37% |
| KPI 9 (ICU mortality) | 19,51% |
| KPI 10 (ATB adjustment) | Escalation: 38,46%<br>De-escalation: 25,64%<br>No adjustment: 35,9% |
| KPI 11 (T0 to ICU admission <6h) | 21 (51,2%) |

**Fig. 1 (abstract 0001042)** Demographics and KPI adherence

| | ICU 1 | ICU 2 | ICU 3 | ICU 4 | ICU 5 | ICU 6 | ICU 7 |
|---|---|---|---|---|---|---|---|
| KPI 1 Activation | 50% | 60% | 57,14% | 100% | 0% | 40% | 0% |
| KPI 2 BC preATB | 50% | 60% | 57,14% | | 80% | 100% | 100% |
| KPI 3.1h ATB <1h shock | 12,50% | 60% | 28,57% | | 20% | 20% | 0% |
| KPI 3.3h ATB <3h sepsis | 37,50% | 80% | 57,14% | | 40% | 20% | 50% |
| KPI 4 ATB adequacy | 50% | 80% | 42,86% | | 42,86% | 100% | 50% |
| KPI 5 source control | 33,33% | 0 | 50% | 0 | 50% | 0 | 0 |
| KPI 6 Lactate H0 | 50% | 80% | 85,71% | 100% | 90% | 100% | 60% |
| KPI 7 Lactate H6 | 100% | 100% | 71,42% | 100% | 80% | 100% | 50% |
| KPI 8 NE use | 100% | 40% | 100% | 100% | 100% | 100% | 25% |
| KPI 9 ICU mortality | 28,57% | 0 | 14,29% | 0 | 30% | 0 | 20% |
| KPI 10 ATB de-escalataion | 14,29% | 80% | 14,28% | 0% | 33% | 20% | 0% |
| KPI 11 ICU admission < 6h | 37,50% | 80% | 42,85% | 100% | 40% | 80% | 60% |

| Q | ADHERENCE | PERCENTIL |
|---|---|---|
| Q4 | VERY HIGH | 75-100 |
| Q3 | HIGH | 50-75 |
| Q2 | LOW | 25-50 |
| Q1 | VERY LOW | 0-25 |

**Fig. 2 (abstract 0001042)** Bundle adherence matrix

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**Topic:** Sepsis

## 001043

### Changing trends in the bacteriological profiles and antibiotic susceptibility at a burn ICU in Greece

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**Introduction:** Infectious complications is a major cause of morbidity and mortality in Burn units.
**Objectives:** This study aimed to determine the changing trends of causative bacteria and antibiotic susceptibility over the past decade.

**Methods:** This study retrospectively analyzed the positive blood cultures of patients admitted to the burn unit in years 2014 and 2023. Changing trends in the bacteriological profiles and antibiotic susceptibility were recorded and analyzed.
**Results:** A total of 150 of positive blood cultures were detected. Gram-negative bacteria were isolated in 69% of the cases in 2014 and in 74.3% in 2023; Pseudomonas aeruginosa was identified as the common isolate. Pseudomonas aeruginosa (22.6% in 2014 and 33% in 2023) and Acinetobacter Baumannii complex (16.7% in 2014 and 19.7% in 2023), followed by Klebsiella spp (14.3% in 2013, 6% in 2023) were the dominant Gram-negative bacteria during both during the years 2014 and 2023.
Gram-positive bacteria were isolated in 20.2% of the cases in 2014 and in 13% in 2023. Coagulase-negative Staphylococci (CoNS) were identified as the common isolate during both periods. Fungi were isolated in 10.8% (2014) and 12.6% (2023) cases. Among fungi, Candida albicans (5.8%) followed by Candida glabrata (1.25%) were the dominant fungi in 2014, but Candida albicans was replaced by Candida glabrata (4.5%) and was the prevalent fungus in 2023. Comparative analysis showed a significant reduction in Gram positive bacteria during the last decade (36% decrease).
Multidrug resistant microorganisms presented 97% of Pseudomonas aeruginosa and Acinetobacter Baumannii complex and 83% of Klebsiella spp in 2023. Concerning the change in antibiotic resistance generally the resistance increased during the decade.

**Table 1 (abstract 0001043)** Changes in antibiotic resistance

| | Ciprofloxacin | Colimycin | Tigecycline | Carbapeneme |
|---|---|---|---|---|
| Pseudomonas | 60% increase | 5% increase | | 25% increase |
| Acinetobacter | No change | 45% increase | 60% increase | No change |
| Klebsiella spp | No change | 10% increase | 15% decrease | 10% decrease |
| E. coli | No change | 6% increase | | 5% increase |

**Conclusions:** The etiological profile of burn sepsis has undergone a significant change in the last decade. Reduction in Gram-positive bacteria and increase in non-albicans Candida species was observed. Antibiotic resistance has increased, and continuous surveillance for antibiotic susceptibility is required to ensure efficient therapeutic outcomes.

**Topic:** Infections and prevention.

### 001044

### Clinical features and outcomes of severe seasonal influenza in a sentinel Tunisian SARI center

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**Introduction:** Severe acute respiratory infection (SARI) is the cause of an important mortality worldwide. In Tunisia, different sentinel SARI centers have participated in the national data collection to better identify microbiological, clinical and evolutionary features.
**Objectives:** To assess clinical, therapeutic and evolutionary characteristics of severe seasonal influenza in patients admitted in Zaghouan's intensive care unit (ICU).
**Methods:** We conducted a descriptive retrospective study including patients admitted for severe acute respiratory infection (SARI) in the ICU of Zaghouan's regional hospital in Tunisia between October 2022 and May 2023. All patients had their nasopharyngeal swab tested for viruses. Demographic, clinical, therapeutic and evolutionary data were collected.
**Results:** We included 74 patients who all underwent nasopharyngeal sampling for SARI. A male predominance was observed with a gender ratio of 1.8. Median age was 54 years [15–81]. All patients were transferred to the ICU from the emergency department except for 7(9%) who were transferred from other departments. Three patients (4%) have been to Saudi Arabia for religious rituals within two weeks prior to the respiratory infection. Only 3 patients (4%) were vaccinated against influenza.
Nasopharyngeal swab testing was positive in 44 patients (60%): H1N1/pdm 2009virus in 15 patients (20%), H3N2 influenza A virus in 3 patients (4%) and influenza B virus in 4 (5%), SARS-CoV-2 in 6 (8%), rhinovirus in 5 (6%), adenovirus in 2 (2%), human bocavirus in 2 (2%) among other viruses. Bacterial coinfections were noted in 4 cases: Enterobacter cloacae, Escherichia coli, Pseudomonas aeruginosa and *Mycobacterium tuberculosis.*
The mean time between symptom onset and hospitalization was $3 \pm 3$ days. At least one comorbidity was noted in 70 patients (95%): heart disease in 40 patients (54%) and diabetes in 16 (22%). Sixteen female patients (22%) were pregnant. Fever was found in 36 cases (48%) with a median temperature of 38 °C [36–40]. A cough was reported in 41 patients (55%). All patients had signs of respiratory distress upon admission, circulatory failure was noted in 21 cases (28%), neurological distress in 15 (20%) and acute kidney injury in 17(23%). Signs of radiological severity were observed in 31 patients (42%). Mechanical ventilation was needed in 35 patients (47%). Systemic steroids were administered in 13 patients (17%), antivirals in 10 (13%) and antibiotics in 35 (47%). The mortality rate was 28%.
**Conclusions:** Severe acute respiratory infections represent a significant challenge to healthcare systems. Therefore, it is crucial to prioritize vaccination campaigns to reduce health costs and mortality.

**Topic:** Infections and prevention

### 001045

### Morbidity and mortality in adult patients infected by SARS CoV-2 admitted to the intensive care unit at the University Hospital of Maracaibo during March 2020–March 2022 period

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**Introduction:** The first two cases of COVID-19 in Caracas, Venezuela, were reported two days after the World Health Organization declared a pandemic on 2020. Soon after, Venezuela declared a state of emergency in the health system. Due to the complex transmission of some *SARS CoV-2* variants, the wide range of symptoms, aggressive progression from severe to critical illness and lack of access to diagnostic tests, the total of deaths by COVID19 are still unknown in

Venezuela. University Hospital of Maracaibo was selected as a sentinel and the ICU was one of the most important of the west of the country.

**Objectives:** To determine the morbidity and mortality in adult patients infected by *SARS CoV-2* admitted to the Intensive Care Unit of the University Hospital of Maracaibo between March 2020 and March 2022.

**Methods:** The research was cross-sectional, descriptive, cohort type. This study included 299 patients aged 18 years or older infected by *SARS CoV-2* (RT-PCR confirmed) who were admitted to the ICU. The evaluation and registration of the patients was carried out by intensivists and residents of the Critical Care Medicine postgraduate program at the University of Zulia. SPSS software for Windows, version 24.0, was used for statistical analysis. Spearman's correlation coefficient was used for non-parametric variables and Pearson's correlation coefficient for parametric variables.

**Results:** The mortality rate was 74.6% ($n = 223$) seen in Table 1. The highest mortality rate was concentrated in two peaks during the periods May–July 2020 and May–July 2021 (Fig. 1). COVID19 vaccine coverage started in February 2021 only for health care providers and COVID19 vaccine was available for all Venezuelans in August 2021. During the first year of the pandemic, a higher risk of mortality was observed in men (OR: 2.14; 95% CI: 1.16–4.13) and in patients ≥ 51 years (OR: 2.26; 1.13–4.54). Hypertension (HBP) was the most frequent comorbidity (35.8%), as a single previous diagnosis (14.4%) or in combination with obesity (OB: 15.7%) and type 2 diabetes mellitus (T2DM: 9%). Individuals with HBP + OB had a higher risk of requiring IMV (OR: 2.19 [95% CI 1.10–4.6]), VAP (OR: 4.26 [95% CI 1.47–10.32]) and death (OR: 2.78 [95% CI 1.24–6.80]) and patients with HBP + T2DM had a higher risk of myocardial dysfunction (OR: 2.96 [95% CI 1.27–6.9]) (Table 2).

A high number of patients required invasive mechanical ventilation (IMV) (199/200, 66.6%). Mortality in these patients was 93.5% (Table 3). The degree of severity of Acute Respiratory Distress Syndrome (ARDS) was linearly associated with the PEEP value ($p = 0.001$) and mortality ($p = 0.001$). The mortality rate was 10%, 22.4%, and 58.2% for mild, moderate, and severe degrees of ARDS. Significant differences were found between survivors/non-survivors groups in gradient (324/423), PaFiO2 (170.5/86 mmHg) and shunt (14/21) values. Septic shock (39,56%) and acute kidney injury (25,4%) were associated with a higher mortality risk of 18.49 (CI 95% 6.53–52.34) and 18.37 (95% CI 4.38–76.93), respectively. A protective effect of remdesivir on mortality was observed in the non-IMV group (OR: 0.248; 95% CI 0.105–0.583) (Table 4).

**Conclusions:** Male gender and age ≥ 51 years were significantly associated with mortality in patients infected with SARS CoV-2 during the first year of the pandemic. Hypertension alone or combined with OB and DM2 was associated with worse clinical outcome and mortality due to *SARS CoV-2* infection. The requirement for IMV behaved as a predictor of mortality, associated with an increased risk of septic shock, acute kidney injury, VAP and pneumothorax and mortality. A protective effect of remdesivir on mortality was found in non-IMV patients.

**Table 1 (abstract 0001045)** Epidemiological variables, comorbidities and symptoms of *SARS CoV-2* infected patients admitted to the Intensive Care Unit ($n = 299$ patients)

| | N | Percentage |
|---|---|---|
| ***GENDER*** | | |
| Male | 180 | 60.2 % |
| Female | 119 | 39.8% |
| ***AGES (YEARS)*** | | |
| < 40 years | 93 | 31.1 % |
| 41-60 years | 110 | 36.8 % |
| 61-80 years | 96 | 32.1 % |
| Medians de edad | 51 (17-80 years) | |
| | | |
| ***SYMPTOMS PRIOR TO ADMISSION TO ICU*** | | |
| Respiratory (Cough, dyspnea) | 282 | 94.3% |
| Gastrointestinal (diarrhea, vomiting) | 3 | 1 % |
| Neurologycal (confusion, loss of strength) | 1 | 0.3 % |
| Respiratory and gastrointestinal | 9 | 3 % |
| Respiratory and neurologycal | 4 | 1.3 % |
| | | |
| ***RISK FACTORS AND COMORBIDITIES*** | | |
| No comorbidities reported | 116 | 38.8 % |
| Respiratory diseases | 24 | 8.0 % |
| Cardiovascular diseases | 85 | 28.4 % |
| Endocrine disorders | 33 | 11.0 % |
| Multisystem comorbidities | 39 | 13.0 % |
| Other comorbidities (neurologycal, rheumatic) | 2 | 0.6 |
| | | |
| Pregnant | 21 | 7.0 % |
| | | |
| ***VENTILATION*** | | |
| Invasive Mechanical Ventilation (IMV) | 199 | 66.6 % |
| Non Invasive Mechanical Ventilation (NIMV) | 59 | 19.7 % |
| None | 41 | 13.7 % |
| | | |
| ***LENGHT OF STAY IN ICU*** | | |
| 1-10 days | 120 | 40.1 % |
| 11-20 days | 84 | 28.1 % |
| 21-30 days | 37 | 12.4 % |
| 31-40 days | 32 | 10.7 % |
| >40 days | 26 | 8.7 % |
| | | |
| ***MORTALITY*** | 223 | 74.58 % |

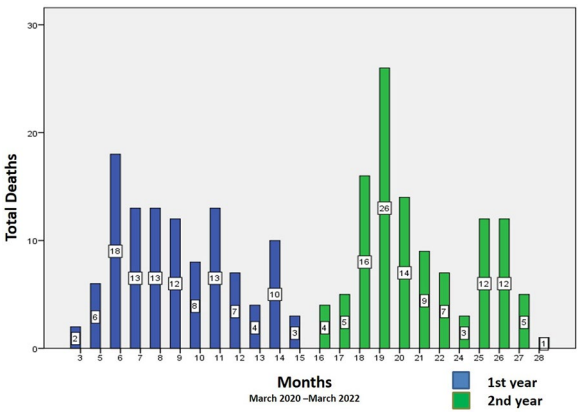


**Fig. 1 (abstract 0001045)** Distribution of mortality of patients with COVID-19 for month admitted to the Adult ICU of the University Hospital of Maracaibo during the period March 2020 to March 2022. At the bottom, every month is identified with a number, where 1 represents March 2020. The bar boxes specify the number of patients who died in the corresponding month

**Table 2 (abstract 0001045)** Distribution of comorbidities in patients admitted to the iCE with *SARS CoV-2* infection stratified into age groups

| Comorbidities | ≤40 years | ≥41-60 years | 61-80 years | All patients |
|---|---|---|---|---|
| Asthma | 9 (9.7%)* (3.0%)** | 10 (9.1%)* (3.3%)** | 2 (2.1%)* (0.7%)** | 21 (7.0 %)** |
| HBP isolated | 5 (5.4 %)* (1.7%)** | 20 (18.2%)* (2,7%)** | 18 (9.7%)* (3.0%)** | 43 (14.4%)** *p=0.038* |
| T2DM isolated | 1 (1.1%)* (0.3%)** | 8 (7.3%)* (2.7%)** | 6 (6.2%)* (2.0%)** | 15 (5.0%)** |
| OB isolated | 5 (5.4%)* (1.7%)** | 6 (5.5%)* (2.0%)** | 6 (6.2%)* (2.0%)** | 17 (5.7%)** |
| HBP+T2DM | 0 | 8 (7.3%)* (2.7%)** | 19 (19.8%)* (6.4%)** | 27 (9%)** *p=0.001* |
| HBP+OB | 5 (5.4%)* (1.7%)** | 22 (20%)* (7.4%)** | 20 (20.8%)* (6.7%)** | 47 (15.7%)** *p=0,004* |
| HBP + other comorbidities (No T2DM, No OB) | 4 (4.3%)* (1.3%)** | 9 (8.2%)* (3.0%)** | 11 (11.5%)* (3.7%)** | 24 (8.0%)** |
| HBP + all comorbidities | 10 (10.8%)* (3.3%)** | 43 (39.1%)* (14.4%)** | 54 (56.2%)* (18.1%)** | 107 (35.8%)** *p=0.001* |

HBP: hypertension; T2DM: type 2 diabetes mellitus; OB: obesity. *: percentage within age group

**: Percentage of total patients ($n=299$)

**Table 3 (abstract 0001045)** Evaluation of mortality in patients with COVID-19 according to the requirement of invasive mechanical ventilation

| | Survivors | | | Non survivors | | | All patients |
|---|---|---|---|---|---|---|---|
| IMV | 13 (6.5%) [a] | (17.1%) [b] | (4.3%) [c] | 186 (93.5%) [a] | (83.4%) [b2] | (62.2%) [c] | 199 66.6% [c] |
| Non-IMV | 63 (63.0%) [a] | (82.9%) [b] | (21%) [c] | 37 (37.0%) [a] | (16.6%) [b2] | (12.4%) [c] | 100 33.4% [c] |
| Total | 76 (25.4%) | | | 223 (74.6%) | | | 299 |
| | | | | | | | *p= 0.001* |

[a] Percentage in relation to the group receiving invasive mechanical ventilation (IMV; $n=199$) or group that did not receive IMV ("Non-IMV": $n=100$)

[b] Percentage in relation to group of surviving patients ($n=76$)

[b2] Percentage in relation to the non survivors group ($n=223$)

[c] Percentage in relation to the total number of patients under study, $n=299$. The Non-IMV group includes patients who received NIMV ($n=59$) and those who did not require ventilation ($n=41$)

**Table 4 (abstract 0001045)** Antiviral therapy (remdesivir) and mortality in patients who did not received IMV

| Antiviral Therapy | Survivors | Non Survivors | Total | *p* | OR |
|---|---|---|---|---|---|
| Yes | 42 (76.4%)[a] (67.7%)[b] | 13 (23.6%) [a] (34.2%)[b2] | 55 (55%) | *0.001* | 0.248 (IC95%; 0.105-0.583) |
| No | 20 (44.4%) [a] (32.3%) [b] | 25 (55.6%)[a](65.8%)[b2] | 45 (45%) | | |
| All | 62 | 38 | 100 | | |

[a] Percentage within the "Antiviral therapy" group

[b] Percentage in relation to the group of "Survivors" patients ($n=62$)

[b2] Percentage in relation to the group of non survivors ($n=38$)

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001046

### The role of disease severity on the disagreement between anti-Xa activity and activated partial thromboplastin time measurements in critically ill patients


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**Introduction:** Appropriate dosing of anticoagulants is crucial in preventing adverse events in critically ill patients (1). However, discrepancies often arise between anti-Xa activity and activated partial thromboplastin time (aPTT) measurements in patients receiving unfractionated heparin (UFH), and the underlying biological mechanisms behind are not fully elucidated (2).
**Objectives:** To evaluate whether the disagreement between anti-Xa activity and aPTT values in critically ill patients could be explained by disease severity.
**Methods:** Retrospective analysis of patients admitted to our Intensive Care Department, treated with continuous UFH for any reason, in whom concomitant measurements of Anti-Xa activity and aPTT were performed. Several biological and clinical parameters were collected at the moment when each anticoagulation test was performed. We classed each sample by using two different nomograms as in infra-therapeutic, therapeutic (aPTT ratio between 1.6 and 2.5 or anti-Xa value between 0.3 and 0.7 U/mL) or supra-therapeutic ranges. Thereafter, in group 1 we included samples with aPTT lower than anti-Xa values, in group 2 samples with concordant aPTT and anti-Xa values, and in group 3 samples with aPTT higher than anti-Xa values.
**Results:** We retrieved 132 patients with 823 blood coagulation samples between Aug-2022 and Feb-2023. Median age was 61 (52–70)

years, body weight was 80 (67–94) kg and 36% had sepsis. The main reasons for UFH administration were atrial fibrillation (35%), pulmonary embolism (24%), extracorporeal membrane oxygenation support (14%), mechanical cardiac valve (13%), and thromboprophylaxis (14%). The agreement between aPTT and anti-Xa values was poor with an intra-class correlation coefficient of 0.30 (0.24–0.36); and 235 (29%) samples were in group 1, 437 (53%) in group 2 and 151 (18%) in group 3 (Fig. 1). Higher degrees of disease severity and organ dysfunction were found in group 3 (Table 1).

**Table 1 (abstract 0001046)** Comparison of different parameters in the 3 different groups

| Variable | Group 1 | Group 2 | Group 3 | *P* |
|---|---|---|---|---|
| Leucocytes (cells × 103/µL) | 13.1 (9.2–17.6) | 12.7 (9.3–16.9) | 12.0 (8.1–17.5) | 0.15 |
| Platelets (cells × 103/µL) | 277 (167–401) | 222 (126–316) | 86 (50–144) | < 0.01 |
| Creatinine (mg/dL) | 0.7 (0.5–1.5) | 1.2 (0.7–2.1) | 1.4 (1.1–2.1) | < 0.01 |
| Norepinephrine (mcg/kg/min) | 0.02 (0.00–0.13) | 0.00 (0.00–0.11) | 0.10 (0.00–0.41) | < 0.01 |
| PaO2/FiO2 ratio | 243 (178–324) | 243 (183–324) | 250 (184–371) | 0.49 |
| Total bilirubin (mg/dL) | 0.4 (0.3–0.7) | 0.5 (0.3–0.9) | 1.7 (0.6–6.2) | < 0.01 |
| pH | 7.44 (7.40–7.48) | 7.44 (7.40–7.48) | 7.41 (7.38–7.45) | < 0.01 |
| Bicarbonate (mmol/L) | 28 (25–33) | 26 (24–30) | 24 (21–27) | < 0.01 |
| Lactate (mmol/L) | 1.0 (0.7–1.3) | 0.9 (0.7–1.3) | 2.1 (1.4–4.2) | < 0.01 |
| Total SOFA score | 6 (3–8) | 6 (4–9) | 12 (7–16) | < 0.01 |
| ICU mortality (%) | 18% | 16% | 63% | < 0.01 |

**Conclusions:** In this cohort of patients under UFH, higher organ dysfunction and disease severity were observed in samples with aPTT values higher than anti-Xa activity. It should be preferable to use aPTT values in more severe patients to decrease their risk of bleeding.

| | | *aPTT monitoring protocol* | | |
|---|---|---|---|---|
| | | *Infra therapeutic range* | *Normal therapeutic range* | *Supra therapeutic range* |
| *Anti-Xa activity monitoring protocol* | *Supra therapeutic range* | **12 (1.5)** | **29 (3.5)** | **41 (5.0)** |
| | *Normal therapeutic range* | **194 (23.6)** | **165 (20.0)** | **44 (5.3)** |
| | *Infra therapeutic range* | **231 (28.1)** | **63 (7.7)** | **44 (5.3)** |

**Fig. 1 (abstract 0001046)** Disagreement between aPTT and antiXa values in patients samples under UFH. White zone: concordant values. Light gray zone: aPTT lower than antiXa values. Dark gray zone: aPTT higher than antiXa values

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**Topic:** Transfusion and haemostasis disorders

## 001047

### Development and validation of AI-model to predict refractory septic shock

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**Introduction:** Prediction of refractory septic shock in patients with sepsis helps the clinician gain additional lead time, facilitate early referral to the tertiary care center, enable early ICU admission, and facilitate shared decision-making with the family members. These subgroups of patients are often poorly represented in large RCTs investigating the efficacy of interventions in septic shock (1). As per our best knowledge, the literature currently lacks an "AI model" for predicting refractory septic shock in patients with sepsis.
**Objectives:** To extract the variables that will contribute significantly to predicting refractory septic shock, select variables for developing the AI model, develop an AI model from the selected variables, and prospectively validate the developed AI model.
**Methods:** This is an ambispective study conducted in the intensive care units of the All India Institute of Medical Sciences, New Delhi, India. Institutional ethical committee approval was obtained, and CTRI registration was completed. It is a two-stage study. The first phase involves the development of an AI model, utilizing retrospective clinical, laboratory, and radiological data of patients admitted to the medical and surgical ICU with sepsis. The second phase will be the prospective validation of the developed AI model.
**Results:** The first phase of the study was completed. We analyzed 72 variables for 800 patients and found 16 features above the top 30% threshold. The test accuracy was $0.760 \pm 0.095$ (F1 score: $0.744 \pm 0.061$), and the validation accuracy of the same was $0.792 \pm 0.045$ (F1 score: $0.782 \pm 0.063$). Adding Ph and Procalcitonin to the previous 16 features, the test accuracy was $0.760 \pm 0.033$, the F-score was $0.759 \pm 0.033$, and the validation accuracy was $0.809 \pm 0.044$, the F1Score was $0.807 \pm 0.045$. Prospective validation of the model is ongoing.
**Conclusions:** The currently developed artificial intelligence model has achieved acceptable accuracy in predicting refractory septic shock. If prospective validation shows acceptable predictive accuracy, the Prediction AI model can be useful for identifying patients at high risk of refractory septic shock. Customizable risk thresholds can be set for individual clinical installations depending on available resources and local practice requirements.

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**Topic:** Sepsis

## 001048

### Physicians' attitudes towards decisions to withhold or withdraw life-sustaining treatment in children in intensive care in Sweden

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**Introduction:** Sometimes, intensive care is not in the patient's best interest, but other values should be prioritised. This can be due to futility of care, poor neurological outcome or short life expectancy, even with critical care. The decision to withhold or withdraw life-sustaining treatment is complex, with several parameters to consider. The prognosis of the child might be uncertain, but the parents' wishes and legal issues should also be considered. We know there is variability in how these decisions are made between European regions. This issue of end-of-life decision-making in pediatric critical care has yet to be studied in Sweden.
**Objectives:** This study aims to investigate the attitudes and experiences of end-of-life decisions for pediatric patients among Swedish intensive-care specialists.
**Methods:** This is an observational national survey study. A selection of hospitals that treat children under 15 years of age for more than 48 h at least ten times a year are contacted. A web-based questionnaire is distributed to physicians employed in the intensive care department of such a hospital. The questionnaire consists of 50 questions concerning the respondent's own experience of end-of-life care in children, their view on the ethics of withhold and withdraw decisions, facilitating factors in the work climate and their views on shared decision-making and conscientious objection. Answering the survey is voluntary, and no reimbursement is offered. All study data are collected and treated anonymously.
**Results:** The answers from the questionnaire are analysed with descriptive statistics.
**Conclusions:** Increased knowledge of physicians' attitudes and experiences of withhold and withdraw decisions in Swedish pediatric critical care is vital to understanding how these decisions are made. An understanding of how these decisions are made is necessary to supply supporting systems and education to ensure that these decisions are always made in an as objective and fair manner as possible. This will affect the patient's quality of life and access to palliative care, give them a chance to make choices for the final time.

**Reference(s)**

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3. The study is financed through state funding at The Sahlgrenska Academy, Gothenburg University.

**Topic:** Ethics and end of life care

## 001049

### Use of radiomics to assess the anatomical evolution and severity of COVID19 induced ARDS (C-ARDS) in ICU during the pandemic

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**Introduction:** The number of patients admitted to the ICU for C-ARDS has decreased significantly since the start of the pandemic in March 2020. The role of the evolution of variants or collective immunity is not established. C-ARDS is defined with CT chest imaging (CT), positive PCR test nasopharyngeal in accordance with the Berlin criteria. An artificial intelligence tool (IA) evaluating the quantitative lesion extension by an approach combining tools of radiomics and automated quantification was developed as part of the project European Dragon to quantify, based on CT imaging, the volumetric extension lesions recognized as typical of COVID-19 infection during the pandemic (1). We sought to quantify the objective reduction in C-ARDS episodes during time and to measure the links with the evolution of variants.
**Methods:** Single-center retrospective study in the ICU of a Belgian tertiary hospital between 02/01/2020 and 01/31/2023. Extraction of clinical-radiological data from patients with acute respiratory failure (ARF) and positive PCR COVID. Automated analysis of imaging determining a severity score anatomical and percentages of infected surface per lung lobe. Determination of patient groups by principal component analysis based on image analysis.
Use of national epidemiological data. Nonparametric tests and regression logistics (SAS and R).
**Results:** In the initial cohort of 1017 patients admitted to the ICU with a positive COVID PCR, 631 patients had a CT scan analyzed by the quantification tool. First, admissions were separated according to 6 successive predominant variants (ancestral, alpha, delta, omicron BA.1, BA.2 then BA.5) or 5 vaccination campaigns. The probability of a patient having ARDS was significantly lower from delta variant ($p = 0.0028$). Moreover, logically, the vaccination campaigns demonstrate a drop in the number of admissions for C-ARDS.
Secondly, based on imaging, the severity is also significantly decreased from BA.2 and BA.5 variants (Figure, $p < 0.0001$). Finally, a principal component analysis allows to distinguish 4 groups based on severity and anatomical distribution. The most severe groups and upper lobe damage decreases over time as well.
**Conclusions:** Automated IA tool analysis of CT scans of patients suffering from COVID makes it possible to confirm the extension of the lesion as well as its distribution by lobe allowing an approach automated quantitative. It also makes it possible to document the reduction in serious cases over time. The predominance of delta and then omicron variants in our region was associated with this reduction.

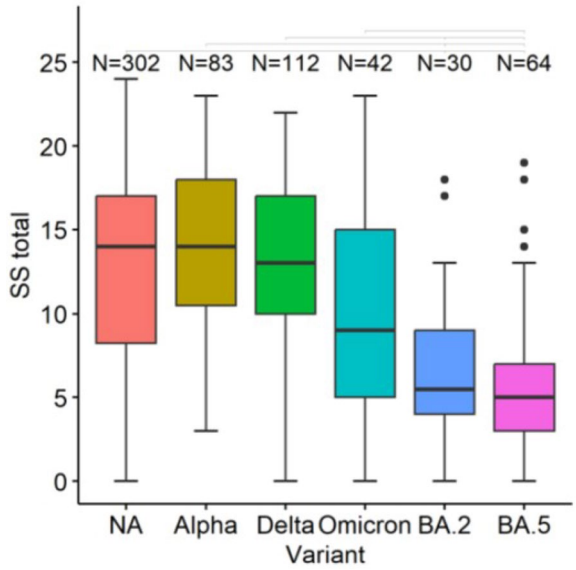


**Fig. 1 (abstract 001049)** Severity score measured by radiomics at each period of the pandemic

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001050

### Lactate ameliorates sepsis-induced lung injury via mTOR–ATF4 signaling pathway

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**Introduction:** Sepsis induces lung injury by overwhelmed activation of alveolar macrophages (AM) which is dependent on glycolysis and increased level of lactate. Metabolism is the new therapeutic target for the prevention and treatment of sepsis. We previously found that inhibition of mTOR signaling downregulated the expression of macrophage-derived cytokine IL-6 and IL-1β, improving the survival of septic mice.
**Objectives:** To determine the role of lactate against sepsis-induced lung injury and the regulatory mechanisms.
**Methods:** Adult male C57BL/6N mice(6–8 weeks old) were pre-treated by intra-tracheal application of lactate(300 μg/kg).Sepsis was induced by cecal ligation and puncture (CLP), and the broncho-alveolar lavage fluid (BALF), plasma, and lung tissues was harvested 16 h after the onset of sepsis. BALF protein concentrations were measured using BCA; the pathological changes of the lung tissue were demonstrated by HE staining;Il-6 levels in both BALF and plasma were determined by Elisa; lung neutrophil deposition was evaluated with Western blotting. In vitro, alveolar macrophage cell line (MH-S) was pre-treated with lactate (10 mM) and follow stimulated with lipopolysaccharide (LPS,1 μg/mL). The level of related inflammatory mediators and M2 macrophage marker Arg1 were assessed by ELISA, RT-qPCR, and Western blot, respectively. We probed the expression of mTOR and downstream effectors, ATF4, PFKFB3 by Western blotting. To determine the role of lactate against sepsis-induced lung injury and the regulatory mechanisms, LPS-induced MH-S cells were pre-treated with rapamycin (100 nM, an inhibitor of mTOR), and MHY1485 (10 μM, an activator of mTOR). Additionally, LPS-induced MH-S cells were pre-treated with ATF4 (siRNA knock-down) and I-152 (2 mM, an ATF4 activator). LPS-induced MH-S cells were pre-treated 3-PO (50 μM, an inhibitor of PFKFB3), and the level of Arg1, ATF4, and PFKFB3 were assessed by ELISA, RT-qPCR, and Western blot, respectively.
**Results:** Lactate pre-treatment significantly reduced IL-6 levels in BALF and plasma, decreased total protein in BALF supernatant, improved lung tissue pathology, and diminished neutrophil infiltration in septic mice. In vitro, lactate suppressed LPS-induced mRNA expression of IL-6, TNFα, and other pro-inflammatory factors in MH-S cells, reduced IL-6 in supernatants, and increased IL-10 and Arg1 expression. LPS stimulation markedly raised levels of p-mTOR, p-p70S6K, ATF4, PFKFB3, and IL-6, but these were effectively attenuated by lactate pre-treatment, with concurrent Arg1 upregulation. Rapamycin pre-treatment similarly reduced p-p70S6K, ATF4, PFKFB3, and IL-6 levels, while increasing Arg1 post-LPS challenge. The lactate's inhibitory effect on LPS-induced p-mTOR, p-p70S6K, ATF4, PFKFB3, and IL-6 was reversed by MHY1485. ATF4 knockdown notably decreased PFKFB3 and TNF-α in supernatants and increased Arg1 protein expression. I-152 counteracted LPS-induced increases in IL-6 mRNA, PFKFB3, and Arg1 proteins. Finally, 3-PO pre-treatment post-LPS exposure reduced expressions of pro-inflammatory factors such as IL-1β, TNFα, MCP-1, and IL-6.
**Conclusions:** Lactate downregulates PFKFB3-mediated glycolysis through modulation of the mTOR-ATF4 signaling pathway, resulting in an attenuated inflammatory response and mitigation of sepsis-induced lung injury. This study highlights a potential therapeutic role for lactate in sepsis management.

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**Topic:** Sepsis

## 001051

### Team-based nursing in neuro intensive care unit

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**Introduction:** Traditionally, Neuroscience Intensive Care Unit (NICU) with 18-bed capacity has 1 Registered Nurse (RN) assigned as Nurse in-charge (NIC) to provide patient care and administrative work, e.g., assigning staff and coordinating patient movement. This reduces the efficiency of RNs as they have to multi-task.
**Objectives:** Team-based Nursing (TBN) was introduced in May 2021 to allow nurses to utilize their strengths and license to their full potential. This study investigated its effectiveness with the aim of improving staff satisfaction and reducing workload of nurses without compromising patient safety.
**Methods:** Two clinical indicators—reported incidents of medication errors and compliance of 4-point catheter bundle care were compared before and after implementation of TBN. An anonymised staff satisfaction survey was conducted two years post implementation to measure staff satisfaction.
**Results:** The average (SD) medication errors reported for 1000 patient-days reduced slightly, 18.1 (10.8) pre vs 12.0 (6.8) post-TBN, $p$ value = 0.057. *Chart 1* showed the monthly reported medication errors

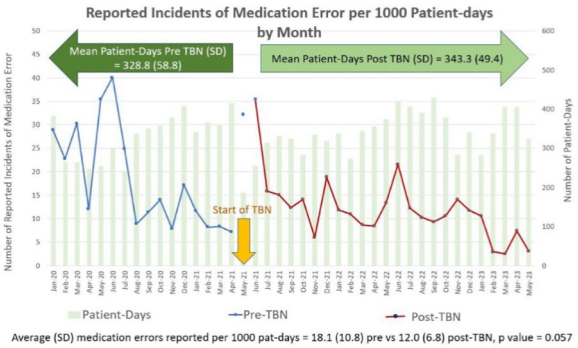
and patient-days. The average compliance of 4-point catheter bundle care is 96% pre vs 97.4% post.

Out of 75 RNs who were invited to participate in the survey, 60 RNs (80%) responded. 86.4% of nurses felt that the nursing care have improved since the start of TBN and the same percentage of nurses felt that Team leaders are of great help especially when taking over during breaks and administering new, STAT orders when principal nurses are not able to do so.

**Conclusions:** Prior to the commencement of TBN in NICU, there was 1 NIC, 9 principal nurses (PN) and 3 enrolled nurses (EN) per shift. The tasks performed by NIC and team leaders were as shown in *Table 1*.

In TBN setup, the workforce is re-engineered. 1 EN is assigned per shift to monitor the telemetry and 3 Team Leaders (all RNs) who each lead 3 RNs share the workloads of previous NIC and are more available for patient care (Table 1 and Fig. 1). Smaller teams result in higher accountability towards patients. 75% of staff are on the ground during break times; patient's safety is not compromised. At the height of pandemic, while non-ICU trained nurses were deployed to work alongside the stretched ICU nursing staff, TBN has enabled the ICU-trained Team Leaders to work closely with augmented non-ICU trained staff without compromising patient and staff safety. More RNs were trained to perform the role of a team leader. This allowed the RNs to develop and sharpen their leadership potential. Team Leaders can now help to mentor the new RNs while performing their duties.

TBN not only allows efficient utilization of manpower, but also fosters teamwork and camaraderie among nurses. This makes the most hectic shifts more manageable, hence improved staff satisfaction without compromising patient safety as indicated by stable reported incidents on medication errors and 4-point catheter bundle care compliance.




Reported incidents of medication error per 1000 patient-days by month

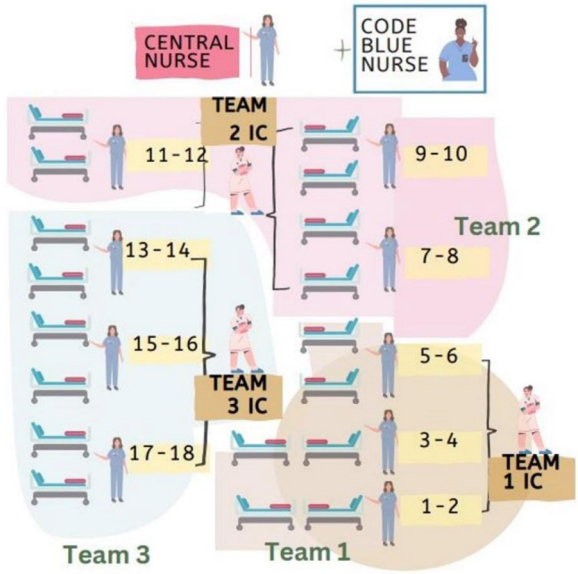



**Fig. 1 (abstract 1051)** Illustration of TBN

**BEFORE**
**Tasks of NIC**

- Sets staff assignment for next shift
- Set meal breaks for next shift
- Check staffing for next day during PM shift
- Prepare next day on-call list
- Update patient handover sheet and census board
- Handover important patient information during roll call
- Follow Doctors' rounds
- Manage ward situation:
  - Liaise with ICU gatekeeper on the availability of beds and admissions
- Take over Principal Nurse during breaks, scans, transfer, dialysis etc.
- Holds the Red & Blue Key (CD, CCOD cupboard, Med-trolley)
- Holds Yellow Key (Aspen, Property cupboard)
- Holds the ward handphone
- CD count (Including Pharmaceutical Fridge items)
- EN performs Glucometer QC check at 2am and covers telemetry monitoring duty during breaks.

**AFTER**
**Tasks of Team Leaders**

| Team Leader 1 | Team Leader 2 | Team Leader 3 |
|---|---|---|
| • Set staff assignment for next shift | • To hold Red & Blue key (CD, CCOD cupboard, Med-trolley) | • Holds Yellow key (Aspen, Property cupboard) |
| • Set meal breaks for next shift | • CD count (Including Pharmaceutical Fridge items) | • Holds the ward handphone |
| • Check staffing for next day during PM shift | • Glucometer QC at 2am | • Central roll call |
| • Prepare next day on-call list | | • Takeover Central for breaks |

- Follow Doctors' round
- Manage ward situation:
  - Liaise with ICU gatekeeper on availability of beds and admissions
- Determine the sequence of new admission for the shift and communicate with own team members of 3

**Table 1 (abstract 1051)** Tasks of NIC and team leaders before and after TBN

**Reference(s)**

1. We would also like to thank Nursing Managers and Nursing Leaders who supported the team to implement the project.
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**Topic:** Nursing care and physiotherapy

## 001053

### Alteration in immunoglobulins levels before liver transplant are not associated with higher incidence of postoperative nosocomial infections

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**Introduction:** Patients undergoing liver transplantation (LT) are particularly susceptible to postoperative nosocomial infections due to the prolonged hospitalization and the need for immunosuppressive therapy to prevent organ rejection. (1) Moreover, cirrhotic liver disease (LD) causes a deregulation of the immune system known as cirrhosis-associated immune dysfunction (CAID). CAID is primarily attributed to a defect in enteric compartmentalization, leading the immune system to develop a phenotype of chronic pro-inflammatory response and subsequent immune paralysis that increase the risk of infections. (2) This phenomenon is particularly prominent in acute on chronic liver failure (ACLF). Abnormalities in immunoglobulin (IG) levels are frequently observed in patients with LD and may be correlated with the degree of polyclonal B lymphocyte activation. (3) It is still unclear whether there is a correlation between IG levels and susceptibility to infection development.
**Objectives:** To study the association between pre-LT level of IG subclasses (IgG, IgM, and IgA) and the onset of infections in post-LT period in patients with or without ACLF.
**Methods:** We performed an observational retrospective monocentric study. We included patients admitted to intensive care unit (ICU) after LT. We collected IG levels at day of LT, together with perioperative clinical and microbiological data. The primary endpoint was the association between pre-LT IG levels and the incidence of post-LT infections in patients with or without ACLF. Continuous variables were compared using the Wilcoxon signed rank test or the Kruskal–Wallis test while categorical variables were compared using the Chi-square test.
**Results:** A total of 103 patients undergoing LT were included in the study, of whom 20 patients were diagnosed with ACLF. Thirty patients (29%) developed post-LT infection of whom 21 (70%) were caused by multi-drug resistant bacteria. 30% of the infections were associated with bacteriemia. As expected, patients with ACLF present a significantly higher risk of developing post-LT infections (odds ratio 4.8 CI 1.7–13.5). The values of all IG subclasses directly correlate with the severity of LD (measured with MELD-Na score) (Fig. 1) but we did not find any correlation between any IG level subgroups and the development of postoperative infections (p.0,53, 0,23 and 0,13 for IgA, IgG and IgM, respectively) (Fig. 2). Nor they correlate with ICU stay (p.0,82, 0,38 and 0,13 for IgA, IgG and IgM, respectively) and mortality (p.0,95, 0,27 and 0,78 for IgA, IgG and IgM, respectively).
**Conclusions:** Pre-LT values of all IG subclasses are directly correlated with the severity of LD. No correlation was observed between IG levels and the development of post-LT infections in both ACLF and no-ACLF patients. Further studies will be required to assess the kinetic of IG post-LT and the development of infections.

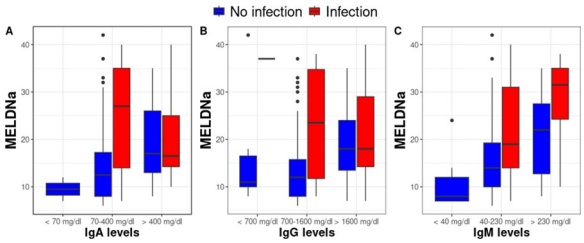


**Fig. 1 (abstract 0001053)** Correlation between MELDNa score and pre-LT level of IG subclasses with infections

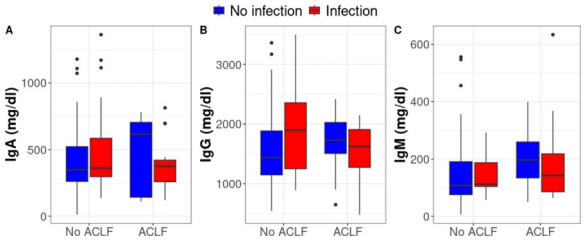


**Fig. 2 (abstract 0001053)** Correlation between pre-LT level of IG subclasses in ACLF and No-ACLF subpopulations with infections

**Reference(s)**

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**Topic:** Infections and prevention

## 001054

### Analysis of radiological and echocardiographic characteristics of patients admitted to the ICU for pulmonary embolism and their relationship with the need for fibrinolysis or mechanical thrombectomy

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001054

**Introduction:** Pulmonary embolism (PE) is a prevalent condition which clinical spectrum encompasses various presentations with divergent outcomes, with approximately half of cases diagnosed in emergency settings. Timely diagnosis and treatment have demonstrated significant enhancements in patient outcomes and survival rates.
**Objectives:** The main objective of the study is to analyze the radiological or echocardiographic variables most related to the need for fibrinolysis or mechanical thrombectomy in patients admitted for acute PE in the ICU of a tertiary hospital. As secondary objectives, we aim to describe the demographic, clinical, hemodynamic, and evolutionary characteristics of these patients.

**Methods:** This is a retrospective observational study including all patients diagnosed with PE upon admission to the ICU via CT angiography over a period of 18 months (July 2022 to November 2023). Demographic, hemodynamic, radiological (location of filling defects, dilatation of *Truncus Pulmonalis*, right cavities, or radiological conclusion of hemodynamic compromise), and echocardiographic (tricuspid annular plane systolic excursion (TAPSE), tricuspid annular systolic velocity (RV S')) data were collected for each patient. The relationship of each variable with the need for reperfusion (fibrinolysis or thrombectomy) is expressed in terms of positive or negative predictive value (PPV, NPV). Statistical analysis was performed using R 4.1 for Windows.
**Results:** During the study period, 93 patients were included. The median age was 63 years (IQR 53.73). 57% of the patients were males. Severity stratification according to ESC guidelines was high risk in 26% of patients, high intermediate in 52%, and low intermediate in 21%. 12% of patients had secondary cardiopulmonary arrest, and in-hospital ICU mortality was 11%. PPV and NPV for the studied variables are presented in Table 1.

**Table 1 (abstract 0001054)** PPV and NPV for the studied variables

| Study | Variable | PPV (%) | NPV (%) |
|---|---|---|---|
| TC | *Truncus Pulmonalis* dilatation | 42 | 70 |
| | Radiological conclusion: evidence of hemodynamic impact | 42 | 88 |
| Echocardiogram | TAPSE | 53 | 88 |
| | RV S' | 58 | 87 |

**Conclusions:** The PPV of any of the variables in isolation is generally low. The studied echocardiographic and radiological variables independently present a high NPV for the need for reperfusion.

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4. Sociedad Española de Medicina Intensiva, Crítica y Unidades Coronarias (SEMICYUC)

**Topic:** Cardiovascular issues in ICU

## 001055

## Macklin effect in ARDS patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001055

**Introduction:** The Macklin effect is a radiological tomography sign in which a rupture of the alveolar wall is observed, causing air dissection along the pulmonary bronchovascular structure and interstitial emphysema. This sign has been described as a predictor of pneumothorax (PNX) and/or pneumomediastinum (PNM) [1, 2].
**Objectives:** To ascertain the correlation between the Macklin effect and barotrauma such as PNX and PMD in COVID-19 patients admitted to our Intensive Care Units (ICUs) during the Italian pandemic period.
**Methods:** Retrospective study on COVID-19 ARDS patients admitted to the ICUs of the University Hospital Integrated Trust of Verona during the first, second and third Italian pandemic waves. All screened patients belong to the REINSURE-ARDS Registry of the AOUI of Verona (1946CESC).
Patients with a computed-tomography (CT) executed during their hospitalization were included in the study; all available CTs were evaluated in the search for barotrauma and/or Macklin sign.
**Results:** Among 514 patients admitted to our ICUs during the first three pandemic waves, 367 patients (269 men, 98 women, median age 65 years [57–73]) underwent chest CT for COVID-19 ARDS, had radiological signs of interstitial pneumonia and were included in this study. Of these, 278 (75.7%) patients were intubated and managed with protective invasive mechanical ventilation.

**patients (13.6%) had clinical signs of barotrauma, which was radiologically confirmed; 29 (7.9%) patients had a positive Macklin sign on imaging investigations.**
Among patients positive for barotrauma, 26 (54%, true positive rate 54%) had a positive Macklin sign (Macklin/barotrauma ratio: first wave: 0/5; second wave: 16/24; third wave: 10/19). Considering patients with a positive Macklin sign, 7 presented the sign from a previous negative CT, while 11 had a subsequent negative control CT.

Furthermore, the positive Macklin sign was found in radiological exams executed in a preceding hospital stay in 3 patients, during the studied ICU recovery in 21 patients and in subsequent exams in 2 patients.
The patients who tested positive for the sign presented 10 PNM, 8 bilateral PNX and PNM, 7 right PNX and PNM and 1 left PNX and PNM.
Lastly, three patients with positive Macklin sign tested negative for PNX or PNM (false positive rate 10.3%).
All Macklin positive patients were managed with invasive mechanical ventilation.
**Conclusions:** Our data confirm the positive predictive value of the Macklin sign, nevertheless with lesser accuracy compared to the available literature.
Lodi V and Boffa E equally contributed to this work.

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3. Project funded by the European Union—NextGenerationEU—Ministry of Health—PNRR 2022; Project code: PNRR-MAD-2022–12376796

**Topic:** Acute respiratory failure and mechanical ventilation

## 001057

### Safety and effectiveness of inhaled sedation in ICU patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001057

**Introduction:** Inhaled sedation with halogenated agents such as sevoflurane is widely used for inducing and maintaining anesthesia in surgery. More recently it has been incorporated to the intensive care unit (ICU) setting as first line therapy or for those patients in whom all other anesthetics fail to achieve a deep sedation.
**Objectives:** The aim to describe the safety and effectiveness of inhaled sedation with sevoflurane given through the Anaesthetic Conserving Device Sedaconda®ACD (Sedana Medical) to invasively ventilated patients in the ICU and to determine the reduction in propofol, benzodiazepines, opioids perfusions and other drugs once it was initiated.
**Methods:** A retrospective observational descriptive study during a five-month period including all the patients admitted to the ICU to whom inhaled sevoflurane was administered as rescue therapy for sedation. Data were collected from a total of 11 patients.
**Results:** The diagnoses of the patients at the time of admittance were: community acquired pneumonia (CAP) 6 cases (2 of them needed venovenous-ECMO), polytrauma patients 2 cases, septic shock of abdominal origin 2 patients and 1 case of refractory status epilepticus.
The mean age was 53.73 years (CI 95% 41.58–65.88), the average for SOFA and APACHE II scores at the time of ICU admittance were 9.73 (CI 95% 5.23–14.23) and 22.91 (CI 95% 12.77–33.04), respectively. Mean length of stay in ICU was 33.46 days and the average duration of invasive mechanical ventilation was 26.92 days. Figure 1.
Prior to the utilization of inhaled sevoflurane all 11 patients required two or more sedative drugs as well as analgesia with opioid perfusion and neuromuscular blocking agents (NMBA).
The sedative agents more frequently used in our group of patients were: propofol, administered in 100% of the patients, midazolam in 54.5% of them, ketamine 45.5% and dexmedetomidine 36.4%. NMBA (cisatracurium) was required in continuous perfusion in all cases. Figure 2.
Once sevoflurane was started, opioids could be down-titrated by more than 50% of the initial dose in 63.6% of the patients. Sevoflurane led as well to discontinuation of at least one sedative drug in 100% of our group of patients.
There were only two secondary effects reported. A polytrauma patient with no head injury developed diabetes insipidus; and another patient with severe CAP who required VV-ECMO had ventricular tachyarrythmias due to long QT interval. In both cases the effects disappeared and there were no relapses of the incidents described after termination of sevoflurane.
**Conclusions:** Inhaled sedation with halogenated agents is presented in clinical guidelines as first-line therapy for patients in the ICU, in the same level as propofol. In spite of the adverse events described in our patient sample, sevoflurane has been proven safe and effective in reducing and even withdrawing other anaesthetic drugs in those patients in whom aimed sedation scores are difficult to reach.

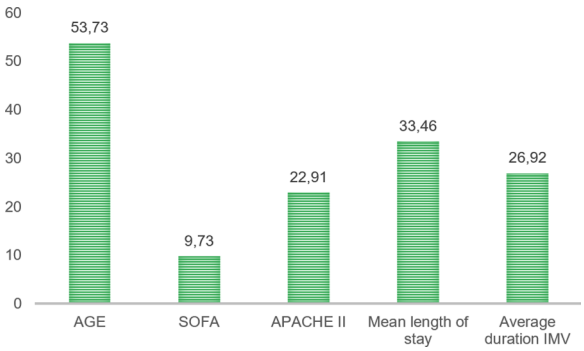


**Fig. 1 (abstract 0001057)** .

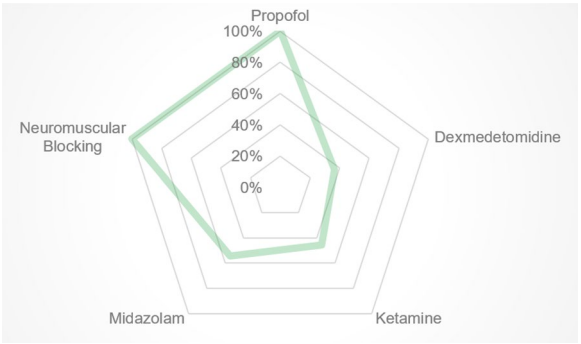


**Fig. 2 (abstract 0001057)** .

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**Topic:** Sedation, analgesia and delirium

## 001058

### Impact of the inclusion in the Great Guardship rotational circuit for subarachnoid haemorrhage on the clinical profile and patient outcomes: experience in our center

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**Introduction:** Spontaneous subarachnoid hemorrhage (SAH) represents a subset of hemorrhagic strokes, comprising approximately 10% of all stroke cases globally. This condition poses significant challenges due to its high morbidity, mortality rates, and associated healthcare expenditures. Moreover, it is recognized as a time-sensitive pathology. In an effort to ensure equitable access to care for all affected patients within the Catalan community, a collaborative guardship program, known as Great Guardship (GG) was established in 2022 among select tertiary hospitals equipped with specialized neuro-radiology, interventional radiology, neurosurgical, and intensive care units. Our hospital joined this initiative in June 2022, contributing to a coordinated approach in managing this complex medical condition.
**Objectives:** To determine whether there are differences in the demographic, clinical characteristics, functional outcomes and mortality of patients with a diagnosis of spontaneous SAH admitted before and after our participation as healthcare provider tertiary center in the GG.
**Methods:** A retrospective cohort study was conducted, including all consecutive patients with a diagnosis of spontaneous SAH admitted between March 2018 and July 2023 to the intensive care unit of a tertiary hospital. We compared data from patients admitted before and after inclusion in the GG circuit (May 2022). The association between GG participation and mortality, as well as functional status at ICU discharge (measured by modified Rankin score, mRS), was analyzed via multivariate analysis, adjusting for potential confounding variables including SAPS II, APACHE II, CT Fisher grading scale, WFNS scale, and time to arteriography in hours.
**Results:** A total 116 patients with spontaneous SAH, in 90 (77.6%) a culprit aneurysm was confirmed, of these 47 (52%) were admitted in pre-GG period and 43 (48%) in GG. GG patients had a lower percentage of women (63% vs 83%) and lower severity according to WFNS scale (IV/V score: 55.8% vs 85.1%), SAPS II (41 vs 54) and APACHE II (15 vs 20). Additionally, more diagnostic arteriographies were performed in the GG group (41% vs. 32%), with a shorter time from admission to arteriography (6.4 vs. 13.9 h). Additionally, more diagnostic arteriographies were performed in the GG group (41% vs. 32%), with a shorter time from admission to arteriography (6.4 vs. 13.9 h). No significant differences in complications were observed. In multivariate analysis, neither the association between GG and mortality (odds ratio 1.67, 95% CI [0.36–7.19]) nor GG and mRS (odds ratio 0.43, 95% CI [− 0.41–1.30]) were significant. Further details and data are provided Table 1.
**Conclusions:** Inclusion in GG circuit resulted in a change in the clinical profile of the patient towards lower severity, an increase in the rate arteriography utilization and a reduction in time to arteriography. No differences were observed in terms of complications or association between admission during GG and mortality or functional status at discharge.

**Table 1 (abstract 0001058)** .

| | Pre-Great Guardship (n=47) | Great Guardship | p |
|---|---|---|---|
| **Age, median (IQR)** | 64.1 [53.-73.7]] | 62.0 [52.1-71.7] | 0.47 |
| **Women, n (%)** | 39 (83) | 28 (63) | **0.05** |
| **Arteriography, n (%)** | 32 (68.1) | 41 (95.3) | **<0.01** |
| **Time to arteriography (h), median (IQR)** | 13.9 [7.6-22.0] | 6.4 [2.6-10.7] | **<0.01** |
| **Fisher IV, n (%)** | 45 (95.7) | 41 (95.3) | 0.93 |
| **WFNS, n (%)** | | | **<0.01** |
| - **1** | 3 (6.4) | 7 (16.3) | |
| - **2** | 2 (4.3) | 7 (16.3) | |
| - **3** | 2 (4.3) | 5 (11.6) | |
| - **4** | 16 (34.0) | 14 (32.6) | |
| - **5** | 24 (51.0) | 10 (23.3) | |
| **WFNS 4-5, n (%)** | 40 (85.1) | 24 (55.8) | **<0.01** |
| **SAPS II, median (IQR)** | 54 [39-59] | 41 [32-53] | **<0.01** |
| **APACHE II, median (IQR)** | 20 [15-22] | 15 [10-19] | **<0.01** |
| **Treatment, n (%)** | 36 (76.6) | 35 (81.4) | 0.58 |
| **Mortality, n (%)** | 21 (44.7) | 11 (25.6) | 0.06 |
| **Neurological complications, n (%)** | 43 (91.5) | 39 (90.7) | 0.90 |
| - **Vasoespasm** | 17 (36.2) | 22 (51.1) | 0.15 |
| - **Re-bleeding** | 5 (10.6) | 6 (14.0) | 0.63 |
| - **Hydrocephalus** | 27 (57.4) | 33 (76.7) | 0.05 |
| - **Intracranial hypertension** | 29 (61.7) | 32 (76.2) | 0.14 |
| **Systemic complications, n (%)** | 21 (44.7) | 22 (51.2) | 0.54 |
| **Mechanical ventilation (MV), n (%)** | 44 (93.6) | 39 (90.7) | 0.61 |
| **Time of MV (days), median (IQR)** | 4.5 [1-10.5] | 11 [3-17] | **<0.01** |
| **ICU LoS (days), median (IQR)** | 6.5 [2-13] | 13 [4-21] | **<0.01** |
| **Hospital LoS (days), median (IQR)** | 19 [2-30] | 25 [17-40] | **0.02** |
| **mRS, median (IQR)** | 5 [3-6] | 4 [2-6] | 0.06 |

**Topic:** Neurointensive care

## 001061

### Cytokine evolution in the first 24 h of patients with suspected infection, with or without sepsis

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**Introduction:** Sepsis is a medical condition that affects 30 million people worldwide every year. It leads to 27 million hospitalizations and causes 6 million deaths annually. It's crucial to identify septic patients early in the emergency department (ED).
**Objectives:** Our study aimed to analyze the changes in cytokine levels in patients who presented with suspect infection and either developed or did not develop organ dysfunction, which was measured by the SOFA score, during the first 24 h.
**Methods:** We conducted a prospective observational cohort study on patients with suspected infection with a high risk of developing sepsis (measured by a NEWS scale of $\geq 3$). We drew blood and performed severity scores at baseline, 4 h, and 24 h. We defined sepsis according to the Sepsis 3 definition. We modeled cytokine time series using LOESS smoothing.
**Results:** We analyzed data from 43 patients, of whom 30 (69%) developed sepsis within the first 24 h. There were no significant differences in age or comorbidities between the two groups. None of the cytokine trajectories measured provided an early indication of patients who experienced sepsis, as shown in Fig. 1.
**Conclusions:** In this exploratory analysis, we found that the measures and trajectories of cytokines during the first 24 h did not allow for an early prediction of sepsis in high-risk patients.

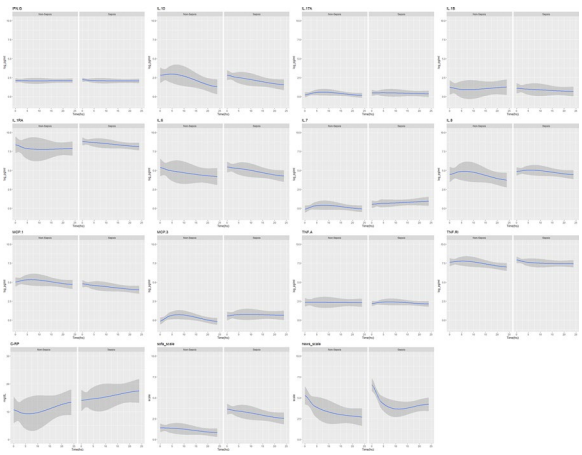

**Fig. 1 (abstract 001061)** Cytokine and severity scores evolution

**Reference(s)**

1. This study was funded by the Science Minister of Spain CPP2021-008394

**Topic:** Sepsis

## 001062

### Intracranial haemorrhage, brain-stem death testing and organ donation: a simulation and traditional-based education series

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001062

**Introduction:** In the UK, diagnosis of death using neurological criteria (DNC) typically falls under the remit of intensive care doctors. (1) Once DNC has been confirmed, patients are referred to be considered for organ donation (OD). (2) A common cause of brain stem death is intracranial haemorrhage (ICH). (3) Two learning theories used in medical education include behaviourism and constructivism. (4) Traditional-based education typically adopts a behaviourist approach (5) and simulation-based education (SBE) uses both theories. (6) The Whittington is a 360-bed district general hospital (DGH) in North London, with a 12-bed Intensive Care Unit (ICU). On occasion, we admit patients with ICH, not suitable for neurosurgical interventions and hence not transferred to our local neurosurgical centre. These patients generally have poor outcomes, and a significant proportion are diagnosed DNC. Between March 2023 and March 2024 at the Whittington, there were 22 referrals for OD; 7 of whom met the criteria for diagnosing DNC, which all subsequently underwent. 1 proceeded to donate. Relative infrequency of admissions with ICH, DNC, and proceeding OD leads to unfamiliarity and lack of confidence amongst clinical staff in managing these patients. We used SBE and traditional teaching to educate ICU and non-ICU staff about DNC and the OD process. We also educated staff on neuro-ICU principles in a DGH, contextualising DNC and OD around a simulation of acute ICH and raised intracranial pressure (ICP).
**Objectives:** 1. Use SBE to expose participants to management of neuro-ICU patients in a DGH. 2. Use SBE to develop communication skills when discussing poor prognosis with next of kin. 3. Educate clinical staff regarding when and how to undertake brain stem death testing. 4. Raise awareness of OD, and OD statistics relevant to Whittington.
**Methods:** We used high-fidelity simulation, clinical skills workshops, and small-large group lectures. In the first simulation, participants managed a patient with acute ICH with raised ICP who did not respond to interventions. The second simulation was communications-based, discussing poor prognosis of this patient with the next of kin. This scenario included a professional actor as the next of kin. A non-validated questionnaire consisting of Likert-scale questions was completed by participants. Additionally, we conducted immediate post-simulation debriefs which utilised the PEARLS (promoting excellence and reflective learning in simulation) framework to facilitate both technical and non-technical debriefs. (7) The final interactive aspect was a skills workshop in which diagnosis of DNC was demonstrated and participants could perform the steps required to diagnose DNC. To complete the series, we presented lectures for ICU clinical staff and a Grand Round targeting the wider hospital clinical staff, outlining the process of diagnosing DNC and highlighted our hospital's statistics for OD.

**Results:** Two questions were of interest; "Simulation has improved knowledge of this topic", and "Human factors (HF) knowledge has improved following this simulation". Regarding the raised ICP scenario, 75% 'strongly agreed' there was improvement in their knowledge following the simulation. 50% 'strongly agreed' their HF understanding had improved. Regarding the difficult communications simulation, 50% 'strongly agreed' that HF knowledge had improved. Participants found the actor to be very helpful for developing communication skills and helping with immersion in the simulation. For the skills workshop, participants commented on the usefulness of going through the steps of diagnosing DNC. Feedback from the Grand Round was also favourable with participants commenting on increased awareness and knowledge of the OD process.
**Conclusions:** This series led to an overall increase in the perceived knowledge of managing patients with ICH, raised ICP, diagnosis of DNC, and the overall OD process. We plan to incorporate these simulations, alongside the skills workshop, into our regular simulation programme. Our aim is that these occur once per academic year. Additionally, we will initiate an annual update (June each year) of the hospital's OD statistics and present at the departmental educational meeting which will be open (in-person and remotely) to the entire hospital. One of the main constraints was lack of training time, particularly amongst ICU nursing staff. We aim to run the simulations on dedicated nurse training days to ensure nurse participation.

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**Topic:** Brain death, organ donation and transplantation

## 001063

### Systemic immune-inflammation index (SII) as useful biomarker to predict the outcomes in patients underwent living donor liver transplantation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001063

**Introduction:** The inflammatory reaction, which plays a key role in graft survival, is associated with the post-transplant prognosis. We hypothesized that systemic immune-inflammation index (SII) could provide more valuable information in assessing the outcomes in patients with end-stage liver diseases (ESLD) after living donor liver transplantation (LDLT).
**Methods:** Three hundred and seventy-eight patients with end-stage liver diseases who underwent LDLT from March 2016 to October 2023 were analyzed in this retrospective study. Demographic, and biochemical data were obtained using electric medical records system. We analyzed the relation between the SII and the outcomes including pre- and post-operative model for end-stage live disease (MELD) score, short-term (one month) mortality, time for mechanical ventilation, and stay duration of intensive care unit and hospital day based on Pearson correlation coefficient using correlation analysis, and investigated the cut-off value of SII identifying short-term mortality using area under the receiver operating curve (AUROC). Multivariate logistic analysis was used to assess the risk factors of short-term mortality.
**Results:**: SII were significantly correlated with pre- and post-operative model for end-stage live disease (MELD) score, short-term mortality, time for mechanical ventilation, and stay duration of intensive care unit and hospital day ($P < 0.05$). Platelet-to-lymphocyte ratio (PLR) showed a statistically significant correlation with short-term mortality and time for mechanical ventilation. Neutrophil-to-lymphocyte ratio (NLR) were correlated with pre- and post-operative model for end-stage live disease (MELD) score, short-term mortality, and time for mechanical ventilation. The cut-off value of SII in predicting short-term mortality after LDLT was $275 \times 10^9$ cells/L (AUROC = 0.603; sensitivity, 53.3%; and specificity 69.5%).
**Conclusions:** The SII may serve as a convenient, low-cost and noninvasive prognostic biomarker for patients after LDLT for ESLD.

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1 SII | 1 | 0.128* | 0.138* | -0.138* | 0.108* | 0.181* | 0.132* | 0.009 | 0.721* |
| 2 Pre-operative MELD score | | 1 | 0.689* | -0.231* | -0.069 | 0.198* | 0.067 | 0.095 | 0.197* |
| 3 Post-operative MELD score | | | 1 | -0.194* | -0.045 | 0.202* | 0.071 | 0.091 | 0.178* |
| 4 Short-term Mortality | | | | 1 | 0.210* | 0.030 | -0.274* | -0.238* | -0.210* |
| 5 Hospital stay | | | | | 1 | 0.140* | 0.229* | -0.061 | 0.048 |
| 6 ICU stay | | | | | | 1 | -0.006 | -0.002 | 0.081 |
| 7 Duration of mechanical ventilation | | | | | | | 1 | 0.244* | 0.165* |
| 8 PLR | | | | | | | | 1 | -0.007 |
| 9 NLR | | | | | | | | | 1 |

SII, systemic immune-inflammation index; MELD, model for end-stage liver disease; ICU, intensive care unit; PLR, platelet-to-lymphocyte ratio; NLR, neutrophil-to-lymphocyte ratio.
*Correlation is significant at the 0.05 level (2-tailed)

**Table 1 (abstract 001063)** Pearson's correlation matrix

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**Topic:** Brain death, organ donation and transplantation

## 001064

### Evaluating the carbon footprint arising from laboratory investigations in the intensive care unit (ICU)

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001064

**Introduction:** Currently, healthcare contributes 4–5% to global carbon emissions [1, 2]. Of this, the intensive care unit (ICU) produces three times more carbon emissions than the general ward [3]. Total carbon emissions per patient day in ICU ranged from 88 to 178 kg CO2-e [3, 4], predominantly contributed by energy consumption and consumables [5]. However, no studies have studied the carbon footprint arising from laboratory investigations in the ICU.
**Objectives:** Our study aims to evaluate the carbon footprint arising from laboratory investigations in the ICU over a 4-month period.
**Methods:** A retrospective single-center cohort study was conducted in the Surgical ICU in Singapore General Hospital. The number of laboratory investigations ordered for all patients admitted from May to August 2023 was extracted from the electronic medical records system. Existing process-based Life Cycle Assessment (LCA) data were used to determine the carbon footprint of the investigations ordered [6, 7]. Some examples of investigation and their CO2-e (kg CO2-e/test) used are full blood count (0.0386), coagulation profile (0.0663), C-reactive protein (0.0005), arterial blood gas (0.049), urea and electrolyte test (UECr, 0.143).
**Results:** 131 patients were admitted to the ICU for a total of 604 patient days. An average of 13.2 investigations were ordered per patient day. The total carbon emissions over this period was 739 kg CO2-e, which equates to driving 3041 km, or an average of 1.22 kg CO2-e per patient day. The most common investigation ordered was UECr, while liver panel ± Gamma-glutamyl transpeptidase generated the highest total carbon emissions (0.3137) (Table 1). 20.7% of investigations lacked available LCA data. These include fibrinogen, procalcitonin, lactate, ketones, creatinine kinase, Troponin-T and NT-proBNP. It is uncertain how much these investigations contribute to the total emissions attributable to laboratory investigations in the ICU.
**Conclusions:** Our study quantified the carbon footprint contributed by laboratory investigations in ICU from available LCA data. Adopting a holistic approach to environmental sustainability, ICUs' laboratory investigations also contribute to generate greenhouse gases, albeit small, and can be targeted to reduce unnecessary carbon footprint. There will be aggregation of marginal gains if any such measures of reducing unnecessary investigations can be extended to the rest of healthcare. This can lead to benefits such as cost reduction [8], iatrogenic anemia and need for blood transfusions [9].

**Table 1 (abstract 0001064)** Number of laboratory tests ordered from May to August 2023 and carbon emissions attributed

| | Total tests ordered | Average tests ordered per patient day | Total carbon emissions (kg $CO_2e$) |
|---|---|---|---|
| FBC | 890 | 1.474 | 34.4 |
| aPTT/PT | 399 | 0.661 | 26.5 |
| PT & INR | 105 | 0.174 | 5.1 |
| ABG | 936 | 1.550 | 45.9 |
| UECr | 1120 | 1.854 | 160.6 |
| K | 24 | 0.040 | 0.3 |
| Ca/PO4 | 893 | 1.478 | 47.0 |
| Mg | 974 | 1.613 | 24.5 |
| Liver panel (incl GGT) | 427 | 0.707 | 144.6 |
| Liver panel (excl GGT) | 192 | 0.318 | 60.2 |
| Albumin | 140 | 0.232 | 3.9 |
| CRP | 199 | 0.329 | 0.1 |
| Phlebotomy | - | - | 185.9 |
| **Total** | 6299 | 10.428 | 738.9 |

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**Topic:** Health Services Research and Outcome

## 001065

### Impact of definitive surgical treatment timing in the approach of pelvic trauma patients

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**Introduction:** Pelvic trauma (PT) represents 3% of all trauma and is among the most serious and deadly trauma-related lesions. Its management involves a multidisciplinary approach and surgical treatment is frequently crucial to improve patient outcome.
**Objectives:** To compare two different definitive surgical timing strategies [early (< 48 h) (EDS) and late (> 48 h) (LDS)] in critically ill patients with PT and to evaluate its impact in the outcome.
**Methods:** Retrospective single-centre study of all patients over 18 years with PT admitted to a ICU of a Tertiary University Hospital between January 2020 and December 2023. SPSS was used for statistical analysis.
**Results:** Forty patients (36%) of the 112 critically ill PT patients were submitted to definitive surgical treatment, mainly male (80%) with median age of 47y. Median Injury Severity Score (ISS) was 25. Concomitant brain (BT) and thoracic trauma were present in, respectively, 37,5% and 35% of the patients. According to the Young Burges (YB) classification, 7,5% of PT resulted from antero-posterior compression (APC), 87,5% from lateral compression (LC) and 5% from vertical shear (VS). Most PT were grade I (70%) of WSES classification and only 7,5% were grade IV. Shock index (SI) was ≥ 0,9 in 45% of the patients. ICU and hospital length of stay (LOS) were 12 and 41,2 days, respectively. Only one patient (2,5%) died in the hospital.
Median time for definitive surgical treatment was 96h after ICU admission. EDS was done in 7 patients (17,5%) and LDS in the remaining 33 patients (82,5%).
LDS patients were significantly younger (41 vs. 69y; $p < 0{,}001$). Falls were the main mechanism of PT in both groups (57% in EDS vs. 55% in LSD) and it did not influence the time of surgery. EDS patients had a higher Glasgow Coma Scale (GCS) ($p = 0{,}011$). Serum lactate, arterial pH, haemoglobin and coagulation times on admission did not influence timing of surgical decision. However, EDS patients had significantly higher median serum fibrinogen levels (292 vs 215 mg/l; $p = 0{,}049$). Although not statistically significant, LSD was more frequent in patients with SI ≥ 0,9 (94,4% vs 5,6%; $p = 0{,}105$) or with lactate > 2mmol/l (90,9 vs 9,1%; $p = 0{,}205$).
No differences were found regarding general severity scores but an ISS ≥ 15 was significantly more frequent in LSD group (81,3% vs 28,6%; $p = 0{,}012$).
All APC types of fractures had EDS while LC and VS fractures had more frequently LDS ($p < 0{,}001$). No relationship was found between WSES classification and surgical timing strategy ($p > 0{,}721$).
Median ICU LOS was higher in the LSD group but without statistical significance (11 vs 2 days; $p = 0{,}063$).
**Conclusions:** Most patients were submitted to LDS. Age, GCS, ISS ≥ 15 and YB classification were associated with time to definitive surgery. Hemodynamic instability on admission seems to support LDS. EDS shows a tendency to shorter ICU LOS without impacting mortality.

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**Topic:** Trauma

## 001066

### Targeted discovery of gut microbiome-remodeling compounds for the treatment of systemic inflammation response syndrome

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**Introduction:** Systemic Inflammation Response Syndrome (SIRS) is a critical condition characterized by an overwhelming inflammatory state leading to organ failure and increased mortality. The gut microbiome has emerged as a novel therapeutic target for SIRS due to its significant role in modulating the body's immune response.
**Objectives:** This study aimed to evaluate the therapeutic efficacy of the Xuanfei Baidu formula (XFBD) in the treatment of SIRS and to elucidate the role of gut microbiome modulation in its therapeutic action.
**Methods:** We applied a combination of 16S rRNA sequencing and fecal microbiota transplantation (FMT) to determine the impact of XFBD on the gut microbiome of SIRS-induced mice. Additionally, we

isolated 51 compounds from XFBD and tested their gut microbiome remodeling effects in vitro to mimic the healthy gut microbiota structure. We then formulated various gut microbiome remodeling compound (GMRC) cocktails from these compounds and assessed their efficacy in treating SIRS.
**Results:** XFBD treatment significantly lowered mortality and reduced inflammatory markers in SIRS mice. The beneficial effects of XFBD were partially attributed to alterations in the gut microbiome, as evidenced by FMT experiments. In vitro analysis of the 51 XFBD compounds revealed distinct capacities to reshape the microbial structure towards that of healthy controls. Among the GMRC cocktails created, GMRC cocktail C—composed of aucubin, gentiopicroside, syringic acid, gallic acid, p-hydroxybenzaldehyde, para-hydroxybenzoic acid, and isoimperatorin—was most effective in modulating the gut microbiota and improving SIRS outcomes. Further, in vitro experiments confirmed GMRC cocktail C's ability to rebalance the bacterial composition in samples from SIRS patients.
**Conclusions:** The findings highlight the Xuanfei Baidu formula's promising therapeutic potential in treating SIRS through gut microbiome modulation. The study also emphasizes the significance of innovative treatments targeting the microbiome, such as the development of GMRC cocktails, offering new avenues for managing SIRS and enhancing patient survival.

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**Topic:** Infections and prevention

## 001069

### Isavuconazole use in critically ill patients

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**Introduction:** Isavuconazole (ISV) gained relevance in recent years in our unit as an alternative to voriconazole in pulmonary aspergillosis (PA) due to the absence of the need to monitor serum concentrations, action spectrum and safety profile.
**Objectives:** To describe ISV use in critically ill patients admitted in our intensive care unit (ICU) with suspected PA diagnosis, analyzing patient's characteristics, indication for ISV initiation, if it was empirical or guided, PA diagnosis, ISV tolerance and treatment length.
**Methods:** A descriptive retrospective observational study of ISV use in patients admitted in our ICU from September 2019 to July 2023. PA diagnosis was obtained from bronchoalveolar lavage (culture/PCR/galactomannan), bronchial aspirate culture or peripheral blood galactomannan.
**Results:** During the study period, 2098 patients were admitted in our ICU, whom 112 (5.33%) received treatment with ISV. The average age was 61.11 years (95% CI 59.01–63.21). 78 (69.74%) were men. The most relevant medical histories were: high blood pressure 50 patients (44.64%), dyslipidemia 32 (28.57), active smokers 22 (19.64%), obesity 28 (25%) and diabetes 31 (27.67%). The average APACHE II score was 18.50 (95% CI 17.20–19.80). Mainly reasons for ICU admission were in 69 (61.60%) patients COVID pneumonia, 9 (8.03%) community-acquired pneumonia and 9 (8.03%) abdominal sepsis. The average SOFA score at the beginning of ISV treatment was 7.71 (95% CI 7.16–8.25). 24 (21.42) patients were under continuous renal replacement therapy and 3 (2,67%) with ECMO therapy. ISV treatment was initiated due to ventilator-associated pneumonia in 81 (72.32%) patients and 17 (15.17%) cases due to febrile-syndrome without identified focus. 48 (42.85%) patients were diagnosed with PA. Treatment with ISV was empirical in 99 patients (88.39%). The overall average duration of treatment was 13.39 days (95% CI 11.71–15.07), with 18.08 days (95% CI 15.12–21.04) in patients with PA and 9.72 days (95% CI 8.30–11.14) in those who were not PA. The reason for treatment discontinuation was in 33(29.46%) cases due to determination of non-PA, 51 (45.53%) cases due to the end of treatment and 28 (25%) due to exitus. Treatment was tolerated without adverse effects that required discontinuation of ISV.
**Conclusions:** ISV use as antifungal treatment has been indicated in patients with suspected PA. The average SOFA score at the beginning of treatment was 7.71 (95% CI 7.16–8.25). In PA-diagnosed patients, treatment was 18.08 days. No ISV treatments ended because of adverse effects.

**Topic:** Sepsis

## 001070

### Mechanical thrombectomy in pulmonary thromboembolism: are we looking to the future?

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**Introduction:** Pulmonary embolism (PE) is a common form of venous thrombosis that sometimes can be fatal. Risk factor such a recent major surgery and cancer, mainly lung, gastric and cerebral, carries a higher risk of developing PE. The most used scale for determining the severity of the PE is the PESI scale, been class IV and V with the higher risk of death. High-risk PE requires an urgent diagnosis and treatment strategy, with thrombolytic treatment indicated as the first option. Mechanical thrombectomy is indicated in high-risk PE on those cases where thrombolysis is contraindicated or has failed, having the potential advantage of immediate removal of the thrombus and restoration of pulmonary blood flow.
**Objectives:** To describe 6 cases of high-risk pulmonary thromboembolism admitted to the ICU of the Hospital of León who underwent urgent endovascular reperfusion treatment given the situation of hemodynamic instability and contraindication to fibrinolytic therapy.
**Methods:** Retrospective observational study that was carried out in the ICU during 2023 analyzing the data of patients who were diagnose of high-risk PE and hemodynamic instability and underwent mechanical thrombectomy.
**Results:** A higher incidence of high-risk PE is observed in men (67%) than in women (33%). It was observed that the most common risk factors among patients were arterial hypertension (67%), smoking (50%), morbid obesity (50%), and lung and brain cancer (33%). At the time of admission all patients had a high-risk PESI, class IV (50%) and class V (50%) with a higher mortality in PESI V (67%). All 6 cases were massive PE, define as obstruction of the pulmonary arterial tree that exceeds 50% of the cross-sectional area. All had in common right ventricular dysfunction at the time of diagnosis. All of the patients underwent mechanical thrombectomy, only 1 of them was due to failure of fibrinolysis resulting in a fatal outcome. In all of the other cases was because of contraindications for fibrinolysis.
Mortality was observed in 50% if the cases (3), in these 3 cases during the procedure it was not possible to observe pulmonary vein occlusion due to lack of progression of the contrast towards the trunk of the pulmonary artery, probably due to the material use during the procedure, secondary cardiopulmonary resuscitation maneuvers were performed that led to death. All three cases that survived, mechanical thrombectomy with extraction of the thrombus was performed with

no incidences. The median number of days admitted to the ICU was 12 of those patients who survived.
**Conclusions:** Although these results should be interpreted with caution due to a low number of patients treated, we observed that mechanical thrombectomy can result in better outcomes when the extraction of the thrombus is successful. Are we looking into the future of PE treatment?

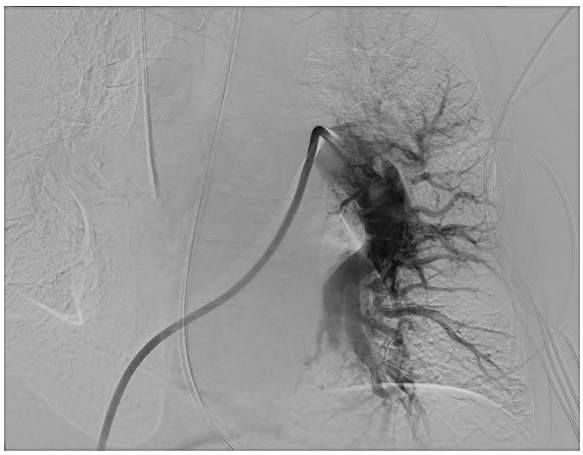

**Fig. 1 (abstract 001070)** Mechanical thrombectomy in pulmonary embolism

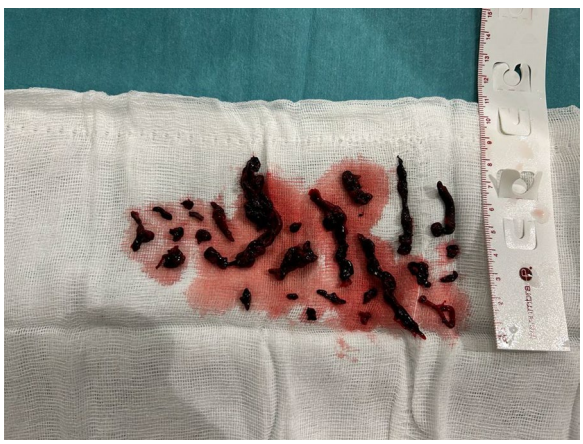

**Fig. 2 (abstract 001070)** Thrombus obtained from a mechanical thrombectomy in a patient with pulmonary embolism

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**Topic:** Imaging in intensive care

## 001071

### Socio-economic status, country-of-origin and COVID-19 in the Intensive Care Unit (SEC-COVID): a population-based retrospective cohort study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001071

**Introduction:** The COVID-19 pandemic placed an extraordinary burden on ICUs in Sweden due to its low number of ICU beds per capita. (1) Previous Swedish data suggest that individuals with an immigrant background, lower levels of education, and lower income were more likely to experience severe COVID-19 requiring mechanical ventilation, (2) which is in line with international data. (3) It is unclear if this translated to a higher risk of death post ICU-admission (2, 3).
**Objectives:** This study aimed to evaluate 90-day mortality following ICU admissions in COVID-19 patients with acute hypoxemic respiratory failure (AHRF) across various socioeconomic and country-of-origin groups in Sweden.
**Methods:** Registry-based cohort study of all adults (≥ 18 years) admitted to Swedish ICUs with PCR-confirmed SARS-CoV-2 infection (ICD-10 diagnosis code U07.1) and AHRF between 6 March 2020 and 31 December 2022. Intensive care data were combined with socioeconomic and comorbidity data from multiple national quality registries. Our primary outcome measure was 90-day mortality.
Country-of-origin and socioeconomic factors (income and education) were considered as main exposures in a multivariable logistic regression analysis, and adjusted covariates included in the model were age, sex, multiple comorbidities, SAPS III score and pandemic wave.
**Results:** 8061 patients were included. The majority of patients were born in a Nordic country (64.6%). The largest non-Nordic group was Asian (16.5%). When compared to the highest income quartile four as reference, only quartile two was significantly associated with 90-day mortality (OR 1.2, 95% CI 1.0–1.5, $p < 0.05$). There were no differences due to educational level. Compared to persons with Nordic country-of-origin, Asian (OR 1.3, 95% CI 1.1–1.6, $p < 0.01$), South American

(OR 1.5, 95% CI 1.0–2.3, $p < 0.05$) and African (OR 1.4, 95% CI 1.0–2.0, $p < 0.05$) individuals had increased risk of death.
**Conclusions:** Both country-of-origin and income level are independently associated with an increased risk of death at 90 days in ICU patients with AHRF due to COVID-19. However, no differences were seen due to level of education.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001072

## Impact of FILMARRAY® pneumonia panel plus (FAPP) on antimicrobial decision-making in critically ill patients

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**Introduction:** Severe pneumonia remain a major cause of morbidity and mortality worldwide (1). Both diagnosis and treatment pose significant challenges (2). The FILMARRAY® Pneumonia Panel Plus (FAPP) provides fast real-time results, enabling targeted antimicrobial therapy and reducing the use of broad-spectrum antibiotics (3, 4).
**Objectives:** To evaluate the impact of FAPP implementation on antimicrobial decision-making in critically ill patients with suspected pneumonia.
**Methods:** A retrospective descriptive study was conducted in a 22-bed polyvalent ICU in Spain, with a 24/7 microbiology laboratory, between January 2023 and February 2024. All cases in which FAPP was requested were analyzed, including microbiological results and the therapeutic approach. Changes in antibiotic treatment were classified as positive (escalation/initiation) or negative (de-escalation/discontinuation). Culture results were considered positive for those microorganisms detectable by the multiplex PCR filmarray.
**Results:** 188 respiratory samples from critically ill patients were analyzed. 156 (83%) were obtained from patients with invasive mechanical ventilation. 91 (48.4%) were considered nosocomial infections. 124 (66%) FAPP samples were positive, with a positive culture concordance in 45 (36.2%). There was no case where FAPP was negative and culture positive. In 42%, a positive FAPP with a negative culture was obtained (Table 1).
After the FAPP results were known, therapeutic adjustments were made in 69 cases (36.7%): 68.1% (47 samples) were based on de-escalation or discontinuation of antibiotics, and 31.8% (22 samples) on escalation or initiation of antibiotics. All changes classified as positive had a positive FAPP result ($p < 0{,}002$) (Table 1). In 54.8% of the positive samples, it was detected only 1 pathogen, in 33% 2 pathogens, and in 23% ≥ 3.

The most commonly identified bacteria were *Haemophilus influenzae, Staphylococcus aureus,* and *Streptococcus pneumoniae*. In 5 cases, two resistance factors were detected: methicillin resistance in *S. aureus* (MRSA) and class B carbapenemase(VIM). However, a therapeutic change was done in 100% of the cases, 80% were escalated/initiated and 20% were de-escalated/discontinued antibiotics.

**Table 1 (abstract 001072)** Demographic and clinical characteristics of study population (*N* =) n%

| | | Antibiotical decision-making | | | Therapeutic change (n = 69) | | |
|---|---|---|---|---|---|---|---|
| **Variables** | **Total 188** | **No 119 (63,2)** | **Yes 69 (36,7)** | ***P* value** | **+[c] 22(31,8)** | **−[d] 47(68,1)** | ***P* value** |
| AGE (Mean ± SD) | 59,9 ± 15 | 60,9 ± 13 | 58,2 ± 18 | 0,223 | 53,1 ± 22 | 60,6 ± 15 | 0,097 |
| MV[a] | 156 (83,0) | 93 (78,2) | 63 (91,3) | 0,021 | 21 (95,5) | 42 (89,4) | 0,403 |
| ICU ADMISSION | | | | 0,146 | | | 0,003 |
| Resp. failure | 103 (54,8) | 65 (54,6) | 35 (55,1) | | 9 (40,9) | 29 (61,7) | |
| Shock | 41 (21,8) | 31 (26,1) | 10 (14,5) | | 1 (4,5) | 9 (19,1) | |
| Cardiac arrest | 13 (6,9) | 7 (5,9) | 6 (8,7) | | 1 (4,5) | 5 (10,6) | |
| Polytrauma | 9 (4,8) | 3 (2,5) | 6 (8,7) | | 5 (22,7) | 1 (2,1) | |
| Others | 22 (11,7) | 13 (10,9) | 9 (13,0) | | 6 (27,3) | 3 (6,4) | |
| NOSOCOMIAL | 91 (48,4) | 55 (46,2) | 64 (53,8) | 0,431 | 11 (50,0) | 22 (46,8) | 0,805 |
| FAPP[b](+) | 124 (66,0) | 71 (59,7) | 53 (76,8) | 0,017 | 22 (100%) | 31 (66,0) | 0,002 |
| CULTURE (+) | 45 (23,9) | 23 (19,3) | 22 (31,9) | 0,052 | 11 (50) | 11 (23,4) | 0,027 |
| FAPP/CULTURE | | | | 0,032 | | | 0,004 |
| +/+ | 64 (34,0) | 48 (40,3) | 16 (23,2) | | 0 (0) | 16 (34,0) | |
| −/− | 45 (23,9) | 23 (18,3) | 22 (31,9) | | 11 (50,0) | 11 (23,4) | |
| ± | 79 (42,0) | 48 (40,3) | 31 (44,9) | | 11 (50,0) | 20 (42,6) | |

[a] Mechanical ventilation
[b] Filmarray
[c] escalation/initiation
[d] De-escalation/discontinuation

**Conclusions:** The use of FAPP in critically ill patients with suspected pneumonia implies a change in antibiotic therapy in 36.7% of cases. This percentage is likely to increase with experience, reducing treatment failure rates and the use of broad-spectrum antibiotics.

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**Topic:** Infections and prevention

## 001074

### Optimization of infusion therapy in the postoperative period in children with congenital heart defects

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001074

**Introduction:** In recent years in Uzbekistan, congenital heart defects (CHD) have taken a leading position in prevalence compared to other developmental defects in. Key recommendations are to use isotonic balanced solutions to restrict IV-MFT infusion volumes [1]. But the optimal strategy for fluid replacement after major surgery remains unclear and there is considerable interest in the investigation of more restrictive fluid regimens [2]. Recent evidence suggests that acetate-buffered infusions result in better hemodynamic stabilization [3].
**Objectives:** The purpose of the study is to optimize infusion therapy in the postoperative period of cardiac surgery. We examined 40 cardiac intensive care patients under the age of 6 months in the intensive care unit of the Children's National Medical Center.
**Methods:** The study material was the assessment of clinical and central hemodynamic parameters using echocardiography (EchoCG), central venous pressure (CVP), invasive measurement of blood pressure (ABP), acid–base balance (ABG). All patients were divided into two groups depending on the volume of infusion therapy. The 1-st group included 20 children with IV-MFT according to Holiday and Segar (4 ml/kg/hour of general volume), the 2-nl group included 20 children with IV-MFT according to an optimized regimen (1 ml/kg/hour) were calculated separately from the volume of inotropic and vasoactive support. The solution of choice for fluid support was Ringer's solution in both groups. Inotropic support in both groups was provided with adrenaline 0.05 mcg/kg/min, milrinone 0.5 mcg/kg/min.
**Results:** As a result of the work, EchoCG comparison showed significant differences between the groups: EFLV in the 1-st group did not exceed 46%, when in the 2-nd group it reached figures above 52%. EDV, on the contrary, was higher in the 1-st group by 20% (9.78 ml and 8.15 ml, respectively). We also noted differences in the compared groups in the following parameters: CVP in the 1-st group 13–14, in the 2-nd group 11–11.5; sodium in the 1-st group 128, in the 2-nd group 141; calcium—no difference. In the 1-st group, we identified signs of metabolic acidosis (pH < 7.32), and in the 2-nd group the pH value remained within the range of 7.34–7.42. BE in the 1-st group was 3 times less than in the study group (− 4.5 and − 1.5, respectively); ABP—41.8 mmHg (1 group) and 47.3 mmHg (2 group), diuresis—0.8 ml/kg/hour (1 group) and 1.5 ml/kg/hour (2 group).
**Conclusions:** Our proposed optimization of infusion therapy in the postoperative period of cardiac surgery, based on separate calculation of the main infusion at the rate of 1 ml/kg/hour of the volume of inotropic and vasoactive support, showed a significant difference compared with the control group in favor of reducing the hemodynamic load. This made it possible to reduce the shortening of the period of mechanical ventilation and the stay of children in the ICU. Nevertheless, we consider continuing research in this field.

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**Topic:** Cardiovascular issues in ICU

## 001075

### Experience in the use of extracorporeal membrane oxygenation support

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**Introduction:** When mechanical ventilation is not enough, extracorporeal membrane oxygenation could play a role as a form of rescue therapy and may provide beneficial results in the hands of skilled clinicians in centers with experience in using ECMO properly in selected patients.
**Objectives:** To describe the characteristics of patients admitted to a third-level hospital critical care unit over the past two decades who required the use of extracorporeal membrane oxygenation (ECMO) support.
**Methods:** Observational, retrospective study of ECMO patients over the past two decades in the ICU of H.G.U Gregorio Marañón. Epidemiological data, comorbidities, clinical characteristics prior to the initiation of the technique, organic supports used, complications, severity scales, and outcomes according to RESP score and functional class at one year according to the mMRC scale were collected. For descriptive analysis, quantitative variables were expressed as mean with standard deviation if their distribution was normal, or as median with interquartile range otherwise. Qualitative variables were expressed as percentages.
**Results:** 91 patients on ECMO during the reviewed period, with ECMO-VV used in 95% of cases. Indications for ECMO-VV were refractory hypoxemia (44%), severe hypoxemia/acidosis (6%), severe hypoxemia and severe respiratory acidosis (42%), and 8% as support prior to a procedure. ECMO-VA accounted for 5%, with cardiac dysfunction related to sepsis (20%), cardiogenic shock (40%), and pulmonary embolism (40%). Age: 49 ± 12 years, 68% male, BMI 28 ± 6, APACHE II score on admission 14 ± 8. Comorbidities: obesity 69%, hypertension 72%, lung disease 5%, diabetes 14%, cardiovascular disease 15%. immunosuppression 20%.
Pre-ECMO: APACHE II 17 ± 8, SOFA 8 ± 4, PO2/FiO2 73 ± 21, pCO2 70.6 ± 19.4 mmHg, days on mechanical ventilation (MV) 9 ± 11, MV > 7 days 50%. 65% received aggressive MV (plateau pressure > 30 cmH2O, driving pressure > 15 cmH2O) for 1.38 ± 1.8 days. Inhaled nitric oxide 61.5%, prone positioning sessions 3 (1–5), neuromuscular blockade 100%, vasopressor drugs 69%, and acute respiratory distress syndrome (ARDS) with extracorporeal membrane oxygenation (ECMO) 19%. Complications: ventilator-associated pneumonia (VAP) 14%, bloodstream infection (BSI) 9%, arrhythmia 10%, pneumothorax 8%. ECMO days: 16 ± 9, total MV days: 44 ± 20, tracheostomy 61%. ECMO mortality 50%, ICU mortality 61%, reasons: Acute Exacerbation of Chronic Obstructive Pulmonary Disease (AECOPD) 44%, Multiple Organ Dysfunction Syndrome (MODS) 31%, Cerebrovascular Accident (CVA) 12%. ICU stay 53 ± 27 days, hospital stay 73 ± 58 days. ICU and hospital survival rate: 48%. RESP Score: Group I 2%, Group II 22%, Group III 40%, Group IV 12%, Group V 1%, with associated survival rates: Group I 100%, Group II 74%, Group III 33%, Group IV 55%, Group V 100%. Functional class at one year (mMRC): Class II 30%, Class III 70%.

**Conclusions:** High hospital stay, complications, and mortality of critical patients who required ECMO. Marked deterioration of functional class in one-year survivors.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001076

### Efficacy of balloon-supported manual compression hemostasis for Impella sheaths

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001076

**Introduction:** The efficacy of Impella in cardiogenic shock has been widely reported; however, Impella, which requires a large-bore sheath, may require prolonged pressure hemostasis or cause difficulty in hemostasis by manual compression after removal. Therefore, surgical hemostasis (SH) is used, which is highly invasive and carries the risk of infection. Thus, hemostatic device techniques (HDT) using suture-meditated closure systems and, more recently, hemostatic devices based on collagen plugs have been reported. However, HDT also pose a risk of infection and difficulty using alternative techniques in the event HDT hemostasis fails.
**Objectives:** The balloon-supported manual compression hemostasis method (BSMC) can shorten the time to hemostasis while avoiding the risk of infection by not leaving sutures or collagen plugs, and can also be used as an alternative technique when hemostasis is difficult to achieve.
We investigated the efficacy and safety of BSMC as a method of hemostasis for Impella compared to SH and HDT.
**Methods:** This study included 31 patients who underwent Impella removal from 55 consecutive patients treated with Impella at Mito Saiseikai General Hospital from June 2020 to May 2024. Three types of hemostasis methods were used: BSMC, SH, and HDT (all with a suture-meditated closure system). The success rate, time to hemostasis, and perioperative complications of each method were investigated.
**Results:** Sixteen patients underwent BSMC, eight underwent SH, and seven underwent HDT.
The success rate of BSMC was 93.8% (14/15) (excluding one case of thrombus occlusion), 100% (8/8) with SH, and 85.7% (6/7) with HDT ($p = 0.72$).
The time to hemostasis was $18.9 \pm 8.93$ min for BSMC, $35.3 \pm 10.7$ min for SH, and $10.0 \pm 5.13$ min for HDT. The time to hemostasis for BSMC was significantly shorter than that of SH ($p < 0.001$) and was not significantly different from that of HDT ($p = 0.16$). In one case using BSMC in which hemostasis was difficult, hemostasis was achieved using SH, and balloon compression was used to control bleeding.
There was one case of wound dehiscence with SH and one case of wound infection requiring antimicrobial therapy with HDT, but none with BSMC.
**Conclusions:** BSMC significantly shorter hemostasis time compared to SH and had no significant differences compared to HDT, and it had no complications associated with hemostasis. Thus, BSMC may be an effective hemostatic option after Impella removal.

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**Topic:** Cardiovascular issues in ICU

## 001077

### Correlation between quadriceps strength and thickness in critically ill patients: an observational prospective study

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**Introduction:** Mechanical ventilation (MV) is associated with severe adverse outcomes in critically ill patients and the impact of ventilator induced diaphragmatic dysfunction (VIDD) is still unclear.
**Objectives:** (i) To assess the association between quadriceps thickness and strength in patients in intensive-care unit (ICU); (ii) to assess time to reach the sitting position as a functional outcome.
**Methods:** Clinical Trial number NCT06289244. Critically ill adults requiring at least 48 h of invasive MV were consecutively enrolled. Quadriceps strength over the ICU stay period was assessed by rectus femoris cross-sectional area (CSA), Medical Research Council (MRC) sum-score, and dynamometer measurement. In addition, the association between muscle strength and muscle thickness variation in peripheral and respiratory muscles was investigated using multivariable mixed-effect model. Time to sitting position was used as dependent variable in multivariable Cox model to understand the relationship of peripheral and respiratory muscles' strength and thickness variation.
**Results:** So far, we included 36 over 50 patients (females 36.1%), as our target sample size (72%). Mean age was 56.3 (16.2) years, and they spent 12.7 (10.4) days on MV during 16.6 (12.4) days of ICU stay. Preliminary results showed several strong positive correlations: rectus femoris CSA and quadriceps thickness ($\rho = 0.55$, $p < 0.001$), respiratory muscle strength and MRC ($\rho = 0.73$, $p < 0.001$), respiratory muscle strength and quadriceps extensor right ($\rho = 0.67$, $p < 0.001$) and MRC and quadriceps extensor right ($\rho = 0.78$, $p < 0.001$) (Fig. 1). For those evaluated at ICU discharge ($n = 21$), 17 (81%) scored < 48 on the MRC scale. In patients with preserved diaphragm function, median time to sitting position was 7 (interquartile range (IQR): 6–18 days), compared to 17 (IQR = 16-) days in patients with impaired diaphragm function. Among these, the 35.4% (95%CI: 18.6; 67.3) did not reach sitting position after 14 days of ICU stay compared to patients without diaphragm waste (75% (95%CI: 50.3; 100.0).
**Conclusions:** The current results provide encouraging evidence supporting the use of ultrasound and dynamometer in combination with the MRC scale to assess peripheral muscle strength in ICU patients. The diaphragm function seems to have a key role guiding rehabilitation interventions promptly.

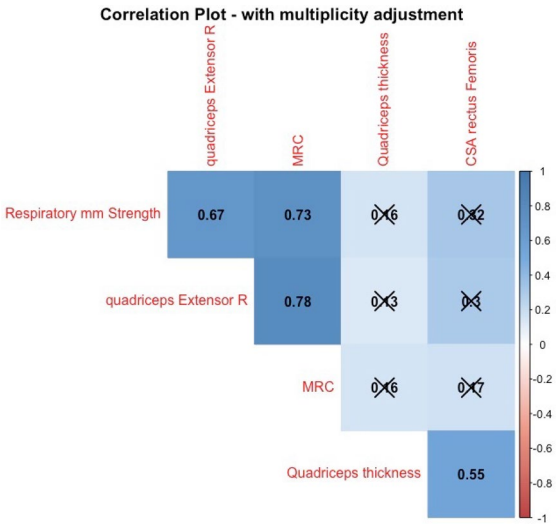


**Fig. 1 (abstract 001077)** Correlation Plot- with multiplicity adjustment. *Abbreviations: R = right; MRC = Medical Research Council; CSA = cross-sectional area; mm = muscles

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**Topic:** Nursing care and physiotherapy.

## 001078

### Analysis of the characteristics of hypertension occurring during the perioperative period

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**001078

**Introduction:** In patients scheduled for surgery, there are often cases where the surgery is delayed due to excessively high blood pressure upon entering the operating room. 'White coat hypertension is a unique entity, in which there is rise of blood pressure noted in patients who are normotensive in non-medical settings, but develop hypertension on entering in a medical facility. This phenomenon is also noticeable in the medical environment, especially when patients are nervous about entering the operating room.
**Methods:** We reviewed the electronic medical records of patients who had undergone Phacoemulsification and Posterior capsular lens insertion (PE & PCL) for cataract with monitored anesthesia care (MAC). Patients receiving psychiatric medication were excluded. Data were compared and analyzed by extracting the first vital signs in the ward on the day of surgery, three vital signs every 3 min immediately after entering the operating room, and three vital signs every 5 min after transfer to the recovery room.
**Results:** Vital signs (HR, SBP, and MBP) showed significant changes over time except for DBP, and blood pressure and heart rate fluctuations were greatest immediately after entering the operating room (Fig. 1). Additionally, these changes showed significant results regardless of hypertension as an underlying disease.

**Table 1 (abstract 001078)** Demographic data

| | | |
|---|---|---|
| Gender [*n* (%)] | | |
| Male | 62 | (51.2) |
| Female | 59 | (48.8) |
| Age (year) | 70.5 | ± 10.5 |
| Height (cm) | 160.8 | ± 9.1 |
| Weight (kg) | 63.9 | ± 11.9 |
| HTN [*n* (%)] | 53 | (43.8) |
| DM [*n* (%)] | 22 | (18.2) |
| CVA [*n* (%)] | 20 | (16.5) |

Data are presented as mean ± SD or mean

HTN: hypertension; DM: diabetes mellitus; CVA: cerebrovascular accident

**Conclusions:** When a perioperative patient shows unstable vital signs, emotional control or light sedation is a factor to consider in stabilizing the patient.

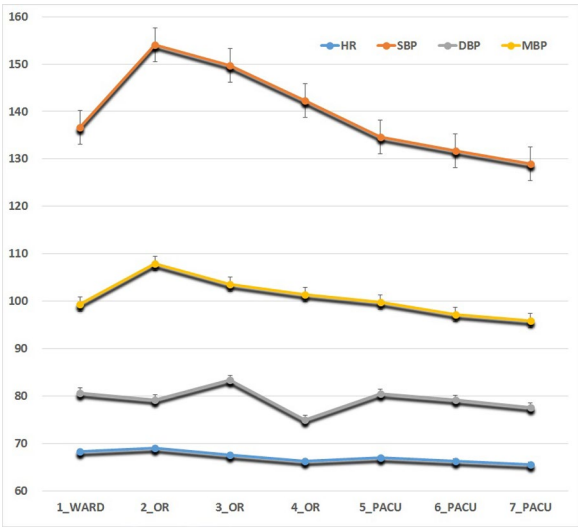


**Fig. 1 (abstract 001078)** These graphs show the mean and standard error of changes in vital signs over time. HR: heart rate; SBP: systolic blood pressure; DBP: diastolic blood pressure; MBP: mean blood pressure; OR: operating room; PACU: post anesthesia care unit

**Topic:** Perioperative care

## 001079

### Cardiovascular complications of oleander poisoning in the intensive care unit

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**Introduction:** The oleander (*Nerium oleander*) is a widespread ornamental plant. Ingestion of this shrub is capable of causing the death of an adult, due to the presence of oleandrin in the leaf, flowers and stem, a substance similar to digoxin. Oleander poisoning is uncommon but serious.
**Objectives:** Describe cardiovascular complications following oleander poisoning in the intensive care unit.
**Methods:** It was a retrospective study including all patients hospitalised for intoxication by oleander in a medical intensive care unit over a period of 19 years (January 2005 to December 2023).
It was decided that the patient had been poisoned by oleander given the circumstances of the accident; consumption of part of the plant with signs of oleander poisoning.
**Results:** Seven patients were admitted to the intensive care unit with oleander poisoning during the course of the study.
The mean age was 43 ± 16 years, with a sex ratio of 0.14. Two patients were diabetic and one had coronary artery disease.
All patients used the plant as an infusion for therapeutic purposes; three patients used it for slimming purposes, one patient used it for abortifacient purposes, two patients used it to relieve joint pain and one patient used it on the advice of a charlatan to treat cancer.
The average consultation time after ingestion was 3.5 h.
Five patients had neurological signs on admission and all patients had digestive signs.
Six patients presented with cardiovascular signs. One patient presented with ST-elevation myocardial infarction and normal coronary angiography. One patient presented with non-ST-elevation myocardial infarction, two patients presented with a repolarisation disorder with a diffuse flat T wave, one patient presented with an extended inferior and anterior digital cup and one patient presented with sinus bradycardia that responded to atropine.
All our patients had a favourable outcome, with an average hospital stay of 3 days.
**Conclusions:** Plant poisoning with cardiovascular complications is rarely reported. Management of oleander poisoning requires rapid diagnosis and close cardiac monitoring.

**Topic:** Poisoning/Toxicology/Pharmacology

## 001081

## Echocardiographic evaluation of ventricular performance in VA-ECMO weaning: results from an observational multicentric prospective study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**001081

**Introduction:** Although temporary mechanical circulatory support devices are increasingly used in the management of cardiogenic shock (CS), several open questions regarding the kind of support and timing of institution/weaning remain open. Echocardiography is widely applied to drive the weaning process from veno-arterial extracorporeal membrane oxygenation (VA-ECMO), although there are no standardized protocols.
**Objectives:** We sought to evaluate the accuracy of echocardiographic indices in predicting successful weaning from VA-ECMO in CS patients. We tested total isovolumic time (tIVT), an index of ventricular performance(1,2) and longitudinal function (MAPSE) on top of the commonly used parameters (left ventricular ejection fraction, LVEF; E/e' at mitral valve; left ventricular velocity time integral, LV VTI; TAPSE; right ventricular S' at tissue Doppler imaging, RV S').
**Methods:** Multicentric prospective study on adults receiving VA-ECMO due to refractory CS and/or cardiac arrest (CA) from 2012 to 2020. Echocardiography was performed at VA-ECMO placement and during the weaning trials. Weaning trials were performed daily starting from 48 h after VA-ECMO institution. A stepwise decrease of VA-ECMO blood flow was applied, until reaching 1 or 1.5 L/min. Successful weaning was defined as removal of VA-ECMO with no requirement for further MCS in the following 30 days.
**Results:** 76 patients were enrolled (23.8% female, 54.2 ± 10.6 years old), 52.6% due to CA. Median duration of VA-ECMO was 58 h; 47 (61.8%) had intra-aortic balloon pump inserted upfront. In-hospital mortality was 62.4% overall, 40% for CS without CA. 6 of the 32 weaned patients died in hospital for multiorgan failure due to septic shock. The baseline echocardiographic parameters associated with successful weaning were (Fig. 1): stroke volume (SV) > 13.2 ml (HR 4.12 [1.71–9.95], *p* 0.002), tIVT > 23.6 min/sec (HR 0.14 [0.02–1.03], *p* 0.053), LV VTI > 6.6 cm (HR 4.99 [1.94–12.87], *p* < 0.001), MAPSE > 6.15 mm (HR 4.42 [1.90–10.24], *p* 0.001), TAPSE > 11 mm (HR 10.13 [1.37–7.02], *p* 0.023), RV S' > 7 cm (HR 5.40 [1.45–20.12], p 0.012). LVEF, E/e' and S' at mitral valve did not reach the statistical significance. Figure 2 shows Kaplan–Meier analysis on echocardiographic indices collected during the last weaning trial and their hazard ratios.
**Conclusions:** Echocardiography is pivotal in defining cardiac recovery and monitoring the weaning trial. Indices reflecting ventricular performance and delivered flow from LV were associated with weaning success both at VA-ECMO institution and throughout the weaning trials. Parameters reflecting ventricular activation and systo-diastolic interaction already demonstrated superiority in defining ventricular performance. Considering the known limitations of LVEF (HR, loading and LV dyssynchrony dependence), tIVT and MAPSE should be introduced in the standard evaluation in the acute setting.

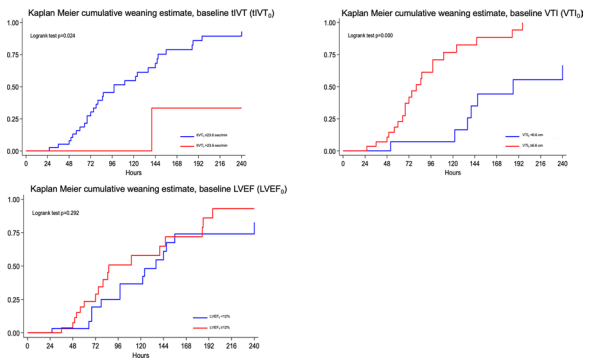
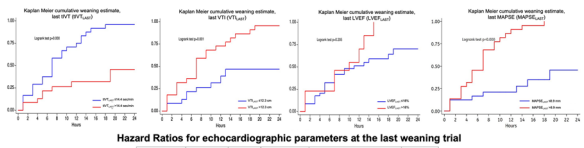



**Fig. 1 (abstract 001081.)** .



**Hazard Ratios for echocardiographic parameters at the last weaning trial**

| Variable | Number | Value | Mean weaning failure time (SD%) | HR (CI 95%) | P value |
|---|---|---|---|---|---|
| T-IVT (sec/min) | 23 | ≤ 14.4 | 7 | 1 | 0.003 |
| | 23 | > 14.4 | 19 | 0.31 (0.14 – 0.67) | |
| LVEF (%) | 14 | ≤18 | 11 | 0.64 (0.74 – 3.00) | 0.25 |
| | 16 | >18 | 10 | 1 | |
| VTI (cm) | 23 | ≤ 12.3 | 7 | 1 | 0.003 |
| | 22 | > 12.3 | 7 | 3.26 (1.50 – 7.10) | |
| $MAPSE_{LW}$ (mm) | 9 | ≤ 8.9 | 24 | 1 | < 0.001 |
| | 22 | >8.9 | 22 | 6.48 (2.66 – 5.80) | |
| TAPSE (mm) | 30 | ≤18 | 16 | 1 | 0.001 |
| | 15 | >18 | 5 | 3.70 (1.74 – 7.99) | |
| E/e | 23 | ≤15.5 | 7 | 0.26 (0.12 – 0.58) | 0.001 |
| | 23 | >15.5 | 19 | 1 | |
| SV (mL) | 23 | ≥ 31 | 7 | 2.72 (1.28 – 5.77) | 0.009 |
| | 10 | <31 | 19 | 1 | |
| CO (L/min) | 23 | < 1.86 | 7 | 3.36 (1.53 – 7.4) | 0.003 |
| | 24 | ≥ 1.86 | 20 | 1 | |
| E' mitral (cm/sec) | 20 | < 7.20 | 7 | 4.58 (2.09 – 9.10) | < 0.001 |
| | 27 | ≥ 7.20 | 19 | 1 | |
| E' RV (cm/sec) | 23 | < 10 | 7 | 3.67 (1.61 – 8.37) | 0.002 |
| | 23 | ≤ 10 | 25 | 1 | |
| RV/LV | 17 | > 0.94 | 13 | 0.56 (0.25 – 1.26) | 0.162 |
| | 30 | ≤ 0.94 | 9 | 1 | |

**Fig. 2 (abstract 001070)** .

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**Topic:** Cardiovascular issues in ICU

## 001082

### A comparative analysis on delirium occurrence among COVID-19 patients treated with high-flow nasal oxygen or non-invasive mechanical ventilation


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**Introduction:** In the intensive care unit (ICU), delirium poses a substantial public health concern, particularly among patients requiring mechanical ventilation (MV) (1). Although delirium has been described in COVID-19 patients requiring MV (2), limited data exist regarding delirium incidence in patients receiving high-flow oxygen therapy (HFNO) or non-invasive mechanical ventilation (NIV).
**Objectives:** To assess the prevalence of delirium in ICU COVID-19 patients receiving HFNO or NIV.
**Methods:** We conducted a secondary analysis of a previously published multicenter cohort study (3), in which we exclusively considered COVID-19 patients receiving HFNO or NIV and who never required MV during their ICU stay. The primary outcome was the prevalence of delirium in the two groups. Secondary outcome was to investigate risk factors associated with development of delirium in this cohort.
**Results:** From a total of 2088 patients, 187 patients were eligible for the final analysis, 90 (48%) treated with HFNO and 97 (52%) treated with NIV. No significant differences in demographics, Charlson comorbidity index, Simplified Acute Physiology Score (SAPS) II, Glasgow Coma Scale (GCS) and the Richmond agitation-sedation scale (RASS) on the day of ICU admission were found between the two groups. Delirium prevalence was 9% ($n=8$) in the HFNO and 18% ($n=23$) in the NIV group (OR 2.34 (95% CI 0.96–5.68); $p=0.6$), with a predominance of hyperactive delirium in both populations (64% and 67%%, respectively). Figure 1 shows cumulative incidence of delirium over time in the two strategies. The time elapsed between the date of ICU admission and the onset of delirium was also comparable in the two groups ($p=0.67$). There were no significant differences between the two groups in the ICU length of stay and mortality at 28 days after admission. No multivariate analysis was performed due to the limited number of delirium events.
**Conclusions:** In this study, the prevalence of delirium was around 15% among COVID-19 patients admitted to intensive care units undergoing HFNO or NIV.

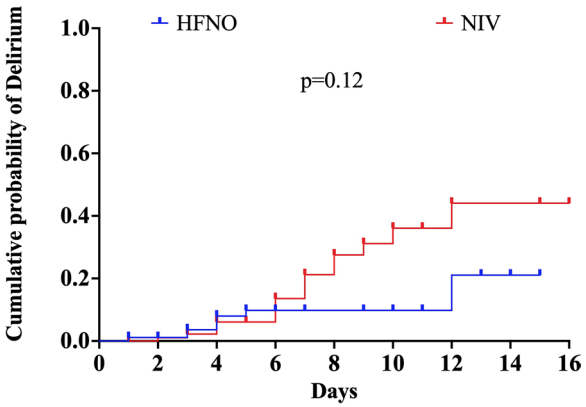


**Fig. 1 (abstract 001082)** Cumulative incidence of delirium over time in the two strategies

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4. None


**Topic:** Sedation, analgesia and delirium

## 001084

### Observations on post-resuscitation care: a retrospective analysis using the 2023 ERC-ESICM quality indicators framework


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001084


**Introduction:** Following return of spontaneous circulation (ROSC) after out of hospital cardiac arrest (OHCA), the primary goal of post-resuscitation care is to implement therapies that increase the likelihood of disability-free survival [1]. In 2023, the ERC, EUSEM, ESC and

ESICM jointly proposed a quality indicators (QIs) framework for evaluating post-resuscitation care [2]. Based on the 2020 International Consensus on Cardiopulmonary Resuscitation Science with Treatment Recommendations, the quality indicators framework is structured around 6 primary and 12 secondary QIs [2, 3].
**Objectives:** To evaluate patient outcomes data including 3-month survival after OHCA using the 2023 ESC-ESICM QIs framework and report our observations on the process.
**Methods:** Single-centre retrospective analysis of all patients admitted to our tertiary referral and major trauma centre ITU at the Royal Sussex County Hospital, over one calendar year (September 2022 to August 2023) with a diagnosis of OHCA. Clinical data were obtained from electronic patient records and outcome data from ITU follow-up clinics.
**Results:** There were 66 OHCA admissions during the study period. Overall mortality was 56%, higher than the all-cause unit risk-adjusted mortality of 20.2%. The initial rhythm was shockable in 47% of cases. Mortality was 38% in the shockable group vs 81% in the non-shockable group. There was minimal difference between the age of non-survivors and survivors (median 66 vs 62 years, IQR 74 to 49 vs 75 to 52, respectively). The causes of OHCA are shown in Fig. 1. We were unable to ascertain fulfilment of QI domain 2.1 and 2.2 as we do not routinely record timing data for bedside transthoracic echocardiography or time to wire which in turn meant the composite QI could not be calculated. Of surprise to us, in 27% of cases we did not achieve targeted temperature management (TTM) to less than 37.7 °C for 72 h post-arrest. There was 100% compliance with domain 1 (structural QIs) and 6.2 (discharge and follow-up).
**Conclusions:** OHCA makes up a disproportionate share of our unit mortality, particularly in the case of non-shockable rhythms. As a strength of the 2023 QIs framework, we have identified TTM as a specific area for intervention to improve quality of care. We have also identified follow-up of survivors (domain 6.2) as being an area in which we perform well.
As an inherent limitation of this study, we analysed patients that survived to ITU admission, which may under-estimate the mortality and quality of care that occurs between ROSC and ITU admission in early non-survivors.
As an observation of the 2023 ERC-ESICM QIs framework, it arguably leans toward cardiac causes of OHCA, though in our institution this made up just 23–26% of admissions. A future revision of the framework may consider special patient groups such as traumatic and neurosurgical causes of OHCA where investigations such as echocardiography may delay other time critical life-saving interventions.

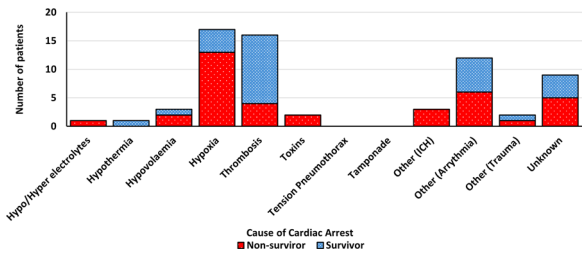


**Fig. 1 (abstract 001084)** Bar chart of OHCA by cause and 3-month survival

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4. None to declare

**Topic:** Cardiac arrest

## 001086

### A data-driven digital health approach to improve CRRT delivery in the ICU

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001086

**Introduction:** Acute kidney injury (AKI) is a frequent complication in the intensive care unit (ICU). About 15% of critically ill patients with AKI require renal replacement therapy, commonly in the form of continuous renal replacement therapy (CRRT). The abundance of electronic health record (EHR) and CRRT device data allows for the development and validation of data-driven digital health solutions to enhance CRRT delivery. This project aimed to develop a data pipeline to feed scalable smart dashboards of patient- and CRRT-relevant data to monitor key performance CRRT indicators and patient outcomes.
**Methods:** We utilized EHR and CRRT device data from the University of Alabama at Birmingham from January 2022 to February 2024. We extracted CRRT device data ($n = 42$ devices) every month via a manual process by a nurse collecting the CRRT machine data cards. The data from CRRT cards were then uploaded to a secure storage location for data processing. We created an ETL (extract, process, and loading) data process in a virtual server environment using Python code to clean and normalize the data. We then connected the Python data pipeline to feed the visualization layer via the Tableau cloud server and to refresh automatically the dashboards. For the visualization layer, we designed specific interactive dashboards with Tableau that exhibit key performance CRRT indicators that are sustainably trackable on a weekly or monthly basis. A key part of the overall solution relies on accurate patient matching. Patient matching is a complex process, made easy by a proprietary algorithm created during this process. The dashboards have been customized to meet the needs of the end-users and provide dynamic tools to filter by many variables such as date, machine, alarm type, service unit, diagnosis, demographics, and many others.
**Results:** We developed smart dashboards in Tableau that incorporate data visualization of pre-selected CRRT and EHR parameters, as well as AI-powered data analytics techniques to support providers in viewing and exploring these data for multiple use cases including quality assurance, process or clinical outcome predictions and patient subphenotyping, thereby identifying previously unnoticed patterns in EHR and CRRT data to augment support clinical decision-making.
**Conclusions:** The development of digital health solutions that integrate multimodal data from EHR and CRRT devices is feasible. While this is a key milestone to enable AI-powered CRRT delivery, the impact

of these digital health solutions on processes and clinical outcomes needs to be tested with contemporary implementation science tools.

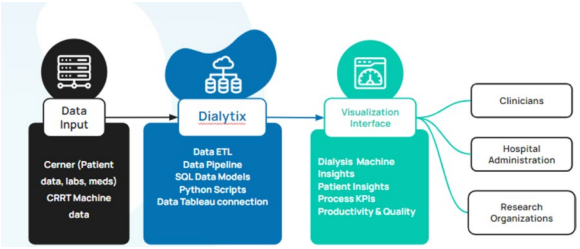


**Fig. 1 (abstract 001086)** High-level data flow

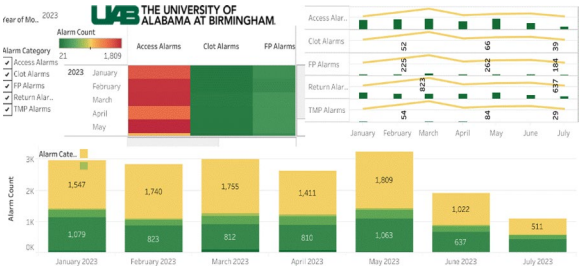


**Fig. 2 (abstract 001086)** Visualization layer—alarms dashboard

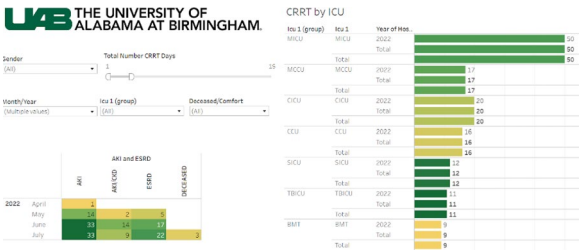


**Fig. 3 (abstract 001086)** Visualization layer—CRRT patient insights dashboard

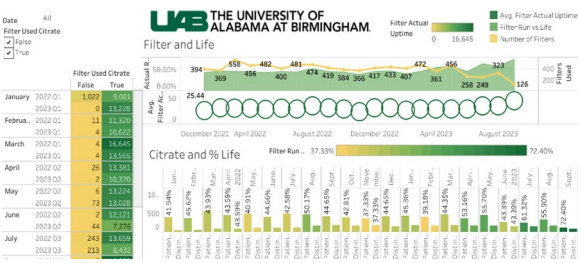


**Fig. 4 (abstract 001086)** Visualization layer—CRRT filter insights dashboard

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2. NIH, NIDDK R01DK133539

**Topic:** Acute Kidney Injury and haemofiltration

## 001087

## Importance of clinical frailty scale as an outcome prediction tool combined with SOFA and APACHE II score for ICU patients > 65 years of age

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001087

**Introduction:** There are several tools created for the prediction of outcomes in the Intensive Care Unit (ICU), such as Sequential Organ Failure Assessment (SOFA) score and APACHE II score that are validated to be used in the ICU and provide crucial information for every patient in order to improve his outcome. In Greece even more ICU patients are > 65 years old and most of them are frail. Clinical Frailty Scale (CFS) is the only frailty quantification tool that can be used in ICU, due to the patient's inability to provide information.
**Objectives:** The aim of this study is to explore the importance of another prediction tool such as the CFS score that includes frailty for ICU patients > 65 years old, due to the different characteristics, comorbidities, polypharmacy and sarcopenia of this group of patients. Another aim is to compare its value in comparison to APACHE II and SOFA score.
**Methods:** 90 ICU patients > 65y.o were included in this study. Their demographics, clinical findings, CFS, SOFA, APACHE II scores on admission, outcome, length of stay (LOS), ventilator- and vasopressor-free days were recorded and statistically analyzed.
**Results:** Out of the 90 ICU patients, 62% were male, the mean age was 74.3 (range 65 to 97), with a mean BMI of 28.8 ± 3.9 and had on average 1.7 ± 1.5 comorbidities (range 0–5). 64% of them were smokers and only 22% had alcohol consumption regularly. Their length of stay was 17 ± 8 days and had a survival rate of 57.1% for all frailty scores. The highest survival rate was for CFS from 1 to 4 (77.2% survival rate) vs 46.8% for CFS from 5 to 9, and the first group had more ventilator-free days (9.7 vs 5.4), more vasopressor-free days (11.7 vs 6.6) and less LOS (10.4 vs 17.3) in comparison to the second more frail group. High CFS of 8 or 9 have less LOS due to death during the first days of hospitalization (avg 10.6) and lower CFS of 1 and 2 had as well less LOS (avg 7.5). The most days spent in the ICU can be found at the CFS = 5 group (avg 27.5). CSF = 2 had the best survival rate of 100%, followed by CFS = 3 (85.7%). On the contrary, CFS = 9 had 100% mortality rate followed by CFS = 8 (80% mortality rate).
**Conclusions:** CFS is an important predictive tool to be used with APACHE II and SOFA score as even more frail patients are admitted to the ICU and their different characteristics, comorbidities and their lower capacity to manage in an ICU environment separate them from the general population. Identifying the frail patients in an ICU can be challenging, but is important to improve outcomes and decrease their LOS.

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**Topic:** Health Services Research and Outcome

## 001088

### Risk factors for mortality on the patients who underwent renal replacement therapy in an ICU in southern Portugal

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001088

**Introduction:** Acute kidney injury (AKI) is a comprehensive clinical syndrome characterized by a sudden decline in kidney function, potentially leading to fluid imbalance, metabolic acidosis, and electrolyte disorders. It represents one of the most prevalent organ dysfunctions observed in critically ill patients and is typically linked with increased morbidity and mortality rates. The management of AKI primarily involves supportive care, with continuous renal replacement therapy (CRRT) utilized in patients experiencing severe kidney injury or its complications. CRRT is necessary in a minority of all critically ill patients and, despite intensive dialysis interventions, is associated with mortality rates ranging from 50 to 80%. While previous studies have identified numerous potential factors, there remains uncertainty regarding those specifically associated with higher mortality rates among patients requiring CRRT. This study was conducted to pinpoint factors that elevate the risk of mortality among patients in our unit requiring CRRT, with the aim of devising strategies to enhance their overall outcomes.
**Objectives:** This study aims to evaluate which factors confer a higher risk of dying on the patients who underwent renal replacement therapy in an ICU in southern Portugal between 2018 and 2022.
**Methods:** We performed a retrospective study and univariable statistical analyses on patients who underwent renal replacement therapy in the ICU between 1 January of 2018 and 31 December of 2022 in order to identify risk factors for mortality.
**Results:** Among the 101 patients enrolled, 65.4% were male, with a mean age of 65.45 (± 12.35) years, and a previous history of chronic kidney disease (CKD) was present in 26.73%. The majority of patients required ICU care due to medical reasons (83.2%) compared to 16.8% with surgical pathologies as the primary reason for admission. Among these, the most common nosologic groups in which the patients' diseases were classified were the digestive system (23.8%), respiratory system (21.8%) and infectious diseases (13.9%). The most common indications for starting CRRT were the patient's inability to manage volume, severe nitrogen retention and severe acidosis.
Despite efforts to maintain adequate hemodynamic stability, all patients except for 4 had at least one evaluation of mean arterial pressure (MAP) below 75 mmHg, and only 24 (23.8%) had no reported values of MAP < 60 mmHg. Additionally, 67.3% of patients experienced episodes of hyperglycemia (defined by serum glucose levels > 180 mg/dL) and 77.2% required invasive mechanical ventilation (IMV). The mortality rate among patients requiring CRRT was 43.6%.
Among the parameters evaluated, age was positively correlated with a higher risk of mortality ($p = 0.015$). Furthermore, a higher number of reported episodes of MAP < 75 mmHg ($p = 0.036$), a higher number of episodes of MAP < 60 mmHg ($p = 0.017$), and IMV ($p = 0.003$) were positively correlated with death. However, neither sex, a previous history of CKD, the type or diagnosis at admission, the indication to start CRRT, nor the number of episodes of hyperglycemia were correlated with a higher risk of mortality ($p > 0.05$).
**Conclusions:** Not surprisingly, among patients with AKI who require CRRT, older age is associated with a higher risk of mortality, likely due to increased comorbidities and reduced physiological reserve. Although CRRT is better tolerated in unstable patients compared to intermittent modalities, it can have hemodynamic consequences. In the context of critical illness, a higher frequency of hypotension episodes and subsequent hypoperfusion is expected, further increasing the risk of mortality. A similar trend is observed with invasive mechanical ventilation (IMV)—patients with more critical conditions are at a higher risk of adverse outcomes. IMV is linked to prolonged ICU stays, increased infectious complications, and higher mortality rates. When combined with CRRT, the prognosis worsens. Interestingly, hyperglycemia did not independently increase the risk of mortality among our patients. Our study results confirm some of our suspicions while highlighting the need for improved patient care. In certain cases, despite our best efforts, outcomes may remain unchanged due to extreme circumstances. However, in others, meticulous hemodynamic monitoring and resuscitation strategies may significantly impact survival rates.

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**Topic:** Acute Kidney Injury and haemofiltration

## 001089

### Performance, correlation and agreement of SaO2/FiO2 and imputed PaO2/FiO2 in patients under invasive mechanical ventilation and extracorporeal membrane oxygenation (ECMO) therapy in a high-altitude facility

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001089

**Introduction:** Linear imputation models have been used to validate SpO2/FiO2 instead of PaO2/FiO2 in various pathologies, particularly in the diagnosis and treatment of ARDS (1–3). Although Rice and Pandharipande found a correlation between the indices, a few years later a nonlinear imputation equation developed by Severinghaus based on the sigmoid behavior with respect to the hemoglobin saturation curve, blood pressure and oxygen saturation. This equation was validated by Brown in patients with ARDS and showed better performance and correlation than the equation first developed (4–7). Given the scarce information on normal oxygenation values in patients living at high altitude, the behavior of these imputation methods in patients

undergoing invasive mechanical ventilation and ECMO support with different pathologies is not known, as they are usually excluded from studies.

**Objectives:** The primary aim of this study was to ascertain the performance, correlation, and concordance between PaO2/FiO2 and SaO2/FiO2, alongside imputed PaO2/FiO2, in patients undergoing invasive mechanical ventilation and ECMO support at a high-complexity healthcare facility over the period spanning from 2020 to 2023.

**Methods:** We conducted a cross-sectional, single-center study with an analytical component, utilizing a database of adult patients admitted to the Extracorporeal Life Support Unit who required ECMO support for at least 24 h. For quantitative variables, we calculated measures of central tendency and dispersion, while for qualitative variables, we determined frequencies and percentages. Diagnostic accuracy measures including sensitivity, specificity, positive and negative predictive values were assessed for PEEP greater and less than 10 cmH2O, PaCO2 greater and less than 35 mmHg, and hemoglobin greater than 12 mg/dL, using severe hypoxemia as a reference for comparison. Additionally, an analysis of the area under the receiver operating characteristic curve (AUROC) with a 95% confidence interval was performed. Pearson's correlation coefficient (for normal distribution) or Spearman's correlation coefficient (for non-normal distribution) was employed to assess correlations between the SpO2/FiO2 determined with the oximeter and PaO2/FiO2 determined from arterial gases or various imputation formulas. Furthermore, the intraclass correlation coefficient was used to evaluate agreement. Statistical significance was set at a $p$-value < 0.05.

**Results:** 272 patients requiring ECMO therapy were included, with a mean age of 42.80 years (SD: 12.33). Among them, 65.44% were men ($n = 178$), with a mean body mass index (BMI) of 28.74 kg/m$^2$. Common comorbidities included obesity (34.93%, $n = 95$) and hypertension (20.22%, $n = 55$). The average ICU length of stay was 29.63 days (SD: 26.7), and 37.87% of patients ($n = 103$) died in the ICU. Sixty-two percent required ECMO veno-venous (VV ECMO) configuration, while 36% required ECMO veno-arterial ($n = 168$). The overall mortality rate was 37.87% ($n = 103$). The AUROC for SaFiO2 in non-severe hypoxemia in VV ECMO patients was 0.939 (CI 0.89–0.99) with an LR + of 6.53 and an LR- of 0.10 (Fig. 1) those with PEEP > 10 cmH2O, it was 0.938 (CI 0.88–0.99) with an LR + of 5.96 and an LR- of 0.09. For patients with hypercapnia, it was 0.931 (CI 0.87–0.99) with an LR + of 5.45 and an LR- of 0.07. Regarding anemia with hemoglobin < 10 g/dL and in the case of hyperbilirubinemia (total Bilirubin > 3 mg/dL), the AUROC of SaO2FiO2 was 0.993 (CI 0.98–1.00) and 0.667 (CI 0.01–1.00) respectively. (Table 2). The AUROC for SaFiO2 in severe hypoxemia in VV ECMO patients was 0.060 (CI 0.01 – 0.11) with an LR + of 0.24 and an LR- of 13.59. For those with PEEP > 10 cmH2O, it was 0.062 (CI 0.01–0.12) with an LR + of 0.26 and an LR- of 16.36. For patients with hypercapnia, it was 0.068 (CI 0.00–0.13) with an LR + of 0.27 and an LR- of 22.53. Regarding anemia with hemoglobin < 10 g/dL and in the case of hyperbilirubinemia (total Bilirubin > 3 mg/dL), the AUROC of SaO2FiO2 was 0.006 (CI 0.00–0.02) and 0.333 (CI 0.00–0.98), respectively.

**Conclusions:** Patients requiring VV ECMO support, the use of SaO2/FiO2 had a high correlation and agreement with PaO2/FiO2 > 150 and may be an alternative and reliable method to guide diagnosis and treatment. However, the opposite occurred when the PaO2/FiO2 was < 150, where good performance was not found.

**Table 1 (abstract 001089)** Clinical and demographic characteristics

| Variables | Death | | P < 0,05* |
|---|---|---|---|
| | Yes = 103 (37,87) | No = 169 (62,13) | |
| Tidal volume (SD) | 276,71 (130,13) | 307,42 (111,49) | 0,043* |
| Respiratory rate (SD) | 13,62 (10,77) | 11,89 (2,59) | 0,046* |
| PEEP (SD) | 10,21 (2,24) | 9,85 (1,65) | 0,134 |
| FiO2 (SD) | 42,84 (18,63) | 38,86 (12,30) | 0,035* |
| NYHA | | | |
| Class I | 100 (97,09) | 164 (97,04) | 0,829 |
| Class II | - | 1 (0,59) | - |
| Class III | 1 (0,97) | 2 (1,18) | - |
| Class IV | 2 (1,94) | 2 (1,18) | - |
| Etiology of ECMO support | | | |
| Pulmonary | 72 (69,90) | 108 (63,91) | 0,274 |
| Cardiac | 25 (24,27) | 55 (32,54) | - |
| Septic | 6 (5,83) | 6 (3,55) | - |
| ECMO configuration | | | |
| Veno-venous | 65 (63,11) | 103 (60,95) | 0,881 |
| Veno-arterial | 35 (33,98) | 62 (36,69) | - |
| Both | 3 (2,91) | 4 (2,37) | - |
| Ventilatory mode | | | |
| VC | 81 (79,41) | 125 (73,96) | 0,309 |
| PC | 21 (20,59) | 44 (26,04) | 0,309 |
| pH (SD) | 7,41 (0,12) | 7,44 (0,07) | 0,009* |
| pCO2 (SD) | 39,26 (7,94) | 38,62 (7,51) | 0,502 |
| paO2 (SD) | 108,65 (76,62) | 88,80 (56,39) | 0,015* |
| HCO3 (SD) | 24,70 (5,29) | 25,83 (4,60) | 0,063 |
| SatO2 (SD) | 93,13 (4,84) | 93,01 (4,44) | 0,835 |
| Pa/FiO2 (SD) | 289,59 (244,18) | 242,57 (152,41) | 0,053 |
| Sa/FiO2 (SD) | | | |
| Lactate (SD) | 2,79 (3,07) | 2,82 (11,73) | 0,978 |
| Blood urea nitrogen (SD) | 37,34 (19,51) | 32,99 (19,08) | 0,073 |
| Creatinine (SD) | 1,80 (1,74) | 1,43 (1,33) | 0,047* |
| Potassium (SD) | 4,23 (0,76) | 4,25 (0,81) | 0,770 |
| Sodium (SD) | 140,76 (5,01) | 140,94 (4,77) | 0,763 |
| Hemoglobine (SD) | 11,17 (1,86) | 10,96 (2,24) | 0,428 |
| Hematocrit (SD) | 33,55 (4,97) | 32,81 (4,83) | 0,303 |
| Leukocytes (SD) | 12.834,61 (7.430,9) | 11.035,21 (4.779,9) | 0,015* |
| Total bilirrubin (SD) | 2,02 (1,91) | 1,78 (1,58) | 0,274 |
| Direct bilirrubin (SD) | 1,17 (1,61) | 0,93 (1,24) | 0,187 |
| Indirect bilirrubin (SD) | 0,65 (0,54) | 0,71 (0,67) | 0,467 |

**Table 2 (abstract 001089)** SpO2/FiO2 diagnostic performance in VV ECMO patients with PaO2/FiO2 ≥ 150

| Variable | AUC (IC 95%) | Se (%) | Sp(%) | LR (+) | LR (-) | P (< 0,05)* |
|---|---|---|---|---|---|---|
| **PaO2FiO2 ≥150** | 1,00 (1,00 – 1,00) | 100 | 97,67 | 42,99 | 0,00 | < 0,001 |
| **SaO2FiO2 ≥ 226 Non severe hypoxemia** | 0,939 (0,89 – 0,99) | 91,13 | 86,05 | 6,53 | 0,10 | < 0,001 |
| **SaO2FiO2 ≥ 226 (PEEP >10)** | 0,938 (0,88 – 0,99) | 91,82 | 84,62 | 5,96 | 0,09 | < 0,001 |
| **SaO2FiO2 ≥ 226 (Bilirrubin ≥3mg/dl)** | 0,667 (0,01 – 1,00) | 100,00 | 66,67 | 3,00 | 0,00 | < 0,001 |
| **SaO2FiO2 ≥ 226 Hemoglobin < 10 mg/dl** | 0,993 (0,98 – 1,00) | 96,88 | 100,00 | - | 0,03 | < 0,001 |
| **SaO2FiO2 ≥ 226 PCO2 > 35 mmHg** | 0,931 (0,87 – 0,99) | 93,41 | 82,86 | 5,45 | 0,07 | < 0,001 |

Se, sensitivity. Sp, specificit. LR, Likehood ratio

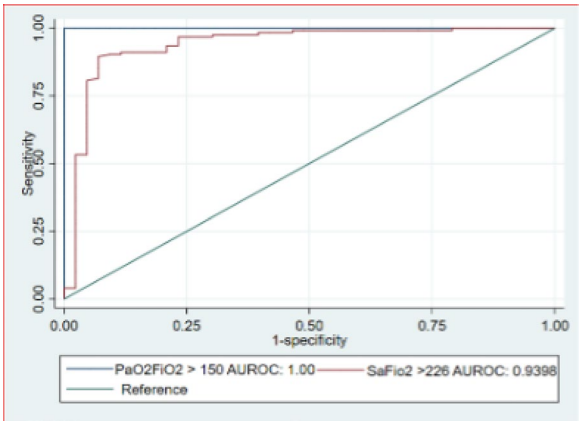


**Fig. 1 (abstract 001089)** Diagnostic performance of SpO2/FiO2 for non-severe hypoxemia in VV ECMO patients

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001090

### Correlation and validity of PaO2/FiO2 and Spo2/Fio2 and PaO2 imputation methods in patients with COVID-19 and invasive mechanical ventilation at 2600 m above sea level

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**Introduction:** PaO2/FiO2 (P/F) is part of the definition and classification of respiratory distress syndrome (ARDS) (1) but requires arterial blood gases (ABG) (2), which is not always available in low-resource settings (3), so it has been proposed that a non-invasive surrogate for (P/F) is the ratio of percent hemoglobin saturation on pulse oximetry (SPO2) to inspired fraction of oxygen (FIO2): SPO2/FiO2 (S/F) (4). Mathematical models have also been proposed to estimate PaO2 without direct measurement of O2 in GSA, by imputation of PaO2 (5), but all these indexes have not been validated in ARDS patients by COVID 19 at 2600 m above sea level (6).
**Objectives:** To determine the correlation and concordance between P/F and S/F and non-invasive methods of imputation: linear, non-linear and logarithmic P/F. To determine the ability of S/F to discriminate severe hypoxemia in patients at 2600 m. above sea level (a.s.l.), under positive pressure ventilation and diagnosis of COVID 19.
**Methods:** Retrospective cross-sectional study of patients with COVID 19, at 2600 m a.s.l. Spearman correlation between P/F and S/F and noninvasive methods was calculated. A generalized linear model was used to calculate an S/F value for a $P/F = 150$, then the validity to detect severe hypoxemia ($P/F \leq 150$) was evaluated by calculating sensitivity (SE), specificity (ES), positive predictive value (PPV), negative predictive value (NPV) and area under the curve (AUROC), finally a Bland–Altman (BA) comparison was performed to assess concordance.
**Results:** Among 292 patients with COVID 19 at 2600 m asl, a positive correlation was found between P/F and S/F of 0.90 ($p < 0.001$), P/F and P/F by linear imputation of 0, 90 ($p < 0.001$), P/F and P/F by logarithmic imputation of 0.87 ($p < 0.001$) and P/F and P/F and P/F by nonlinear imputation of 0.94 ($p < 0.001$). The equivalence relationship between S/F and P/F was described by the equation $S/F = 43.97 + 1.07 \times P/F$ (AIC 11.12), with S/F being 195.04 when P/F was 150. $S/F > 200$ had an SE of 78.2%, ES of 95.9%, PPV 95.6 and NPV 76.1 and an AUROC of 0.96 to detect $P/F \geq 150$, the other performance data for detection of non-severe hypoxemia are shown in Table 1. On the other hand, P/F and S/F showed little agreement between extreme values, as shown in Fig. 1.
**Conclusions:** In patients with COVID-19, S/F is a noninvasive index that shows a significant and strong correlation with P/F and P/F imputation methods. A $P/F = 150$ equals $S/F = 195.04$, given the ability to discriminate non-severe hypoxemia may be useful in low-resource settings without GSA; however, when hypoxemia is severe, its usefulness is limited.

**Table 1 (abstract 001090)** Oxygenation indexes for the diagnosis of non-severe hypoxemia

| Oxygenation indexes | SE (CI 95%) | ES (CI 95%) | PPV (CI 95%) | NPV (IC 95%) | AUROC (IC 95%) |
|---|---|---|---|---|---|
| P/F ≥150 | 100 (100-100) | 61,9 (59,1-64,6) | 78,2 (75,9-80,5) | 100 (100-100) | 1 (1-1) |
| S/F ≥200 | 78,2 (75,9-80,5) | 95 (93,8-96,2) | 95,6 (94,4-96,7) | 76,1 (73,7-78,5) | 0,96 (0,95-0,97) |
| P/F linear imputation ≥150 | 87,5 (85,7-89,4) | 92,7 (91,3-94,2) | 94,3 (93-95,6) | 84,5 (82,5-86,5) | 0,96 (0,95-0,97) |
| P/F logarithmic imputation ≥150,21 | 54,7 (51,9-57,5) | 98,7 (98,1-99,4) | 98,3 (97,6-99) | 61,4 (58,7-64,2) | 0,95 (0,94-0,96) |
| P/F nonlinear imputation ≥150,67 | 84,4 (82,4-86,5) | 93 (91,6-94,5) | 94,3 (93-95,6) | 81,4 (79,2-83,6) | 0,96 (0,95-0,97) |

SE: sensitivity, ES: specificity, PPV positive predictive value, NPV negative predictive value, AUROC area under the curve

Bland-Altman

| | | 95% Confidence Interval | |
|---|---|---|---|
| | Estimate | Lower | Upper |
| Bias ( n = 292 ) | 39.1 | 34.2 | 43.9 |
| Lower limit of agreement | −43.7 | −52.1 | −35.4 |
| Upper limit of agreement | 121.9 | 113.6 | 130.2 |

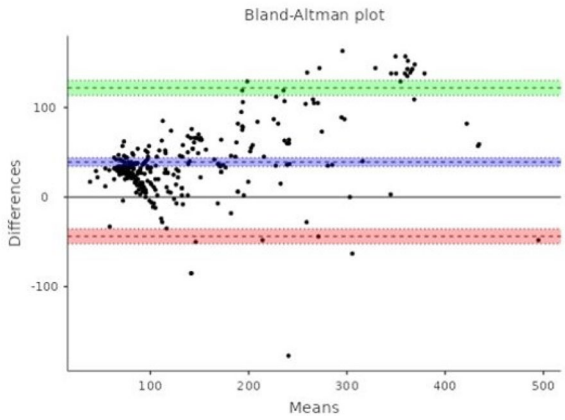


**Fig. 1 (abstract 001090)** Evaluation of the concordance between S/F and P/F

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001092

### Causal mediation analysis shows no evidence of EBV reactivation being responsible for the association between an immunosuppressed sepsis endotype and adverse outcomes

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**Introduction:** Protracted sepsis can result in the development of functional immunosuppression in previously immunocompetent individuals. Systemic immunosuppression results in failure to eradicate the primary infection and a susceptibility to acquiring lethal secondary opportunistic infections (1). Epstein–Barr virus (EBV) has been shown to be the most commonly reactivated virus amongst patients with septic shock (2, 3). EBV reactivation is associated with increased patient morbidity and mortality as well as with the previously described Sepsis Response Signature (SRS) 1 endotype, which is characterised by an immunosuppressed immune profile (4). The SRS endotypes have recently been translated to a quantitative scale (SRSq score) which is reflective of the extent of immune dysfunction for an individual patient (5). A higher SRSq score corresponds to the SRS1 endotype.
**Objectives:** In this study, we aimed to examine whether EBV reactivation causally mediates the association between a high SRSq (parameter to assess immune dysregulation) and outcome. Outcomes were defined as 28-day mortality, ICU length of stay (LOS), and Day 5 SOFA score.
**Methods:** Data from RNA-sequencing of peripheral blood leukocytes, and digital droplet PCR (ddPCR) of plasma to quantify EBV reactivation, were analysed for patients admitted to ICU and recruited to the UK Genomic Advances in Sepsis (GAinS) study (5,6). The quantitative readout obtained from ddPCR was used in the causal mediation models. SRSq score was available for each patient, previously calculated using the *SepstratifieR* package available in R (5). Causal mediation analysis was undertaken using the *mediation* package in R.
**Results:** 619 patients were previously assessed for EBV reactivation with ddPCR. 399 unique patients had RNA-seq data and of these 137 patients had EBV reactivation. EBV reactivation was significantly associated with SRSq (p-value 0.002) and 28d mortality (p-value 0.02). We did not find evidence that EBV reactivation causally mediates the association between high SRSq and any of the outcomes tested (Fig. 1).
**Conclusions:** EBV reactivation on the background of an immunosuppressed endotype does not mediate any of the adverse outcomes investigated, raising the hypothesis that EBV may be a bystander rather than the causal agent of patient morbidity and mortality. However, the absence of a significant causal mediation effect due to EBV may result from the effect of EBV reactivation being small and therefore this study being inadequately powered, or the effect of EBV reactivation being large but only in a subset of patients, thus the effect being diluted within this potentially heterogeneous cohort. Future work should focus on the mechanisms by which EBV reactivation

affects the host to determine whether it is a harmful or bystander pathogen.

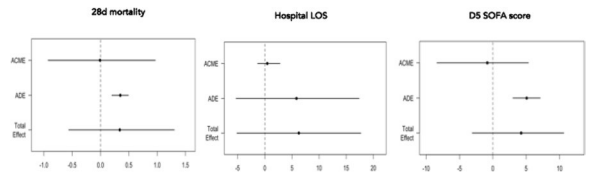


**Fig. 1 (abstract 001092)** EBV reactivation on the background of an immunosuppressed endotype does not mediate any of the adverse outcomes investigated here

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7. Wellcome Trust Clinical PhD

**Topic:** Sepsis.

## 001093

### Cardiac output estimation by pulmonary artery pulse waveform analysis in intensive care unit

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001093

**Introduction:** A new method to evaluate cardiac output (CO) with a pulmonary artery catheter (PAC) has been proposed. Using a traditional PAC, the software in the HemoSphere monitor (Edwards Lifescience, Irvine, USA) allows a quasi-continuous cardiac output (FastCCO) monitoring, based on the analysis of the pulmonary artery pulse waveform. A new method to evaluate cardiac output (CO) with a pulmonary artery catheter (PAC) has been proposed. Using a traditional PAC, the software in the HemoSphere monitor (Edwards Lifescience, Irvine, USA) allows a quasi-continuous cardiac output (FastCCO) monitoring, based on the analysis of the pulmonary artery pulse waveform.
**Objectives:** We investigated whether FastCCO reliably measures absolute values of CO and tracks its changes, compared to intermittent cardiac output (iCO) obtained with pulmonary thermodilution.
**Methods:** In sub-analysis of a prospective observational study (NCT05524558), patients with acute respiratory distress syndrome were monitored with a PAC. Measurements of iCO were done at high positive end-expiratory pressure (PEEP) (T1), after a passive leg raising (PLR) at high PEEP (T2), at low PEEP (T3) and after a PLR at low PEEP (T4). At each timepoint, values of FastCCO were collected immediately before thermodilution which measured iCO. Absolute values of CO were compared by a Bland and Altman analysis for multiple measurements per subject. Correlations between changes in CO were assessed by the Spearman coefficient and trend analysis were performed.
**Results:** Considering absolute values of CO ($n=113$) obtained in 14 patients, the bias (lower to upper limits of agreement) between iCO and FastCCO were 0.20 (−2.20 to 2.60) L/min and the percentage error was 37%. Considering all changes of CO between different timepoints (T1 vs. T2, T1 vs. T3 and T3 vs. T4; $n=86$), the coefficient of correlation between iCO and FastCCO was $r=0.35$ ($p=0.001$). Considering only changes of iCO > 12% ($n=14$), the coefficient of correlation between iCO and FastCCO was $r=0.54$ ($p=0.049$) and the concordance rate between the changes in FastCCO and in iCO was 86% ($p=0.0485$).
**Conclusions:** Compared to iCO, the FastCCO did not reliably estimate the absolute values of CO. However, it may track trends of CO changes induced by PLR or PEEP. More data are needed to determine whether FastCCO can be used to reliably track transient changes in CO to detect preload responsiveness and to individualize fluid therapy. The study is ongoing.

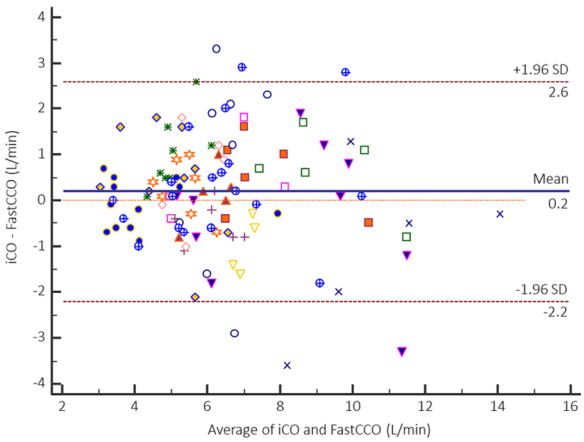


**Fig. (abstract 001147)** Bland–Altman plot for the absolute values of cardiac output obtained by pulmonary thermodilution (iCO) and by pulmonary artery pulse waveform analysis (FastCCO), considering all pairs of measurements ($n=113$)

**Topic:** Cardiovascular issues in ICU

## 001094

### Antibiotic utilization patterns in a Tunisian tertiary hospital's intensive care unit: a one-year retrospective analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001094

**Introduction:** Low–middle-income countries are at high risk of the morbi-mortality caused by the worldwide problem of antibacterial resistance. The poor infrastructure of healthcare systems, the absence of infection prevention societies and antimicrobial stewardship programs, and the paucity of documented reports about antibiotic use

within hospitals and intensive care units (ICUs) contribute to the persistence and even worsening of the threat.
**Objectives:** To report the utilization trends of antibiotics in a Tunisian medical ICU.
**Methods:** A retrospective study conducted over the course of 1 year, from January 1st 2023 to December 31st 2023. All consecutive patients admitted to the medical ICU were included and had their medical charts and records reviewed. Extracted data included demographics, diagnoses on admission, indications, daily-defined doses (DDD), durations of antibiotics, prescribed and results from bacterial culture samples, antibiotic susceptibility testing, occurrence of healthcare-associated infections, length of stay and mortality.
**Results:** 368 patients were admitted to the ICU. Median age, 61 [41–71] years; Charlson Comorbidity Index, 3 [1–4]; and main diagnoses on admission were pneumonia, 164 (44.6%), and shock, 46 (12.5%). Invasive mechanical ventilation (IMV), 120 (32.6%) patients; IMV duration, 8.2 ± 8.9 days; length Of ICU stay, 8.74 ± 9.2 days (LOS deaths, 11.4 ± 14.3; LOS survivals, 8.1 ± 7.3; LOS IMV, 12.3 ± 11.2). Overall mortality, 20.1% and 28.7% for those having received antibiotics. 129 (35.1%) patients had received antibiotics within 3 days before ICU admission of which 42 (32.6%) were stopped on admission. Throughout their ICU stay, 195 (53%) patients had received antibiotics. Most commonly used antibiotics with their respective DDDs per 100 patient-days were third-generation cephalosporins (78 (40%), 17.1), amoxi-clav (70 (35.8), 12.2), fluoroquinolones (70 (35.8%), 11.7), imipenem/cilastatin (66 (33.8%), 20.4), vancomycin (36 (18.5%), 7.7) and colistin (36 (18.5%), 10.3). Total DDDs within the ICU over the one-year study period were at 93.6.
In patients having received antibiotics, 186 (95.4%) had at least one microbiological test prescribed. The positivity ratio of blood samples was 51/413 (12.3%); tracheal aspirates, 81/219 (37%) and urinary cultures, 28/169 (16.6%). Total isolated pathogens was 155, mainly: *Klebsiella pneumonia* (42 (27.1%), 21 (50%) carbapenem-resistant); *Pseudomonas aeruginosa* (33 (21.2%), 24 (72.7%) only colistin-susceptible); and *Acinetobacter baumannii* (28 (18.1%), 28 (100%) imipenem-resistant only colistin-susceptible). Healthcare-associated infections were documented in 55 (14.9%) patients; VAP, 38 (10.3%) and CLAPSI, 17 (4.6%). Mean antibiotic duration was 7.3 ± 6.7 days with a maximum of 62 days.
**Conclusions:** This study highlights the significant utilization of broad-spectrum antibiotics in a Tunisian ICU. This contrasted with limited microbiological results and high rates of MDR bacteria.

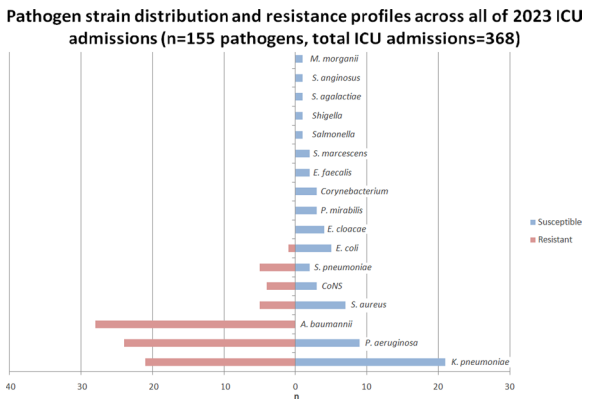


**Fig. (abstract 001147)** Pathogen strain distribution and resistance profiles amongst all 155 pathogens isolated over the 368 admission of the year 2023

**Topic:** Infections and prevention

## 001095

### The impact of preoperative crystalloid administration on non-invasive cardiac output measurements in patients undergoing general anaesthesia for non-cardiac surgery—preliminary results of a secondary aim analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001095

**Introduction:** Perioperative haemodynamic management is critical to patient care, especially during major non-cardiac surgery. Cardiac output (CO) is a haemodynamic parameter that reflects the volume of blood pumped by the heart per unit of time. Monitoring CO provides physicians with valuable information for fluid management and optimising oxygen supply to vital organs.
Non-invasive methods for measuring CO are viable alternatives to invasive monitoring methods such as pulse contour analysis. These techniques are associated with fewer complications, making them suitable for routine use in non-cardiac surgery. It might also be used to assess the effect of a preoperative fluid bolus on post-induction blood pressure.
**Objectives:** This preliminary secondary aim analysis of a randomised controlled interventional study entitled "Effect of Pre-operative Intravenous Crystalloids on Post-Induction Blood Pressure" (ClinicalTrials.govNCT05079269) aims to investigate the effects of preoperative administration of crystalloid fluid on CO during the first 20 min after induction of anaesthesia or until the surgical incision, whichever occurred first.
**Methods:** In the main study, patients were randomly assigned to receive a weight-adjusted balanced, isotonic crystalloid solution before induction of anaesthesia (intervention group) or to standard of care (SOC group). The study was performed at the Medical University Hospitals in Graz and Vienna, Austria. This analysis compares the non-invasive CO measurements between the two groups. CO was measured using the CNAP-Monitor (CNSystems, Graz, Austria). Data from the electronic medical records of patients enrolled in this prospective trial were collected. Patients were categorised based on preoperative crystalloid administration. Demographics, comorbidities, intraoperative fluid management, and haemodynamic variables of available data were analysed. Descriptive statistics summarised the data, comparing groups using the Mann–Whitney *U* and Student's *T* tests.
**Results:**

**Table 1 (abstract 001095)** Demographics and results

| | Fluid ($n = 36$) | SOC ($n = 36$) | *p* value |
|---|---|---|---|
| Age, mean (SD) | 70 (14.73) | 72 (7.53) | 0.352 |
| Male, n (%) | 26 (72.2) | 29 (80.5) | – |
| Height [cm], mean (SD) | 171.972 (8.31) | 173.306 (8.75) | 0.510 |
| Weight [kg], mean (SD) | 82.111 (13.89) | 83.889 (13.28) | 0.581 |
| Intervention fluid received preoperatively (ml), mean (SD) | 573.611 (216.95) | – | – |
| Total volume received intraop [ml], median [IQR] | 1416 [1151.25;2674.75] | 2246 [1318.50;3323.25] | 0.114 |

| | Fluid ($n=36$) | SOC ($n=36$) | *p* value |
|---|---|---|---|
| Total norepinephrine [mg], median [IQR] | 0.135 [0.12;0.48] | 0.343 [0.15;0.94] | 0.071 |
| Total phenylephrine [mg], median [IQR] | 0.200 [0.20;0.38] | 0.400 [0.20;0.85] | 0.452 |
| Total ephedrine [mg], median [IQR] | 25 [13.75;32.50] | 22.5 [10.00;35.00] | 0.926 |

For a total of 72, each group included 36 patients. The preliminary results show no statistically significant difference between mean CO between the groups (5.01;4.98, $p=0.83$). The majority of participants in both groups were male. On average, patients in the intervention group required less norepinephrine and phenylephrine (see Table).

**Conclusions:** Although our study did not provide statistically significant results, these preliminary data revealed a trend towards increased CO in patients who received the intervention. In addition, it showed that patients in the intervention group had a lower average requirement for intraoperative fluids and vasopressors compared to those who received standard care. In conclusion, our results suggest that the intervention has the potential to improve cardiac performance and reduce the need for vasopressors in patients undergoing non-cardiac surgery. However, the main study is not powered for this secondary analysis. Potential non-significant results should be evaluated with a larger sample size to validate these observations.

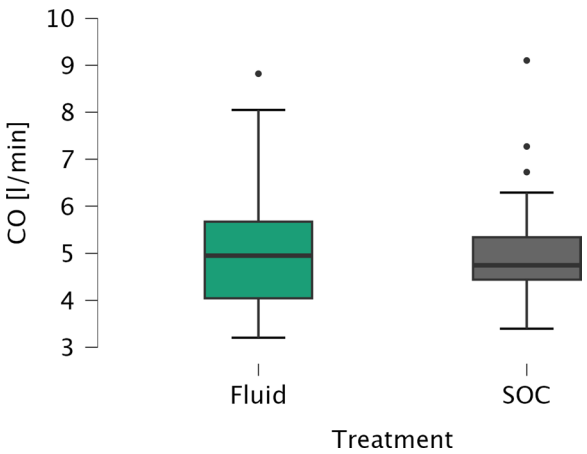


**Fig. (abstract 001095)** .
Mean cardiac output measurements within the first 20 min post-induction comparing the intervention group who received a weight-adjusted crystalloid bolus before induction of anaesthesia with standard of care.

**References**

1. This study is funded by the Austrian Science Fund (FWF KLIF 58429).

**Topic:** Perioperative care

## 001097

### Intravascular versus surface cooling in out-of-hospital cardiac arrest patients receiving hypothermia after hospital arrival—a post hoc analysis of the TTM2 trial

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**001097

**Introduction:** Whether different cooling methods and their precision on target temperature influence cardiac arrest outcomes are unclear. In this study, we primarily aimed to study the performance of targeted temperature management (TTM) at 33 °C in patients treated with intravascular- versus surface-cooling devices after out-of-hospital cardiac arrest (OHCA).

**Methods:** This is a post hoc analysis of the TTM2 trial (NCT02908308), in which TTM at 33 °C initiated after hospital arrival was compared with normothermia. Patients randomized to TTM at 33 °C who underwent cooling with a device were eligible in this study. The main outcome was high-quality cooling performance during TTM, defined as the proportion of patients reaching target temperature < 33.5 °C within 4 h from initiation of cooling, the time outside temperature ranges during maintenance, rewarming rate and post-TTM fever (i.e. one episode of core temperature > 38 °C). As exploratory outcomes, survival with good neurological status, defined as modified Rankin Scale (mRS) scores of 0–3, at 6 months was analyzed using propensity score matching.

**Results:** Among 930 patients randomized to TTM at 33 °C, 876 (mean age 64 years, 80% men) underwent hypothermia with a cooling device and were included in this study. Of those, 266 patients (30%) were treated by intravascular devices and 610 (70%) by surface-cooling devices. The proportion of patients reaching target temperature within 4 h was higher with intravascular cooling (66.5% vs. 49.6%; $p<0.001$) (Figure 1). In addition, temperature outside ranges during the cooling period and post-TTM fever were lower (9.7% vs. 43.4%; $p<0.001$ and 8.7% vs. 21.5%; $p<0.001$, respectively) in the intravascular devices group than the other (Figure 2). In the explorative propensity score matching analysis, 133 of 252 (52.8%) patients in the intravascular cooling group and 109 of 252 (43.3%) patients in the surface-cooling group were alive at 6 months with mRS scores of 0–3 (conditional OR 1.56, 95% CI 1.06–2.29; $p=0.02$).

**Conclusions:** Among patient randomized to TTM to 33 °C after OHCA in the TTM2 study, intravascular cooling, compared with surface cooling, was associated with more rapid cooling, less temperature variability and less post-TTM fever.

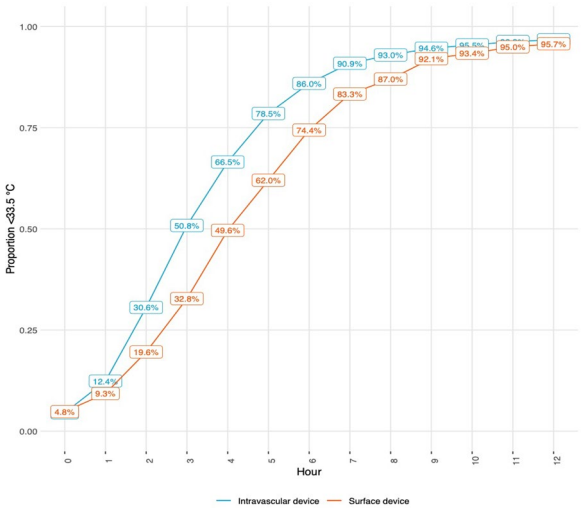


**Fig. 1 (abstract 001097)** Proportion of patients reaching targeted temperature within 12 h in the intravascular versus the surface-device group

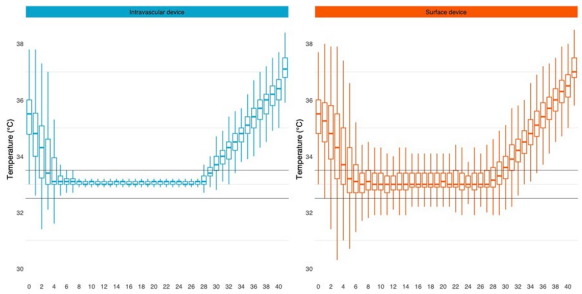


**Fig. 2 (abstract 001097)** Hours from randomization on x-axis. Median and interquartile temperatures in intravascular (blue) and surface (red) cooling groups during the intervention period


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**Topic:** Cardiac arrest

## 001100

### Exploring crucial time factors and pre-hospital chain performance in eCPR/uDCCD Program in a large urban scenario: a prospective analysis


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001100


**Introduction:** Every day, around 1000 individuals across Europe experience an out-of-hospital cardiac arrest (OHCA). Mortality rate exceeds 90% (1,2). Extracorporeal cardiopulmonary resuscitation (eCPR) is a time-sensitive salvage procedure for selected refractory cardiac arrest (rCA) (3). To improve both access to eCPR and survival with good neurological outcomes, description and characterization of causes for delay between OHCA and hospital arrival are crucial.
**Objectives:** To identify and characterize all chain-of-survival timepoints between the occurrence of OHCA and effective VA-ECMO implementation.
**Methods:** A prospective observational study was conducted on selected patients with OHCA and rCA in the urban area of Lisbon between September 2023 and March 2024 at an ECMO referral centre. Eligible patients were all those with age > 18-years and OHCA with a rCA. Patients were treated according to a prespecified institutional eCPR/uDCCD combined program (4). Figure 1 shows identified rate-limiting steps. Primary objective was to characterize specific time points between OHCA and ECMO retrieval, namely no-flow, low-flow, extraction time, transport to hospital time and cannulation time. Secondary objective was to correlate those variables with survival at 24 h, ICU and hospital discharge.
**Results:** During the study period, 29 patients were referred to our eCPR/uDCCD program. Mean age was 52 ± 11.3; eight patients were included in the eCPR branch (27.6%), 11 were included in the organ donation branch (37.9%). Six patients had return of spontaneous circulation (20.7%) and 4 were excluded. Considering the 8 eCPR patients, 4 survived at 24 h and 2 were discharged from hospital. All but 3 patients with rCA were promptly identified (89.7%). No-flow 1 had a median time of 8 min (IQR 0–11.5), and no-flow 2 was 8 min (IQR 0–14) (see Figure 1). Time to advanced life support was 11 min (IQR 10–16) and time to first contact with ICU was 17 min (IQR 11–23). Victim extraction time was 10 min (IQR 25–19) and total scene delay 31.5 min (IQR 4–19). Transit time to hospital was 17 min (IQR 10–25). Globally, mean total low-flow time was 80 min (IQR 62.5–104); in patients submitted to eCPR, low-flow time was 79.5 min (IQR 56–107.25). Time from CA to hospital was 60 min (IQR 50–71). Total time since CA to cannulation in eCPR was 83.5 min (IQR 56–107.25). A significant statistical correlation was seen between survival at 24 h and extraction time ($p = 0.045$), which did not hold when adjusted to only eCPR group.
**Conclusions:** Reducing total scene duration is crucial to optimize pre-hospital chain efficiency, improve eCPR accessibility and, thereby, enhance survival rates. This emphasizes the need for rapid decision-making, prioritizing an early ICU contact by the emergency medical teams and a prompt patient extraction by the pre-hospital teams.

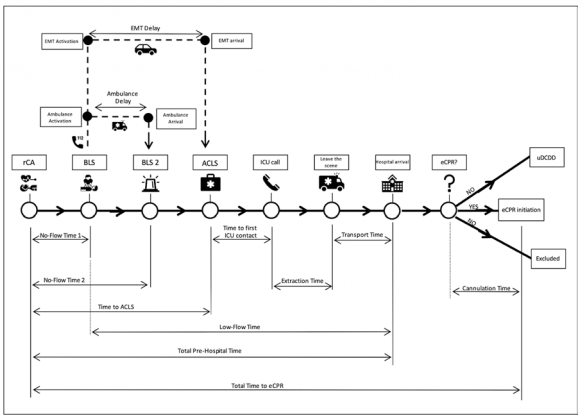


**Fig. 1 (abstract 001100)** eCPR/uDCCD program rate-limiting steps


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5. None disclosed


**Topic:** Cardiac arrest

## 001101

### Prognostic value of shock index combined with procalcitonin in sepsis in the emergency department


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001101

**Introduction:** Sepsis is a common reason for hospitalization in emergency departments. The initial assessment of severity is essential. The aim of our study was to evaluate the prognostic value of the shock index combined with procalcitonin (PCT) for assessing the prognosis of patients hospitalized in the emergency department for sepsis.
**Methods:** This is a prospective observational study conducted over a 6-month period between June and December 2023. Adult patients hospitalized in the emergency department for sepsis were included. The diagnosis of sepsis was based on a suspected or presumed infection associated with a SOFA score $\geq 2$. PCT measurement was performed upon admission. The primary outcome was in-hospital mortality.
**Results:** We included 159 patients. The mean age was $66 \pm 31$ years. The main comorbidities were (%): diabetes (46), hypertension (23.8), and stroke (14%). The most frequent reasons for consultation were (%): asthenia (60) and fever (51). The rate of shock occurrence was 3.1%. In-hospital mortality in our series was 35%. The median shock index was $0.80 \pm 0.32$. A shock index value > 0.9 was not statistically associated with higher mortality ($p = 0.09$). ROC curve analysis of PCT for mortality showed an AUC of 0.720, with a threshold of 0.25 associated with higher mortality in univariate analysis ($p = 0.024$). The shock index combined with a PCT > 0.25 ng/L was statistically associated in univariate and multivariate analyses with higher mortality ($p = 0.001$, OR = 3.49; 95% CI [1.6; 7.5]).
**Conclusions:** The shock index combined with a PCT > 0.25 ng/L is an independent marker associated with in-hospital mortality in patients admitted to the emergency department for sepsis.

**Topic:** Sepsis

### 001102

### Increased pulmonal uptake of [$^{68}$Ga]FAPI PET/CT in patients with post-COVID dyspnea and fatigue after ICU discharge

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**Introduction:** Long COVID has emerged as a major healthcare problem. Although many pathophysiological pathways have been proposed, a comprehensive mechanism of disease remains to be elucidated. Supposed pathophysiology includes persistent low-grade inflammation and microthrombosis, leading to fibroblast activation and ongoing tissue remodeling. Molecular imaging with [$^{68}$Ga]FAPI (which binds to fibroblast activation protein (FAP)) PET allows for whole-body assessment of in vivo fibroblast activation.
**Objectives:** To explore lung FAP activity in former critical COVID-19 patients with persistent dyspnea complaints.
**Methods:** A prospective observational study (NCT05981885) was conducted in patients with self-reported complaints of dyspnea more than 3 months after hospital discharge for confirmed SARS-CoV-2 infection requiring mechanical ventilation or high-flow nasal oxygen therapy. Each subject underwent a [$^{68}$Ga]FAPI PET/CT, HRCT and lung function test. [$^{68}$Ga]FAPI uptake was quantified as the standardized uptake value corrected for lean body mass (SUL). To compare the diffuse (homogeneous, non-focal) lung uptake between the long COVID group and controls, all specific [$^{68}$Ga]FAPI uptake areas were extracted by segmenting the < 50% isocontour of the SUVmax of the lung. Blood pool activity of the vena cava inferior was used for background correction. Muscle uptake was measured in the paravertebral muscles. HRCT was analyzed visually for the presence of ground glass opacities. Fifteen age- and sex-matched subjects without pulmonary pathology, recruited from two centers using similar settings, scanned for oncological reasons, were used as controls.
An independent samples T-test was used for group comparison. The correlation between clinical markers and [$^{68}$Ga]FAPI was explored using Pearson's or Spearman's test.
**Results:** Eighteen long COVID patients were included: 10 males (56%), mean age 60.6 years ($\pm$SD 8.3), BMI of 35.8 kg/m$^2$ (mean $\pm$ SD 8.6), DLCO of 77.3% ($\pm$SD 21.5) and FVC of 85.6% ($\pm$SD 16.5) predicted. Scans were performed at a median of 30 months (IQR 7.5–34.3) after discharge.
Increased uptake of [$^{68}$Ga]FAPI was observed in the lungs of long COVID patients, SULmean $1.2 \pm$SD 0.4 compared to SULmean $0.7 \pm$SD 0.3 ($p = < 0.001$) in controls (Figure 1A). After background adjustment, this difference increased for the whole lung and diffuse uptake (Figure 1B and C). The predicted DCLO and FVC showed moderate correlation with the lung SUL ($r = -0.5$, $p = 0.04$ and $r = -0.5$, $p = 0.035$, respectively) whereas the presence of ground glass opacities ($p = 0.07$), time after discharge ($p = 0.11$) and BMI ($p = 0.60$) did not correlate. Mean paravertebral muscle [$^{68}$Ga]FAPI uptake did not differ between long COVID patients and controls ($p = 0.12$).
**Conclusions:** Patients with long-term complaints of dyspnea after hospitalization for severe acute COVID showed increased pulmonary FAP expression, suggesting persistent fibroblast activity.

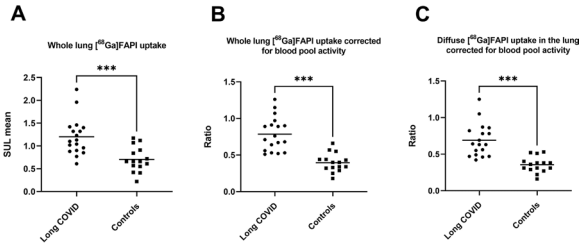


**Fig. 1 (abstract 001102)** A. Average [68Ga]FAPI uptake of the whole lung expressed as the mean standardized uptake value using lean body mass (SULmean). B. Average [68Ga]FAPI uptake of the whole lung corrected for blood pool activity of the vena cava inferior. C. Diffuse [68Ga]FAPI uptake in the lung corrected for blood pool activity of the vena cava inferior

**Topic:** Imaging in intensive care

### 001103

### Acinetobacter-associated ventilator-associated pneumonia (VAP) and central line-associated bloodstream infections (CLABSI) in patients requiring invasive mechanical ventilation (IMV)

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001103

**Introduction:***Acinetobacter baumannii* infections pose a significant clinical challenge in critically ill patients undergoing IMV, leading to considerable morbidity, mortality, and healthcare burden. Understanding the epidemiology and risk factors is essential for guiding infection prevention and improving patient outcomes.
**Objectives:** To determine the frequency, risk factors, and outcomes of *Acinetobacter baumannii*-associated VAP and CLABSI in mechanically ventilated patients.
**Methods:** This was a retrospective study of patients hospitalized from January 2023 to December 2023, in a medical intensive care unit who required IMV for more than 48 h. VAP and CLABSI were identified using a combination of clinical and laboratory criteria. Univariate analysis and multivariable logistic regression were used to analyze the associated factors with *Acinetobacter baumannii*-associated VAP and CLABSI.
**Results:** 340 patients were admitted to the ICU, and 114 (33.5%) required IMV and met the inclusion criteria. Patients' characteristics were: median age, 58 [41–69] years; median SAPSII on admission, 33 [22–44]; median SOFA score, 4 [2–8]; median IMV duration, 4 [2–9]; central-venous-catheter (CVC), 78 (68.4%); CVC duration, 5 [2–7]. Median length-of-stay was at 8 [4–16] days. The overall mortality rate was 48.2%.
Overall, 21 (18.4%) patients developed VAP with density incidence rate estimated at 14 VAP/1000 ventilator days, and 10 (8.8%) patients developed CLABSI with density incidence rate estimated at 9 VAP/1000 catheter days. 31 pathogens were isolated. The most frequently isolated pathogen was *Acinetobacter baumannii*, 13 (42%), followed by *Klebsiella pneumoniae*, 10 (32.2%) and *Pseudomonas aeruginosa*, 5 (16.1%).
Univariate analysis showed that acute respiratory failure on admission (84% vs 59%, $p=0.035$), tobacco use (84% vs 42%, $p=0.019$), septic shock (100% vs 68%, $p=0.030$), tracheostomy (46% vs 9.6%, $p=0.020$), IMV duration (12 [10–18] vs 4 [2–9], $p=0.000$) and length-of-stay (24 [18–28] vs 8 [4–16], $p=0.000$) were associated with *Acinetobacter baumannii* infection. Multivariate analysis found that length-of-stay (RR, 2; 95% CI [1.6–3]; $p=0.010$) and IMV duration (RR, 2.7; 95% CI [1.5–5.6]; $p=0.000$) were risk factors independently associated with *Acinetobacter baumannii* infection.
**Conclusions:***Acinetobacter baumannii*-associated VAP and CLABSI were frequent in the ICU and they had adverse outcomes, including prolonged mechanical ventilation and length of stay and higher septic shock incidence. These findings highlight the need for effective preventive strategies and targeted management approaches.

**Topic:** Infections and prevention

## 001104

### Effect of pre-operative intravenous crystalloids on post-induction blood pressure—methods abstract

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001104

**Introduction:** Intraoperative hypotension is associated with postoperative outcomes and complications (1). Post-induction hypotension is very common due to anaesthetics and preoperative hypovolemia. Interestingly, the effect of preoperative fluid administration on post-induction hypotension remains unknown. Therefore, we conduct a randomized intervention cohort study evaluating the effect of a pre-operative fluid bolus administration on post-induction hypotension as compared to the clinical standard of care.
**Methods:** This multi-centre study will be performed at the Medical University of Graz and the Medical University of Vienna, Austria. The intervention group will receive a balanced crystalloid solution bolus of 500 (< 90 kg) to 1000 mL (> 90 kg BW) within 60 (± 15) min before induction of anaesthesia. The control group will be treated according to the current clinical standard of care. We planned to enroll 550 patients. Our primary aim is to compare the effect of intravenous pre-operative crystalloid administration before induction with the standard of care on post-induction hypotension. As secondary aims, we will evaluate the incidence and amount of vasopressor use during the post-induction period between both groups. We will also evaluate the effect on cardiac output between both the groups. The study is registered at ClinicalTrials.gov with the identifier NCT05079269.
**Results:** Post-induction hypotension mainly depends on age, pre-existing arterial hypertension, and diabetes mellitus (2). One simple but potential intervention to attenuate blood pressure drops might be the administration of a pre-operative fluid bolus. Since there is no consensus on the use of pre-operative fluid treatment to prevent post-induction hypotension, we conducted this adequately powered study to answer this question.
**Conclusions:** This appropriately powered study will answer the question of the utility of a pre-operative fluid bolus administration, which might improve perioperative outcomes through a simple intervention.

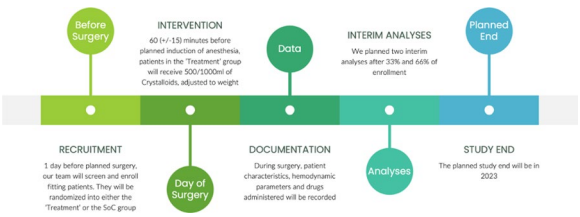


**Fig. (abstract 001104)** .
Timeline of the study design starting before surgery until the planned study end to visualise the methodology.

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3. This study is funded by the Austrian Science Fund (FWF KLIF 58429).

**Topic:** Perioperative care

## 001105

### Acute respiratory failure and cardiovascular disease in intensive care unit patients: a retrospective single unit study

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**Introduction:** Acute respiratory failure is a common reason of admission in the intensive care unit (ICU) and is often presented in patients with medical history of cardiovascular disease. The presence of both entities can impair the outcome of critically ill patients as they increase their frailty.

**Objectives:** The aim of this study is to determine whether the presence of cardiovascular disease in patients with acute respiratory failure has an impact concerning the extubation and the role of tracheostomy in the dismission from the ICU.
**Methods:** A total of 30 patients who were admitted in the ICU following an acute respiratory failure were included in the study and retrospectively studied. All the patients included in the study presented acute respiratory failure as cause of admission. The presence of cardiovascular disease (included atrial fibrillation), the outcome of tracheostomy in terms of dismission from the ICU, the number of patients who underwent extubation and also the number of reintubated patients, the number of ventilation-free days and of vasopressor-free days, and the length of stay (LOS) were retrospectively recorded and statistically analyzed.
**Results:** The mean age of the patients in the study was 74.6 years (range 51 to 97), with a mean APACHE II score of 35.3 ± 8, a mean SOFA score of 13 ± 2 and mean LOS of 18.69 ± 7.5. Of the 28% of the patients who were extubated, half presented only acute respiratory failure and 1 had also a medical history of cardiovascular disease. None of the patients who were reintubated had cardiovascular disease. 56.2% of the patients underwent tracheostomy, and 66% had cardiovascular disease. In the tracheostomy group, the average survival was 77.7%, with a mean LOS of 25.7 ± 10. The patients with acute respiratory failure and cardiovascular disease who underwent tracheostomy had a survival rate of 91% and were dismissed from the ICU on average after 17.5 ± 4 days. From the patients with cardiovascular disease, 30% had a Po2/FiO2 < 100, 38% had a Po2/FiO2: 100–200 and 32% had a Po2/FiO2 > 200.
**Conclusions:** Acute respiratory failure when combined with cardiovascular disease has a negative impact in the prospective of extubation. This study resulted that tracheostomy leads to a positive outcome and a dismission from the ICU. The sample of patients was of limited number and more studies are needed to validate the results of this study.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001106

### Needs and priorities regarding digital follow-up service among critical care survivors: four international focus group interviews

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**Introduction:** The challenges experienced after discharge from an intensive care unit (ICU) require adequate support [1]. Digital services might offer opportunities for delivering remote personalized follow-up service after discharge from the intensive care unit (ICU) [2]. However, little is known about critical care survivors' needs and priorities in digital ICU follow-up support, particularly in an international context.
**Objectives:** To describe the needs and priorities in e-health follow-up service among critical care survivors in four European countries, in specific: Germany (DE), Croatia (HR), the Netherlands (NL), and the United Kingdom (UK).
**Methods:** A qualitative design with focus group interviews has been conducted with critical care survivors recruited from two hospitals (HR, NL) and two patient self-help groups (DE, UK). Inclusion criteria comprised ICU-stay exceeding 48 h, age 18 years or older, proficiency in the respective local language for effective communication and comprehension of study information, and general stability in physical, mental, and cognitive aspects. An a-priory developed interview guide has been composed, pre-tested, and used in local language. Thematic analysis was used to analyze the data.
**Results:** Four focus groups included 22 participants of which half being women ($n = 11$). Their ICU admission varied from 6 days to 9 weeks. We identified three main themes: quality of life post ICU; adequate information in the post ICU period, and the role of technology and suggested e-health functionalities. Each main theme is divided in several subthemes (Figure 1). Participants in all four countries reported significant decline in quality of life post-ICU, facing physical, psychological, social and informational difficulties. They identified informational needs including recognition of health-related symptoms, contact information of relevant healthcare professionals, and offering answers to frequently asked questions. The preferences for an e-health tool in ICU follow-up service included simple functionalities, such as large buttons and a voice-controlled password, and should offer space for communication and interaction. Sharing similar experiences via a chat option could turn into a major source of online community support.
**Conclusions:** The most suggested functionalities for e-health were in line with general needs in ICU follow-up service. Critical care survivors in four European countries (DE, HR, NL, and UK) identified a preference for a digital tool including a simple interface, multi-mode accessibility to facilitate their needs, informative material, and virtual space for communication with peers and healthcare professionals. Future research should investigate the differences among international healthcare systems and assess technological readiness and infrastructure in each country to support the implementation of an e-health follow-up service.

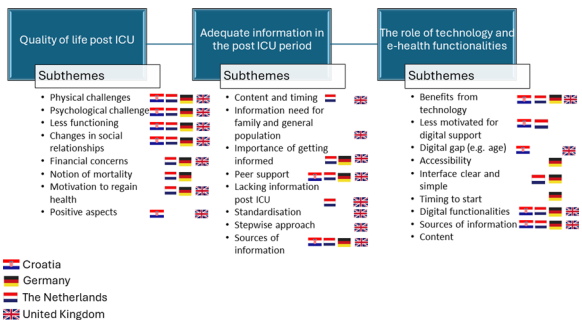


**Fig. 1 (abstract 001106)** Main themes and subthemes identified in four European countries

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3. This work is funded by the European Society of Intensive Care Medicine (ESICM) with the Multidisciplinary Care Award.

**Topic:** Health Services Research and Outcome

## 001108

### Antidotes in toxicology: current uses and practices

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 001108

**Introduction:** In the management of acute intoxications, the use of antidotes is crucial. It acts through various mechanisms to counteract the harmful effects of toxins, highlighting the need for constant reevaluation of their use in clinical practice.
**Objectives:** To describe the epidemiological profile of antidotes used and their clinical impact in the management of acute intoxications.
**Methods:** This was a retrospective, observational study conducted over a 3-month period, from January to March 2023. Patients included were those admitted to the toxicological intensive care unit with a diagnosis of intoxication confirmed by positive toxicological screening. The primary outcome was the use of an antidote.
**Results:** We included 119 patients, with a mean age of $30 \pm 16$ years. The sex ratio was 0.52. The main comorbidities were hypertension (5.9%), diabetes (5.9%), and neurological disorders (11.8%). Fifty-seven patients had psychiatric history (47.9%). All patients were admitted for acute intoxication, with 97 (81.5%) related to drug intoxication. Benzodiazepines were the most commonly reported toxin in our patients, with 20 cases (16.8%). Antidotes were used in 34 cases, accounting for 28.6%. The most commonly used antidote was naloxone, used in 11 opioid intoxications. On admission, there was no statistically significant difference in Glasgow Coma Scale (GCS) scores, but in subsequent assessments, there was a significant difference (GCS of 14.5 vs. GCS of 8.5, $p = 0.048$). Multivariate analysis showed that the use of an antidote was associated with less need for mechanical ventilation ($p = 0.001$, OR 2.67, CI [1.34; 5.38]), fewer cases of inhalation pneumonia ($p = 0.007$, OR 1.685, CI [0.953; 2.981]), and shorter ICU stays (mean stay of 3.8 days vs. 5.1 days, $p = 0.03$). There were no statistically significant differences in laboratory parameters. In addition, patient outcomes were similar, with a good outcome in most of cases.
**Conclusions:** In conclusion, our study highlights the importance of antidotes in the management of acute intoxications, with a significant impact on clinical outcomes. A better understanding of the use of antidotes could improve the management and prognosis of intoxicated patients.

**Table 1 (abstract 001108)** Frequency of antidotes use

| ANTIDOTES | N | % |
|---|---|---|
| Naloxone | 11 | 32.4 |
| Atropine | 8 | 23.5 |
| Flumazenil | 6 | 17.6 |
| N acetylcysteine | 9 | 26.5 |
| **Total** | **34** | **100.0** |

**Topic:** Poisoning/Toxicology/Pharmacology

## 001109

### Severe trauma in elderly patients: a real life picture!

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001009

**Introduction:** Trauma affects all ages. However, the elderly are a special population with multiple comorbidities and lower functional reserve that is growing in developed countries in which trauma incidence is increasing and consequently in the Intensive Care Unit (ICU).
**Objectives:** To characterize critically ill elderly trauma patients and evaluate the impact of the old age ($\geq 65$ y) in the outcome.
**Methods:** This a retrospective, single-center study of all trauma patients consecutively admitted to an ICU of a Tertiary University Hospital from 2019 to 2021. Population was divided in two groups: $< 65$ y and $\geq 65$ y patients (OP). OP were further divided in very old ($> 80$ y) (VOP) and 65–80 y patients. Besides demographic data, type of trauma, severity scores, type of organ support used, ICU length of stay (LOS) and ICU, hospital and 1-year mortalities were collected. SPSS was used for statistical analysis.
**Results:** Of the 458 patients included, 184 (40.2%) were $\geq 65$ y old (median 76 y) of which 69 (15%) were older than 80 y.
Although most of the trauma patients were male, female gender was more frequent in the OP group (41.85% vs 19.71%, $p < 0.001$). The prevalence of comorbidities was higher in the OP (95.1% vs 51.5%, $p < 0.001$) without differences between the VOP and the 65–80 y group (97.1% vs 93.9%, $p = 0.332$). Although median SAPS II score was significantly higher in OP (32.5 vs 22; $p < 0.001$) without differences between VOP and 65–80 y group (34 vs 31; $p = 0.38$), Injury Severity Score (ISS) was significantly lower in OP (10 vs 16; $p = 0.0013$). The prevalence of isolated traumatic brain injury (TBI) was higher in the OP group (36.1% vs 25.1%; $p = 0.008$) but polytrauma with (29.5% vs 42.4%, $p = 0.005$) or without TBI (14.8% vs 25.1%, $p = 0.008$) were significantly less frequent. There were no differences between VOP and 65–80 y group, except for monotrauma which was more prevalent in the VOP (27.9% vs 13.9%; $p = 0.02$). Except for need of invasive mechanical ventilation (IMV) (31.5% in OP vs 44.2% in $< 65$ y; $p = 0.007$), no differences were found between both groups regarding organ support and ICU LOS.
ICU mortality was higher in OP but the difference did not reach statistical significance (10.4% vs 5.5%, $p = 0.068$). Yet, hospital (16.8% vs 7.0%; $p < 0.001$) and 1-year mortality (32% vs 14%; $p < 0.001$) were significantly higher in the OP. Nonetheless, no difference in mortality at any time frame was observed between the VOP and 65–80 y. In logistic regression analysis, age $> 65$ y was an independent risk factor for hospital (OR 2.6; 95% CI 1.1–6.5; $p = 0.033$) and 1-year mortality (OR 2.5; 95% CI 1.02–6.26; $p = 0.046$).
**Conclusions:** Critically ill elderly trauma patients are usually men with comorbidities. On admission, they present higher SAPS II score but lower ISS scores and are less frequently submitted to IMV. Age $> 65$ y is an independent risk factor for hospital and 1-year mortality, but not for ICU mortality.

**Topic:** Trauma

## 001110

### Ventilator-associated pneumonia in patients admitted to the ICU for traumatic brain injury and subarachnoid hemorrhage: a study of risk factors and prognosis

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**Introduction:** Ventilator-associated pneumonia (VAP) is common in Intensive Care Unit (ICU) patients under mechanical ventilation over 48 h and can significantly increase ventilator days and ICU length of stay (LOS). Several risk factors have been studied, such as the male gender, several comorbidities, prior antibiotic therapy, corticosteroids and the type of sedation.
**Objectives:** The aim of this study is to examine the risk factors of developing VAP and how they affect outcome and LOS for ICU patients hospitalized for acute neurological reasons, such as traumatic brain injury (TBI) and hemorrhagic strokes.

**Methods:** A total of 20 ICU patients suffering from TBI or subarachnoid hemorrhage (SAH) with a GCS < 6 before intubation were retrospectively studied, and their demographics, comorbidities, clinical findings, whether they were tracheotomized or not, their medication, prognostic scores, total ICU days and outcome were recorded.
**Results:** The mean age of the patients was 74.1 y.o. (55–89) with 63.1% women. They had a mean of ventilator-free days (28 d) of 9.5 ± 8, with 8.5 mean SOFA score on admission and mean APACHE II score of 21. Mean LOS for all the patients was 16.7 ± 9.7 and a tracheotomy was performed on 57.9% of the patients. VAP was found in 36.3% of the patients during their ICU stay and were divided into two groups, those that had a tracheostomy and those that were intubated. In the tracheostomy group, 87% of the patients developed VAP, half of them before day 10 of hospitalization and had a mean LOS of 24.2 ± 8.7 days. In the non-tracheotomy group, 12.5% developed VAP, all after day 10 of hospitalization and had a mean LOS of 20 days. Smokers had a higher incidence of VAP (59% vs 22.7 non-smokers), while diabetes mellitus was found in 67% and thrombocytopenia in 55% of the patients who suffered from VAP. 63% of the patients in need of blood transfusion developed VAP.
**Conclusions:** VAP is more common in ICU patients with TBI and SAH who smoke, who have a tracheostomy and several comorbidities, mostly diabetes mellitus. It is positively correlated with thrombocytopenia and the number of transfusions during ICU stay as well as increases the days spent on mechanical ventilation and total ICU length of stay. The outcome of these patients does not seem to be affected by VAP, but from the main admission reason. More studies are needed for this subgroup of ICU patients, to identify the main risk factors and personalize their treatment within the ICU.

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**Topic:** Neurointensive care

## 001111

### Acute poisoning in elderly patients in the intensive care unit: epidemiology and prognosis

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**Introduction:** By 2030, people aged 60 or over are expected to represent nearly 18% of the Tunisian population. Acute poisoning in elderly patients is an emerging problem all over the world. Few studies were conducted describing acute poisoning in elderly patients.
**Objectives:** The objective of our study was to describe the epidemiological, clinic-biological, therapeutic and evolutionary features of poisoning in elderly patients.
**Methods:** It was a retrospective, descriptive, observational study of patients aged more than 65 years who required hospitalization in the medical intensive care unit at the Mahmoud Yaacoub Center for Medical Assistance and Emergencies for acute poisoning over a 16-year period from January 2007 to December 2022. Statistical analyses were performed using SPSS 20.0 software.
**Results:** Three hundred patients were included. The mean age was 71 ± 7 years with a gender ratio of 0.91. The most frequent comorbidities were: hypertension (43.3%) and diabetes (26.7%). Poisoning severity was moderate in 113 patients (38%) and severe in 98 (25%). Poisoning was deliberate self-harm in 50% of cases ($n = 150$), mainly due to drugs (65.3%), followed by organophosphates. The most common drugs were psychotropics and anti-hypertensive medications. Carbon monoxide (CO) was the main cause of accidental poisoning (59.5%). Chemical submission was found in 8 patients. Seventy-three patients (24.3%) developed coma following acute poisoning, requiring invasive ventilation. The most frequent laboratory abnormalities were: high white blood cell count (40.7%), followed by anemia (28%) and hypokalemia (24%). The mean length of stay was 3 ± 2 days. Thirteen patients died with a mortality rate of 4.3%. In multivariate analysis, the independent risk factors of mortality were evolutionary complications as rhythm disorders ($p = 0.007$), septic shock ($p = 0.001$), cardiogenic shock ($p = 0.001$) and dyskalemia ($p = 0.005$).
**Conclusions:** Poisoning in the elderly is becoming increasingly frequent, mostly voluntary, with a significant mortality rate.

**Topic:** Poisoning/Toxicology/Pharmacology

## 001112

### Acute heart failure in a Tunisian medical ICU: prognosis and risk factors

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001112

**Introduction:** Acute heart failure (AHF) is a growing critical care concern with high morbidity and mortality. Despite advancements, survival rates remain low, posing a significant healthcare burden. Accurate risk stratification is crucial for optimizing patient outcomes and resource allocation.
**Objectives:** To describe the characteristics of ICU admitted patients with AHF, and identify independent predictors of poor prognosis.
**Methods:** It is a retrospective study of admitted AHF patients in the medical ICU of Farhat Hached University Hospital between January 2011 and December 2023. Variables found to be statistically significant in univariate analysis were included in a multivariate regression model to identify factors independently associated with poor prognosis.
**Results:** One hundred and seventy-three patients were included with a median age of 70 [57–76.5] years. 101 (58.4%) were men. Hypertension 95 (54.9%), diabetes mellitus 82 (47.4%), and chronic obstructive pulmonary disease 31 (17.9%) were the most outstanding associated pathologies. SAPSII was 38 [27–50]. One hundred and twelve (64.7%) patients received vasopressors on admission. Acute coronary syndrome 88 (50.9%) was the most common cause of AHF. Median duration of ICU stay was 4 [2–8] days. The mortality rate was 53.2%.
Univariate analysis identified several factors associated to fatal outcome: physiological reserve [McCabe score ≥ 2 ($p = 0.000$), Knaus C or D ($p = 0.00$), WHO Performance status ≥ 3 ($p = 0.003$), NYHA ≥ 2 ($p = 0.004$)], severity on admission [severe acute respiratory failure ($p = 0.000$), vasopressors use ($p = 0.000$), SAPSII ($p = 0.00$), and

Glasgow coma scale ≤ 12 ($p = 0.034$)] and referral from cardiology ward ($p = 0.000$). A multivariate regression model identified the following factors as independently associated with mortality: OMS ≥ 3 (OR, 4.644; 95% CI [1.755–12.289]; $p = 0.002$), vasopressors use on admission (OR, 7.84; 95% CI , [2.64–23.32]; $p < 0.001$), SAPS II (OR, 1,05; 95% CI, [1.01–1.09]; $p = 0.005$) and referral from cardiology ward (OR, 9.01; 95% CI [2.053–39.55]; $p = 0.004$).

**Conclusions:** This study highlights the high mortality rate of AHF patients in the ICU. Physiological reserve (WHO performance status), admission severity (SAPS II and vasopressors use), and referral from a cardiology ward emerged as independent predictors of mortality.

**Topic:** Cardiovascular issues in ICU

## 001114

### Prognostic value of admission serum biomarkers and inflammation biomarkers for patients with acute kidney injury after cardiac arrest

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001114

**Introduction:** Acute kidney injury (AKI) in cardiac arrest patients has a high prevalence and is combined with an increased Intensive Care Unit (ICU) length of stay (LOS) and poorer outcomes. Many risk factors have been found, different strategies are being used and importance is given to temperature and systolic blood pressure to achieve higher survival. AKI can be part of systematic inflammation concurrent to cardiac arrest and many patients have high values of blood inflammation markers but not many studies exist examining the correlation between inflammation markers and survivability in these patients after cardiac arrest.
**Objectives:** The aim of this study is to determine which patients who develop AKI after cardiac arrest have better outcomes and which serum biomarkers and inflammation biomarkers may affect the need for mechanical ventilation and the LOS.
**Methods:** A total of 30 patients who were admitted to the ICU for more than 48 h following a cardiac arrest with successful resuscitation from 01/01/2023 to 01/01/2024 were retrospectively studied and included in this study. All patients in this study developed AKI during the first 2 days of admission and patients with chronic kidney disease were excluded. Their demographics, comorbidities, continuous renal treatment (CRRT) hours, creatinine levels, CRP, procalcitonin, troponin and CK levels, as well as ventilator-free days (28 d), vasopressor-free days (28 d), LOS and outcome were retrospectively recorded and statistically analyzed.
**Results:** The mean age of the patients in the study was 72 y (28–88), with a mean APACHE II score of 26.4 ± 7.3, a mean SOFA score of 11.4 ± 2.3 and mean LOS of 19.6 ± 5.8, with 51.6% survival amongst all the patients with cardiac arrest and AKI. 38% of the patients needed CRRT and the rest were treated conservatively. Patients that survived had lower mean PCT and CRP values in comparison to patients who did not survive—13.1 ± 0.3 vs 24.1 ± 0.4 and 9.6 ± 1.2 vs 13.7 ± 0.7, respectively. Troponin levels (ng/L) were mostly equal between the survivors and non-survivors (1839 ± 350 vs 1715 ± 229), as well as WBC (k/μl) (15.209 ± 1.521 vs 14.133 ± 1.436). Mortality of the patients treated with CRRT was 80% and 38% for the patients with conservative treatment. Mean LOS for the CRRT group was 29.6 vs 14.1 for the conservative group and both groups had a difference in ventilator-free days—2.4 vs 9.2 and vasopressor-free days—1.6 vs 8.2.
**Conclusions:** AKI in cardiac arrest patients has a high mortality rate, either when treated conservatively or with CRRT. Patients with conservative treatment tend to have better outcomes, shorter LOS and more ventilator and vasopressor-free days. Smoking, high admission CRP and PCT have a negative prognostic value. Levels of troponin and WBC do not seem to affect LOS and outcomes. More studies are needed to validate the prognostic values of several serum blood values and inflammation biomarkers for AKI after cardiac arrest.

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**Topic:** Cardiac arrest

## 001115

### Post-ICU outcomes and follow-up of patients with chronic respiratory failure after a severe acute exacerbation: two-year survey

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**Introduction:** The immediate post-intensive care unit (ICU) phase is recognized as a critical period, especially for individuals grappling with chronic respiratory failure (CRF). Beyond the ICU discharge, CRF patients face a spectrum of challenges, ranging from the threat of lung function decline to recurrent exacerbations, alongside the imperative need for sustained respiratory support. In this context, understanding the trajectory of post-ICU outcomes among CRF patients is indispensable.
**Objectives:** Investigate the respiratory support management of patients with CRF after ICU discharge. Analyze the outcomes, hospital readmissions, and deaths, across the two-year longitudinal follow-up.
**Methods:** This retrospective cohort study examines patients diagnosed with chronic respiratory failure (CRF) discharged from the ICU between January 2022 and March 2024. Prospective data were collected via an electronic register, encompassing patients' ICU characteristics and longitudinal follow-up details, including home ventilatory management and outcomes. For patients not referred to consultation or who were no-shows, electronic medical records (EMRs) and phone interviews were utilized to ascertain outcomes.
**Results:** Out of 250 ICU-discharged patients following acute exacerbation of CRF, 201 (80.4%) had chronic obstructive pulmonary disease (COPD), 32 (12.8%) had obesity hypoventilation syndrome, and 17 (6.8%) had neuromuscular disease. 191 (76.4%) patients received non-invasive ventilation (NIV), while 59 (23.6%) required invasive mechanical ventilation (MV) during the ICU stay. ICU deaths totaled 21 (8.4%). Subsequently, 96 (38.4%) patients were readmitted to the hospital during the 2-year follow-up. The overall mortality rates at 3 months and 1 year were 8 (3.2%) and 17 (6.8%), respectively.
Among the cohort, only 109 patients attended the post-ICU. Home ventilatory support was, NIV, 64 (58.7%), long-term oxygen therapy

(LTOT) 5 (4.6%), room air 28 (25.7%), and tracheostomy 12 (11%). Of 43 NIV-ventilated patients with available compliance reports at 3 months, the mean NIV duration was 11.5 ± 5.1 h/day. The 33 patients discharged without NIV had a mean PaCO2 of 40.4 ± 8.1 mmHg, with none subsequently prescribed NIV. The overall trends in ventilatory support exhibited a decline, with 19.2% transitioning away from NIV at 3 months.
Across the 24-month follow-up period, mean PaCO2 and PaO2 remained stable between 40.7–47.8 and 58.1–67.1 mmHg, respectively.
**Conclusions:** This study reveals poor outcomes in CRF patients post-severe acute exacerbation, likely attributable to underlying conditions, acute presentation severity, and therapeutic gaps despite adequate home ventilatory management. Tailored trajectories may optimize CRF patient care.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001117

### Multidrug-resistant bacteria in bilateral lung transplant recipients: incidence and 28-day patient outcomes

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**Introduction:** Lung transplant recipients invariably share recognized risk factors for acquisition of multidrug-resistant (MDR) bacteria. MDR bacteria carriage increases the complexity of patient management in the Intensive Care Unit (ICU).
**Objectives:** We investigated the incidence and impact of MDR bacteria acquisition, on 28-day patient outcomes post-lung transplantation, in a single heart and lung transplantation centre.
**Methods:** Our lung transplant programme was launched at June 2019, and the first patient was transplanted at October 2020. All transplantation (LT) recipients admitted to ICU of our hospital were studied retrospectively, until January 2023. Data were collected regarding MDR bacteria commonly encountered in critical care, for which a national mandatory reporting requirement is in place. These include carbapenem-resistant organisms (CROs), specifically *Acinetobacter*, *Klebsiella* and *Pseudomonas*, as well as methicillin-resistant *Staphylococcus aureus* (MRSA). They were isolated from the respiratory tract, blood, urine, rectal swab or drainage, according to routine protocols.
**Results:** Twenty bilateral LT recipients were screened. Median age was 49 years (IQR 48–59 years) and 6 of them (30%) were women. MDR bacteria were identified in 8 out of 20 patients (40%) and 62.5% of them demonstrated bloodstream infections. Three of them were already MDR bacteria carriers on admission to the ICU. Median time from ICU admission to MDR bacteria acquisition was 3 days (IQR 3–6 days). *Pseudomonas* aeruginosa ($n = 3$) and *Klebsiella pneumoniae* ($n = 3$) were isolated mainly from the respiratory tract.
Median ICU stay for LT recipients with identified MDR bacteria was 32 days (IQR 32–118 days) versus 10 days (10–16 days) for those without MDR bacteria infection. Mortality at 28 days was 37.5% (3/8) versus 25% (5/20) overall 28-day mortality for LT recipients.
**Conclusions:** Our preliminary findings suggest high incidence of MDR bacteria after LT with frequent bloodstream infections in our centre. Patients presented with MDR bacteria had 3 times greater ICU stay and higher mortality. Continuous screening, early diagnosis and prompt response to treating these pathogens facilitates the way to a successful bilateral lung transplantation.

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**Topic:** Brain death, organ donation and transplantation

## 001118

### Characteristics and outcomes of critically ill cancer patients admitted to a Tunisian intensive care unit

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**Introduction:** Critically ill cancer patients pose unique challenges in the ICU due to underlying malignancies and treatment toxicities. However, data on the characteristics and outcomes of this specific population in developing countries, as Tunisia, remain limited.
**Objectives:** This study aimed to describe the clinical profile and identify independent predictors of in-ICU mortality among critically ill cancer patients.
**Methods:** It is a retrospective study conducted in the medical ICU of Farhat Hached University Hospital between January 2007 and December 2023. All cancer patients with complete records were included. Baseline demographics, clinical features, severity scores, tumor characteristics, and outcomes were collected. Univariate and multivariate analyses were carried out to identify factors independently associated to poor prognosis.
**Results:** During the study period, 5467 patients were admitted. One hundred (1.83%) patients had malignancy. Among these, 58 (58%) had hematological malignancies and 42 (42%) had solid tumors, of whom 28 (28%) had evidence of metastases. Clinical characteristics were: median age, 57.5 [46–66] years; male, 58 (58%); WHO performance status 0 to 1, 63 (63%); mean SAPSII, 52.45 ± 20.8; invasive mechanical ventilation (IMV), 64(64%); median duration of IMV, 2 [2–5.25] days; vasopressors use, 66 (66%). The main reasons for admission were: acute respiratory failure, 46 (46%); septic shock, 26 (26%); coma, 17 (17%) and miscellaneous 11 (11%). The median length of ICU stay was 5 [3–10] days and the mortality rate was 59%. On univariate analysis, the factors associated with mortality were IMV on admission (24.4% vs 91.5%; $p < 0.001$) and vasopressor use (31.7% vs 89.8%; $p < 0.001$). Multivariate regression model identified two factors as independently associated with mortality: IMV on admission (OR, 14.6; 95% CI [3.95–53.9]; $p = 0.000$) and vasopressors use (OR, 4.73; 95% CI [1.25–17.9]; $p = 0.022$).
**Conclusions:** This study highlights the high mortality rate of critically ill cancer patients. Requirement for IMV and vasopressor use on ICU admission were independently associated with mortality.

**Topic:** Haematologic-oncologic issues in the ICU

## 001119

### Imaging of ventilation-perfusion matching using static and dual-energy computed tomography

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**Introduction:** Imaging of pulmonary ventilation, perfusion and ventilation-perfusion ratio may be used to tailor ventilator settings allowing patient centred therapy of lung injury. Yet, determination of ventilation/perfusion maps (V̇/Q maps) in the clinical scenario requires an extensive protocol of additional measurements.
**Objectives:** In this investigation, we propose a protocol composed of dual-energy computed tomography (DECT) and static computed tomography (CT) to derive V̇/Q maps. The derived surrogate for shunt blood flow is compared to intrapulmonary shunt as determined using standard formulae based on blood gas analysis.
**Methods:** Relative pulmonary perfusion Q was determined using DECT derived iodine algorithm (SOMATOM Definition Edge, Twin Beam, Siemens) after intravenous injection of iodine contrast agent (60 ml, 4 ml/s, Ultravist 370, Bayer) during either two-lung (TLV) or one-lung ventilation (OLV) with different concentrations of inhalative nitric oxide (0, 5, 10, 20 ppm) in three anaesthetized pigs (approval #25-5131/496/33). Ventilation maps V̇ were derived by diffeomorphic co-registration of static thorax CT scans taken at end-inspiratory and end-expiratory lung volume (Advanced Normalization Toolkits, Bspline spatial 5 stage regularization, ANTs neighborhood cross correlation) [Avants et al. Motta-Ribeiro et al.]. A cutoff Cshunt to identify shunt regions SVQ with V̇/Q ≤ Cshunt was determined from regression analysis (slope s, offset z, coefficient of determination $R^2$ and root-mean square error RMSE) of the sum of pulmonary blood volume within the respective shunt region and intrapulmonary shunt from blood gas analysis (SBGA). Among tested Cshunt 1/200, 1/100, 1/10, 1/6, 1/5 and 1/4, the ideal cutoff was considered the one with slope closest to unity, offset close to zero and lowest RMSE during TLV.
**Results:** Relative ventilation V̇, perfusion Q and V̇/Q maps during OLV are shown in Figure 1. In TLV, slope was closest to 1 with $s = 0.98$, offset $z = 0\%$ and RMSE lowest with 1.5%, for Cshunt = 1/6. Over all measurements, SVQ was moderately associated with SBGA ($s = 0.620$, $z = 23.1\%$, $R^2 = 0.409$, $P = 0.010$, Figure 2). In OLV, different iNO concentrations resulted in alterations of pulmonary shunt SVQ—unidirectional for both measures—however, more pronounced in SBGA ($s = 0.219$, $z = 40.3\%$ $R^2 = 0.493$, $P = 0.011$).
**Conclusions:** The proposed protocol allows the determination of ventilation-perfusion maps with only three ventilatory holds and a iodine angiography. Shunt blood flow had a moderate association with intrapulmonary shunt.

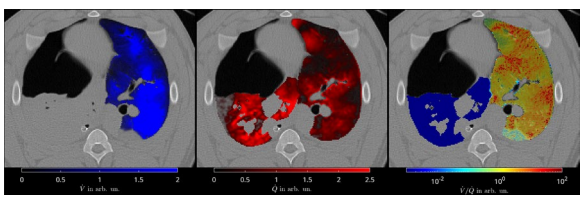

**Fig. (abstract 001119)** .
Representative transversal slides of tidal ventilation V?, pulmonary blood volume Q? and ventilation-perfusion V?/Q? (from left to right) in one-lung ventilation.

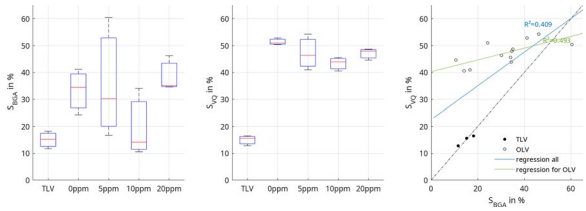


**Fig. (abstract 001119)** .
Pulmonary right-left shunt SBGA from blood gas analysis (left) and pulmonary right-left shunt SVQ as determined from the ventilation-perfusion maps (center) per intervention, and their association (right): with two lung ventilation (TLV), one-lung ventilation (OLV) and parts per million (ppm).

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001120

### Predicting ICU mortality at admission using treatable traits: a comparative analysis of machine learning techniques

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**Introduction:** In the era of precision medicine, a groundbreaking paradigm has surfaced within ICU care, centered on the concept of treatable traits. This innovative approach aims to customize interventions to match the unique needs of each patient, thereby maximizing management efficiency and outcomes.
**Objectives:** This study investigates the predictive capacity of different machine learning techniques in identifying ICU mortality at admission based on treatable traits, thereby advancing the paradigm of precision medicine in critical care.
**Methods:** A retrospective analysis of single-center dataset, comprising information related to 710 patients consecutive ICU admissions throughout a two-year period (2022–2024) mainly balanced between medical respiratory and cardio-circulatory diagnoses, focusing on treatable traits on ICU admission. Different machine learning algorithms including logistic regression, random forest, decision tree, ADA-boost, XGboost, K-nearest neighbors (KNN), and long short-term memory (LSTM) were trained and tested on the dataset. To optimize model performance, the best hyperparameters were searched for each machine learning technique employed in this study. Performance metrics including accuracy and area under the receiver operating characteristic curve (AUC-ROC) were assessed to compare the predictive capabilities of each model. The features included in the respective models were selected by experts guided by clinically relevant treatable traits.

**Results:** Among the identified treatable traits at ICU admission, ten traits were included in the models (sepsis, peripheral hypoperfusion, dysoxia, acidosis, arrhythmia, right heart failure, acute kidney injury, rapid shallow breathing, hypoxemia, and pancytopenia). Among the various machine learning techniques investigated, XGboost demonstrated the highest performance in predicting ICU mortality based on treatable traits (accuracy, 88.73% and AUC, 0.85). Logistic regression and ADA-Boost followed with accuracies of 83.1% and 83%, respectively, and AUC-ROC values of 0.89 both. KNN reached an accuracy of 82.39% with an AUC of 0.78. Decision tree showed a maximum accuracy of 86.97% with an AUC of 0.63. Random forest achieved an accuracy of 87.32% with an AUC of 0.80. Finally, the LSTM model attained an accuracy of 85.21% with an AUC of 0.87.
**Conclusions:** The present study identifies good discriminative properties of a model integrating clinically relevant treatable traits suggesting a certain interest to include the treatable traits approach in the management of critically ill patients.

**Topic:** Information systems and Data Science

## 001121

### "Influence of vasopressin on ventriculoarterial coupling measured by transpulmonary thermodilution"

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**Introduction:** Ventriculo arterial coupling (VAC) reflects cardiovascular performance and efficiency. Is there interaction between ventricular pump ejection and the subsequent change in arterial pressure. The response to vasopressors in VAC is variable. It has been described that noradrenaline could increase end systolic elastance (Ees) and arterial elastance (Ea) but vasopressin only increases Ea; therefore, this could lead to VA decoupling.
**Objectives:** The aim of our work was to evaluate whether patients who received noradrenaline plus vasopressin had ventriculo arterial decoupling and higher Ea values than those who received only noradrenaline.
**Methods:** A prospective study was conducted in a 24-bed medical-surgical intensive care unit (UCI) in Argentina. We included patients with shock who received hemodynamic monitoring with transpulmonary thermodilution. We measured the hemodynamic variables of the first transpulmonary thermodilution measurement.
For the Ea calculation, we use the formula (TAM*0.9)/VS. For Ees, we applied the same principle of measurement in echocardiography, so we use the formula TAS/[(GEDVI/4)-VS]. Statistical analysis was performed by means of student ***t*** test for variables with normal distribution and Mann–Whitney test for variables with abnormal distribution.
**Results:** We included 25 patients with shock, and 18 of them had distributive shock. 11 were female. Mean age was 57 [40–65]. Apache II and SOFA scores were 20 [10–27] and 8 [4–9], respectively. There were statistical significant differences in VVS, noradrenaline dose and RVSI. Hemodynamic variables are shown in Table 1.
**Conclusions:** Vasopressin plus noradrenaline use had shown higher VAC values in comparison with noradrenaline alone, but this did not reach statistical significance. Contrary to what we assumed, the norepinephrine group presented higher Ea values and lower Ees.

**Table (abstract 001121)** Hemodynamics characteristics

| | All | Noradrenaline | Vasopressin y Noradrenalina | P |
|---|---|---|---|---|
| CO | 6.5 [ 4.6 – 8] | 6.3 [ 5.4 – 7.77] | 5.6 [2.8 - 8.1] | 0.90 |
| CI | 3.1 [ 2.3 – 4] | 3.2 [2.8 - 4.0] | 3.3 [1.5 - 4] | 0.34 |
| SV | 58 [ 47 – 86] | 57 [ 47 - 87] | 71 [ 38 - 81] | 0.81 |
| SBP | 101 [ 83 – 116] | 97 [ 91 - 122] | 102 [ 82 - 112] | 0.91 |
| DBP | 60 [ 50 – 66] | 57 [ 51 - 64] | 59 [ 52 - 64] | 0.63 |
| MAP | 71 [ 64 – 79] | 70 [ 63 - 83] | 67 [ 64 - 78] | 0.63 |
| GEDVI | 563 [ 462 –742] | 557 [ 431 - 692] | 629 [ 444 - 764] | 0.94 |
| GEF | 21 [ 15 –27] | 24 [ 16 - 28] | 24 [ 16 - 28] | 0.42 |
| ELWI | 10.3 [ 8.5 – 12] | 10 [ 8.5 - 15] | 11.3 [ 9.4 – 18] | 0.06 |
| IPVP | 2.3 [ 1.90 – 2.80] | 2.6 [ 1.8 – 2.8] | 2.3 [ 1.9 - 3] | 0.00 |
| IRVSI | 1489 [ 1220 – 2557] | 1468 [ 1228 - 1832] | 2005 [ 1098 - 3310] | 0.01 |
| Ea | 1-29 [ 1.17 – 3.90] | 1.62 [ 1.37 – 1.97] | 1.28 [1.13– 3.90] | 0.91 |
| Ees | 1.34 [ 0.79 – 1.69] | 1.26 [0.94 – 1.77] | 1.37 [0.68 – 4.67] | 0.76 |
| VAC | | 1.24 [0.68 – 1.97] | 1.62 [ 1.37 – 1.97] | 0.63 |
| CVP | 14 [ 8.5 – 15] | 11 [7.2 – 14.7] | 15 [12 - 21] | 0.14 |
| MSFP | 24 [ 18 – 27] | 22 [15 - 25] | 26 [20 - 28] | 0.69 |
| VVS | 10 [ 6 – 13.5] | 11 [7 - 15] | 8 [5 - 9] | 0.03 |
| Previous Cumulative Balance | 3500[ 00 – 5900] | 1225 [0 - 5350] | 5430 [2000 - 7250] | 0.21 |
| Noradrenaline | 0.5 [ 0.2 – 0.6] | 0.31 [ 0.12 – 0.59] | 0.67 [ 0.66 – 0.76] | 0.01 |
| Vasopressin | 00 [ 00 – 0.04] | 22 [15–25] | 26 [ 20–29] | 0.69 |
| Mortality | 15(60%) | 10 (40 %) | 5 (20 %) | 0.74 |

**Topic:** Cardiovascular issues in ICU

## 001122

### Pyroptosis-derived exosomes contribute to endothelial injury in sepsis by triggering leukocyte–endothelium adhesion

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001122

**Introduction:** Sepsis is a life-threatening organ dysfunction caused by dysregulated host responses to infection, with endothelial injury the pivotal feature [1]. Diverse range of factors are associated with endothelial dysfunction [2]. Recent studies demonstrated the importance of exosomes of different origin in transporting biologically active substances and cell–cell communication [3,4].
**Objectives:** The aim of our study was to investigate the effect and mechanism of pyroptosis-derived exosomes (Pyro-Exos) on sepsis-related endothelial injury.
**Methods:** Pyro-Exos were isolated from supernatants of pyroptotic cell culture medium and plasma using ultracentrifugation. They were injected to mice or co-cultured with endothelial cells. Strategies including HE staining, immunofluorescence, western blot, qPCR and ELISA were applied to investigate their effects on endothelial injury in vivo. Leukocyte adhesion assay and western blot were used to evaluate the adhesion function of endothelium in vitro.
**Results:** The amount of exosomes in septic mice was significantly higher than that in the sham group. However, inhibition of pyroptosis using disulfiram decreased the exosomes in septic mice (Fig. 1a). Exosomes extracted from sham (Sham-Exos), sepsis (CLP-Exos) and sepsis without pyroptosis (CLP-Exos-Pyro) were injected into healthy mice. Compared with CLP-Exos, CLP-Exos-Pyro contributed to lung injury and increase of inflammatory factors (Fig. 1b–d). Then, we extracted CtrlExos and Pyro-Exos from THP-1 monocytes and injected them into mice. The number of exosomes was significantly higher in pyroptotic cells than control (Fig. 1e). Pyro-Exos contribute to lung inflammation, increase of cytokines and increase of wet weight to body wet ratio in vivo (Fig. 1f–i). Through transcriptome sequencing of endothelial cells treated with Ctrl-Exos and Pyro-Exos, we found that

differently expressed genes were mainly enriched in pathways related to leukocyte-endothelium adhesion (Fig. 1j). In vivo, the expression of ICAM1 on endothelial cell was greatly increased in mice injected with PyroExos (Fig. 1k). In vitro, the number of leukocytes adhered to endothelium was significantly higher with the intervention of Pyro-Exos (Fig. 1l, m). The expression of ICAM1 and P-selectin increased as well (Fig. 1n).

**Conclusions:** Pyro-Exos contribute to endothelial injury in sepsis by the means of triggering leukocyte–endothelium adhesion.

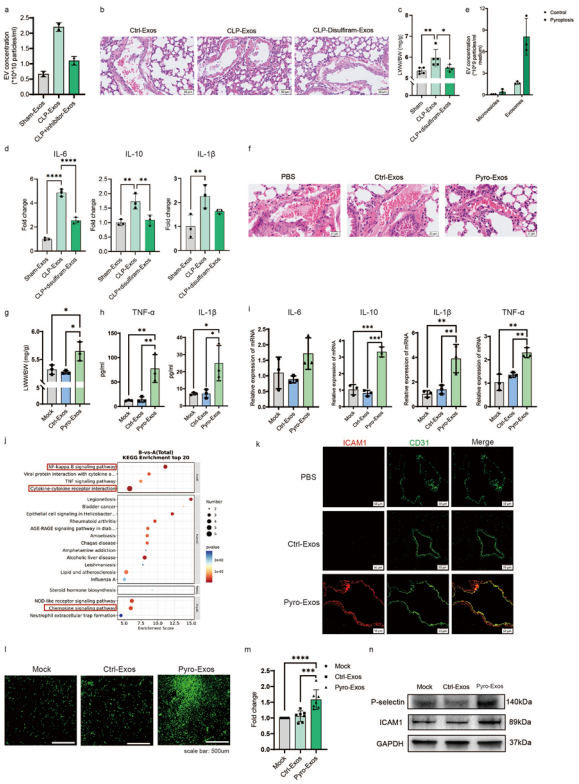


**Fig. 1 (abstract 001122)** Pyroptosis-derived exosomes contribute to endothelial injury in sepsis by triggering leukocyte–endothelium adhesion. a) The amount of exosomes in plasma of sham, CLP and CLP + disulfiram mice. b–d) The lung injury, lung wet weight-to-body mass ratio and inflammatory factors of mice injected with Sham-Exos, CLP-Exos and CLP-Exos$^{-Pyro}$. e) The amount of exosomes of control and pyroptotic THP-1 cells. f–i) The lung injury, lung wet weight-to-body mass ratio and inflammatory factors of mice injected with PBS, Ctrl-Exos and Pyro-Exos. j) The transcriptome sequencing of endothelial cells treated with Ctrl-Exos and Pyro-Exos. k) The immunofluorescence of ICAM1 and CD31 in lung tissue of mice injected with PBS, Ctrl-Exos and Pyro-Exos. l–m) In vitro assessment of leukocyte-endothelium adhesion. n) Western blot of P-selectin and ICAM1 of endothelial cells treated with PBS, Ctrl-Exos and Pyro-Exos

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**Topic:** Sepsis

## 001124

### Effect of an Shenfu injection on 28-day mortality in patients with sepsis: a single-center retrospective study

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**Introduction:** Sepsis is the leading cause of mortality in intensive care unit (ICU). Shenfu injection (SFI) is commonly used to treat patients with sepsis, septic shock, heart failure, and other conditions in clinical practice.
**Objectives:** This purpose of the study was to determine the effect of SFI vs control on 28-day mortality among patients with sepsis.
**Methods:** The Shenfu injection in sepsis patients (SFI) study was conducted on the clinical data of 807 sepsis patients admitted to the ICU at Ruijin Hospital from January 2013 to January 2023. Patients were divided into a treatment group ($n = 176$) and a control group ($n = 631$) based on their use or non-use of Shenfu injection, respectively. Propensity score matching was performed for age, gender, infection site, and other relevant factors. We evaluated the 28-day mortality rate, mechanical ventilation–free days, and vasoactive drug-free days. The safety outcomes included any adverse events (AEs) and severe adverse events (SAEs) through 28 days of follow-up.
**Results:** There were 154 successfully matched groups in this study, the baseline demographics, severity of illness, SOFA score, APACHE II score and comorbidities were well balanced between the study groups. In this patients, the 28-day mortality rate was significantly different between the control group and the SFI group (35 of 154 patients [22.73%] vs 15 of 154 patients [9.74%], respectively; $P < 001$). The median length of stay in ICU of the SFI group which was 16.5 days (IQR 8–35.25 days) was higher than median length of stay in ICU of the control group which was 16 days (IQR 8–41.251 days), $P < 0.05$. Compared with the control group, vasoactive drug-free days in the SFI group was higher than that of the control group (SFI group, 19.35 ± 6.86 days, vs control group, 16.64 ± 8.91 days), $P < 0.01$. Moreover, the D-Dimer level in the SFI group was lower than that of the control group (SFI group, 3.13 ± 4.25 mg/L, vs control group, 4.19 ± 5.11 mg/L), $P < 0.05$. In subgroup analyses, the SFI group had a protective effect in sepsis patients with age < 60 years (OR, 0.049; 95% CI 0.003–0.935), male (OR, 0.314; 95% CI 0.141–0.700), no chronic heart failure (OR, 0.342; 95% CI 0.171–0.683), Charlson index < 3 points (OR, 0.381; 95% CI 0.184–0.787), and no progression to septic shock state (OR, 0.390; 95% CI 0.197–0.773).
**Conclusions:** In this single-center retrospective study among patients with sepsis, the administration of SFI reduced 28-day mortality compared with the control.

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3. The National Natural Science Foundation of China 82372203 (M. M)

**Topic:** Sepsis

## 001125

### Intubation risk factors in severe COVID-19 patients treated with high-flow nasal oxygen therapy: retrospective multicenter analysis

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**Introduction:** Non-invasive oxygen therapy in COVID-19 patients reduces the risk of intubation compared to conventional oxygen therapy. However, it is unclear whether delayed intubation has adverse effects on the mortality and prognosis of severe COVID-19 patients undergoing treatment with high-flow nasal oxygen therapy (HFNO).
**Objectives:** We aim to analyze the risk factors for intubation and mortality among COVID-19 patients receiving HFNO.
**Methods:** In 2020, a retrospective multicenter study was conducted on 908 severe COVID-19 patients admitted to 26 intensive care units (ICUs) in Korea who received HFNO. We divided patients treated with HFNO into two groups: those who were intubated and those who were not, and we used multivariable regression analysis to identify risk factors for intubation.
**Results:** A total of 908 critically ill COVID-19 patients treated with HFNO were enrolled in this study. Out of these, 474 (52%) patients received HFNO treatment, while 434 (48%) underwent intubation. The median age was 67.5 years, with 546 males (60%) and 362 females (40%). Comparing with HFNO, the intubation groups had a lower median duration of HFNO (3.0 vs. 8.6 days; $p<0.001$), platelet count (190,000 vs. 201,000; $p=0.042$), and a higher sequential organ failure assessment score (4.0 vs. 3.3; $p<0.001$), as well as a higher clinical frailty scale before discharge (4.2 vs. 3.8; $p=0.01$). There were no significant differences in ICU or hospital mortality between the HFNO and intubation groups (81 [17.1%] vs. 100 [23%]; $p=0.043$ and 98 [20.7%] vs. 111 [25.6%]; $p=0.076$). Lower PaO2/FiO2 and ROX (ratio of oxygen saturation/fraction of inspired oxygen) index were associated with the intubation risk factor, with an odds ratio (exp [β]) of 0.992 (95% CI [0.989–0.995]) for PaO2/FiO2 and 0.887 (95% CI [0.831–0.948]) for the ROX index, both $p<0.001$.
**Conclusions:** In severe COVID-19 patients receiving HFNO, lower PaO2/FiO2 and ROX index values were associated with an increased risk of intubation. However, when comparing patients receiving HFNO patients, intubation did not influence hospital or ICU mortality.

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4. This study is supported by grant No. (KATRD-S-2021-2) from the Korean Academy of Tuberculosis and Respiratory Diseases

**Topic:** Acute respiratory failure and mechanical ventilation

## 001126

### Evaluation of stress symptoms and secretion of cortisol and melatonin after a music therapy intervention guided by a music therapist. Pilot study in critically ill patients

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**Introduction:** Delirium, anxiety and pain are states of stress resulting from the critical illness, the treatments, and techniques received during the critical situation. They are frequent in patients admitted to the Intensive Care Unit and can compromise their evolution and prognosis (1)(2)(3). The use of music therapy guided by a music therapist in patients with stress (anxiety, delirium and pain) can help to comfort and reduce stress (4)(5).
**Objectives:** To investigate the impact of a music therapy intervention guided by a music therapist, with the aim of improving comfort and reducing stress symptoms in critically ill patients.
To analyze the levels of stress (cortisol) and well-being (melatonin) metabolites in saliva.
**Methods:** This is a prospective and observational study carried out in an Intensive Care Unit for 6 months. Patients with symptoms of stress (anxiety, pain and/or delirium) and a level of consciousness that allowed correct communication (Glasgow > 10 or RASS > -2) were included. Patients with neurological or auditory pathology were excluded. Before and after the intervention, stress symptoms were identified and collected through validated scales. Saliva sample (Salivette®) was collected to determine cortisol and melatonin levels before and after intervention. Demographic, admission, physiological variables and adverse effects were collected. Statistical significance was considered, $p<0.05$.
**Results:** Fourteen interventions were analyzed. 57% were women, with an average age of 56.9 (± 16.1), APACHE II of 17 (5–30) and SOFA of 3 (0–12). The reason for admission was medical in 78.6%, the average number of days before the intervention was 13 (14.6) and 50% received invasive mechanical ventilation. All patients presented symptoms of stress: 5 (35%) of them were delirious, 8 (57%) had severe pain and 2 suffered anxiety.
After the intervention, the delirium was resolved in 100% (5) and comfort improved significantly ($p<0.01$) in most of patients (9 (64%)). In patients with moderate VAS (6 (42%)), the cortisol decreased in saliva after the intervention by 1.6 (1.1–30.2) vs 1.2 (0.6–7.4) ($p<0.04$) and the cortisol/melatonin ratio (5.8 (0.15–249.6) vs 3.7 (0.08–40.8) ($p<0.02$). In cases of intense VAS, cortisol levels also decreased, although not significantly (3.29 (1.1–10) vs 2.44 (1.03–13). No differences were found in the physiological variables before and after the intervention. No adverse effects were described with the intervention.
**Conclusions:** Music therapy guided by a music therapist is a viable and safe intervention in the critically ill patient. The benefits can be observed at a clinical level (improvement in comfort and delirium) and at a metabolic level (decrease in cortisol in saliva and in the cortisol/melatonin ratio). This pilot study will allow a broader study to be carried out.

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001127

### A cost evaluation for replacing pulse oximetry and need for interim solutions

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001127

**Introduction:** Disparities in pulse oximetry accuracy, disproportionately affecting patients of color, have been associated with serious clinical outcomes. Although many have called for pulse oximetry hardware replacement, the cost associated with this replacement is not known.
**Objectives:** To estimate the cost of replacing all pulse oximetry hardware throughout a hospital system.
**Methods: Methods**: This single-system survey was conducted at Duke University Health System in 2023, which is one academic quaternary medical center with three hospitals. The main outcomes and measures were the cost of fleet replacement as identified by current day prices for hardware.
**Results:** New and used prices for 3,542/4,136 (85.6%) across three hospitals for pulse oximetry devices were found. The average equipment cost to replace pulse oximetry hardware is $6,834.61 per bed. Replacement and integration costs are estimated at $14.2–17.4 million for the entire medical system. Extrapolating these costs to 5,564 hospitals in the United States results in an estimated cost of $8.72 billion.
**Conclusions:** "Simply replacing" pulse oximetry hardware to address disparities may be neither simple, cheap, or timely. Solutions for addressing pulse oximetry accuracy disparities leveraging current technology may be necessary.

**Table 1 (abstract 001127)** Average replacement cost for all beds in a hospital across the system

| | | Duke University Hospital | Duke Raleigh Hospital | Duke Regional Hospital | Duke University Health System |
|---|---|---|---|---|---|
| total number of devices | | 2758 | 708 | 670 | 4136 |
| devices with prices | | 2,351 (85.2%) | 600 (84.7%) | 591 (88.2%) | 3,542 (85.6%) |
| number of beds | | 1,048 | 186 | 373 | 1,607 |
| special care beds | | 332 | 28 | 22 | 382 |
| operating rooms | | 53 | 18 | 20 | 91 |
| number of models | Multi-Parameter Module/Monitor | 39 | 24 | 13 | 48 |
| | Pulse Ox Module/Monitor | 28 | 9 | 5 | 34 |
| | Vital Signs Monitor | 53 | 9 | 8 | 58 |
| replacement cost (thousands) | | $ 7,138.06 | $ 2,375.66 | $ 1,482.71 | $ 10,983.22 |
| average replacement cost per bed | | $ 6,811.12 | $ 12,772.34 | $ 3,975.10 | $ 6,834.61 |
| integration costs | 250 hours | $ 2,650.00 | $ 1,425.00 | $ 775.00 | $ 3,250.00 |
| | 500 hours | $ 6,400.00 | $ 2,150.00 | $ 950.00 | $ 6,400.00 |
| total replacement & integration | 250 hours | $ 9,788.06 | $ 3,800.66 | $ 2,257.71 | $ 14,233.22 |
| | 500 hours | $ 13,538.06 | $ 4,525.66 | $ 2,432.71 | $ 17,383.22 |

Based on the number of devices with prices, this table reflects the cost of replacing pulse oximeters by individual hospitals, along with across the three hospitals together. Prices for costs are in thousands (e.g., total replacement and integration at Duke University Hospital $9.8–13.5 million, Duke Raleigh Hospital $3.8–4.5 million, Duke Regional Hospital $14.2–17.3 million).

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**Topic:** Health Services Research and Outcome

## 001128

### Association of skeletal muscle indexes and bone density with 1-year outcomes in critically ill survivors of 7 or more days of mechanical ventilation

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**Introduction:** In patients admitted to the intensive care unit (ICU), muscle mass and bone density are important determinants of short-term outcomes, including in-hospital mortality and discharge disposition[1–6]. It is uncertain if these same risk factors determine post-ICU disability and mortality. We hypothesized that muscle indexes and bone density, measured in the first 14 days of ICU admission, are determinants of 7-day post-ICU disability, captured as the functional independence measure (FIM), and of 1-year mortality. These insights may enhance prognostic information for patients and families during and after an episode of critical illness.
**Objectives:** The primary objective of this study was to assess the association between muscle indexes and bone density—measured on a single abdominal CT scan within the first 14 days of ICU admission—and 1-year mortality in chronically critically ill patients. The secondary objective was to examine how these same measurements relate to the 7-day post-ICU FIM.
**Methods:** This study used the Canadian RECOVER Program (Phase 1) cohort [7], comprised of patients requiring mechanical ventilation for $\geq$ 7 days. Patients who underwent abdominal CT scans within the first 14 days of ICU admission and as part of their clinical management were included. If patients had multiple CT scans, only the first ICU scan was retained for analysis. Skeletal Muscle Index (SMI), Psoas Muscle Index (PMI), and trabecular bone density were measured at the L3 vertebral level. Uni- and multivariable logistic regressions were performed to assess the association between each of SMI, PMI, bone density and 1-year mortality. Uni- and multivariable linear regressions were performed to assess the association between each of SMI, PMI, bone density and the 7-day post-ICU FIM.

**Results:** One hundred patients were included; the median age was 57 [IQR: 45–65] and 43% were female. Median values showed that 1-year non-survivors had lower muscle indexes and bone density than survivors: SMI was 27.9 $cm^2/m^2$ [IQR: 21.8–32.8] vs. 33.8 $cm^2/m^2$ [IQR: 27.8–46.6], $p = 0.03$; PMI was 3.3 $cm^2/m^2$ [IQR: 2.5–4.5] vs. 4 $cm^2/m^2$ [IQR: 3.2–5.6], $p = 0.02$; and bone density was 131 Hounsfield units (HU) [IQR: 100–196] vs. 175 HU [IQR: 131–220], $p < 0.01$. Multivariable logistic regression analysis showed significant associations with 1-year mortality for decreased values of SMI (Odds ratio (OR) per 10-unit decrease in SMI: 2.00, 95% CI 1.25–3.33, $p < 0.01$), PMI (OR per 1-unit decrease in PMI: 1.67, 95% CI 1.11–2.5, $p = 0.02$), and bone density (OR per 10-unit decrease in bone density: 1.11, 95% CI 1.09–1.27, $p = 0.03$) (Figure 1). However, no significant association was found between muscle indexes, bone density, and the 7-day post-ICU FIM.
**Conclusions:** Muscle indexes and bone density measured in the first 14 days of ICU admission are associated with up to 1-year mortality in chronically critically ill patients. These findings may facilitate better identification of patient trajectories and inform clinical decision-making.

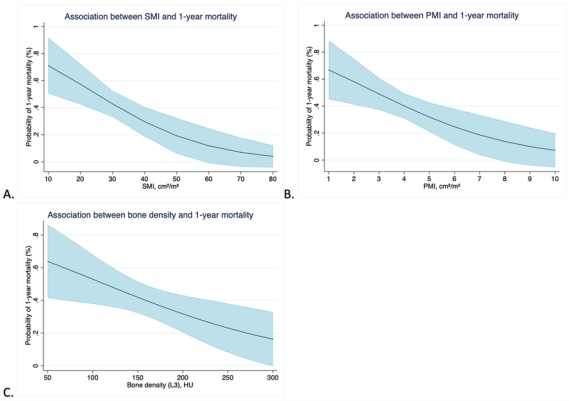


**Fig. (abstract 001128)** Association between SMI, PMI, bone density and 1-year mortality. Association between various musculoskeletal measurements and 1-year mortality, illustrating the fitted probabilities and 95% confidence intervals for 1-year mortality. Models have been adjusted for age, sex, Charlson Comorbidity Index, ICU length of stay (≤ 14 days or > 14 days), and, specifically for analyses involving SMI and PMI, the timing (days) of the CT scan relative to the ICU admission. (A) The association between Skeletal Muscle Index (SMI) and 1-year mortality. (B) The association between Psoas Muscle Index (PMI) and 1-year mortality. (C) The association between bone density and 1-year mortality

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8. Funded by: Canadian Institutes of Health Research


**Topic:** Health Services Research and Outcome

## 001129

### Influence of fluid balance on prognosis and mortality through a logistic regression analysis and ROC curve analysis in a retrospective cohort

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001129

**Introduction:** Fluid overload (FO) is considered, alongside age, one of the most significant prognostic factors in patients admitted to Intensive Care Units [1]. However, we lack sufficient evidence to define a duration or quantity of volume overload detrimental to patient prognosis.
**Objectives:** To determine the influence of persistent FO from 72 h after admission to the Intensive Care Unit (ICU) on the mortality of patients admitted for any reason to a polyvalent ICU. FO was defined as an accumulated fluid balance (AFB) exceeding 10% [2] of the patient's weight at the time of admission to the ICU.
**Methods:** This is a single-center retrospective cohort study of patients admitted for more than 14 days for any reason to a polyvalent ICU between January 2022 and December 2023. Clinical and demographic data were recorded, including intra-ICU mortality (ICU-M), days of mechanical ventilation (D-MV), and length of ICU stay (L-ICU). Logistic regression and ROC curve analyses were performed, comparing fluid overload at 72 h, 7 days, and 14 days post-admission with adjusted ICU-M for D-MV and L-ICU.
**Results:** A total of 146 patients were included, of whom 77.4% were male. Admission reasons were respiratory in 34.2%, neurological in 28.7%, infectious in 23%, cardiac in 7%, polytrauma in 15%, and digestive in 4.1% cases. The accumulated fluid balance (AFB) at 72 h was 3422 ml (−7300–15,000 ml), at 7 days was 5680 ml (−12,200–27,700 ml), and at 14 days was 7330 ml (−20,000–45,000 ml). ICU-M mortality was 28.3%. L-ICU averaged 22.9 days (2 to 53 days). The mean D-MV was 22.4 days (ranging from 1 to 56 days).
Table 1 displays the logistic regression results illustrating the correlation between FO and ICU-M, D-ICU, and D-MV.
In Figure 1, ROC curves at 72 h (a), 7 days (b), and 14 days (c) are presented. The curves displayed an AUC of 0.75, 0.72, and 0.72 at 72 h, 7 days, and 14 days, respectively.

**Table 1**

| | ICU-M OR (95% CI) *p* | L-ICU OR (95% CI) *p* | D-MV OR (95% CI); *p* |
|---|---|---|---|
| FO 72 h | 5.1 (2.1–12.2) p 0.000 | 1.26 (0.49–3.2) p 0.62 | 1.7 (0.6–4.3) p 0.3 |
| FO 7 d | 3.5 (1.6–7.2) p 0.04 | 2.2 (1.0–4.8) p 0.04 | 1.2 (0.6–2.6) p 0.58 |
| FO 14 d | 3.2 (1.4–7.1) p 0.004 | 2.6 (1.3–5.5) P 9 0.01 | 1.6 (0.8–3.2) p 0.22 |

**Conclusions:** Persistent fluid overload at 72 h, 7 days, and 14 days post-admission, defined as an accumulated fluid balance > 10% of the patient's weight at admission, correlates independently with adjusted intra-ICU mortality when adjusted for ICU length of stay and duration of mechanical ventilation. The area under the curve ROC curve analyses is good at 72 h and acceptable at 7 and 14 days post-admission.

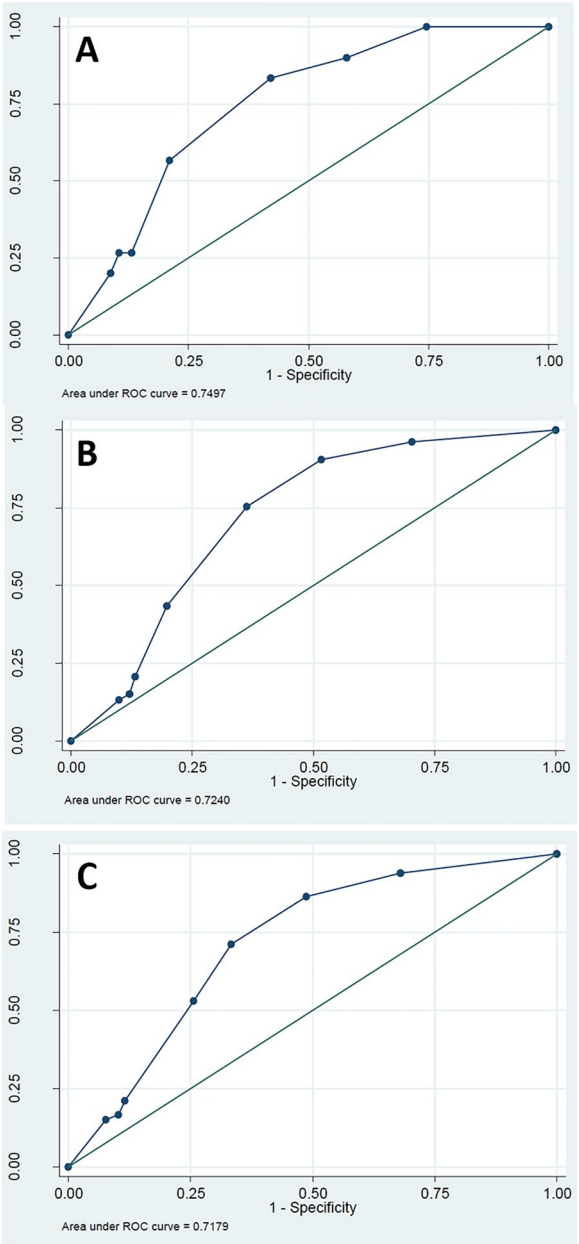


**Fig. 1 (abstract 001129)** ROC curves at 72 h (a), 7 days (b), and 14 days (c)

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001130

## Severe metabolic acidosis in ICU patients correlates with a greater decrease in platelet count in the following days

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**001130

**Introduction:** Many studies have shown that the decline in platelet count in patients after ICU admission is a useful marker of the severity of critical illness. Patients with a greater decline in platelet count tend to have worse prognosis. To date, the reason for the drop in platelet count in patients after admission to the ICU has not been sufficiently clarified. In severe decompression sickness, it is assumed that blood/gas bubble interactions and bubble-induced endothelial damage cause the activation of platelets and their consumption. Therefore, the relative decrease in platelet count is a recognised marker of the severity of decompression sickness. We hypothesize that the physicochemical process of gas bubble formation may be the reason for a similar mechanism of platelet activation, consumption and resulting count decline in critically ill patients.
**Objectives:** Rapid acidification of a solution, containing bicarbonate ions (HCO3-) could cause carbon dioxide (CO2) supersaturation and the formation of gas bubbles. The gas bubbles initially form due to CO2 supersaturation, but then other dissolved gases also diffuse into the bubbles in amounts, proportional to the partial pressure of each dissolved gas. A simple demonstration of this process is the addition of common salt (NaCl) to a glass of carbonated beverage (Figure 1). Blood is an HCO3- containing solution and critically ill patients often develop a sudden onset of profound metabolic acidosis. We assume that a similar gas bubble forming process could be a reason for observed platelet count decline in critically ill patients after admission to the ICU. To evaluate this prediction, we investigated the correlation of metabolic acidosis severity and later platelet count trend in ICU patients.
**Methods:** We analysed the correlation between the severity of metabolic acidosis on admission and the subsequent evolution of platelet count in all ICU patients, admitted to our ICU in a 1-year period (1.1. to 31.12.2020). We observed the correlation between the lowest base excess (BE) of each patient in the 24 h before to 24 h after ICU admission and the relative change in platelet count in the following 2 days after ICU admission.
**Results:** Our study showed a weak to moderate correlation between the severity of metabolic acidosis (represented by a more negative BE) on ICU admission and the relative decrease in platelet count in the first 2 days after admission (represented by deltaT: a more negative deltaT represents a greater decrease in platelet count). The Pearson correlation coefficient is 0.34 with a 95% confidence interval 0.23–0.42, $p < 0.001$ (Graph 1).
**Conclusions:** Patients with a more negative BE on admission to the ICU tend to have a greater relative decrease in platelet count in the following days.

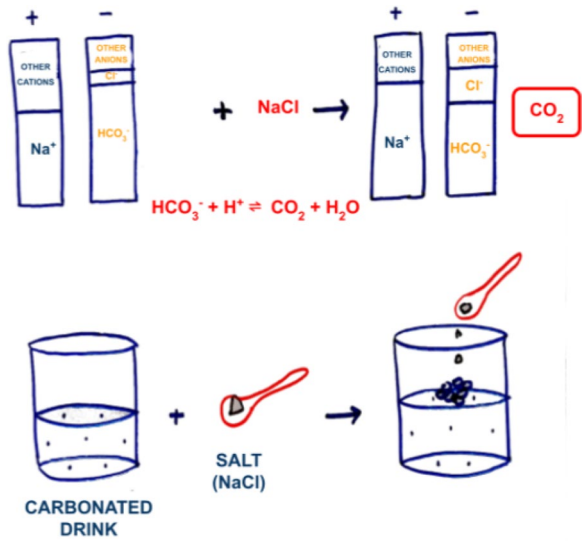
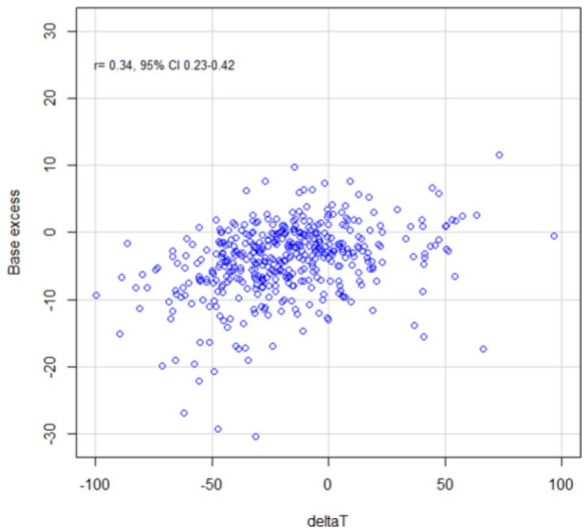



**Fig. 1 (abstract 001130)** After adding salt to a HCO3- containing solution, additional gas bubbles emerge




**Graph 1 (abstract 001130)** Correlation between the severity of metabolic acidosis (more negative BE) and the relative decrease in platelet count 2 days after ICU admission (deltaT). Legend: deltaT = (T2-T0)/T0 × 100; T0: platelet count on admission; T2: lowest platelet count on day 2 after admission to the ICU

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**Topic:** Transfusion and haemostasis disorders

## 001131

### Intensive care admission refusals, causes and outcomes. The prospective experience of a medical ICU in a Tunisian university hospital

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001131

**Introduction:** Critical illness remains a global issue, significantly contributing to in-hospital mortality. In Tunisia, a low-middle income country, critical care beds are significantly limited reaching a maximum of 8 intensive care unit (ICU) beds per 100 000 people owing to surge beds during the COVID-19 pandemic. This results in a number of critically ill patients being refused ICU-admission, potentially resulting in evitable deaths. ICU-refusal practices are rarely documented and non-escalation practices even less.
**Objectives:** To report the rates, reasons and outcomes of patients who were refused ICU admission.
**Methods:** A preliminary analysis of an ongoing prospective study in the medical ICU of Farhat Hached University Hospital, Sousse, Tunisia. These results are over the course of 8 months from August 1st 2023 to March 31st 2024. We included all consecutive patients for which the on-call intensivists were solicited for ICU-admission. Data were collected in a specific online case report form. Collected data included date and time of ICU solicitation, referral sources, patients' demographics, comorbidities, acute presentation diagnosis and severity, reason for refusal and patient outcome evaluated at day 5 of refusal.
**Results:** The ICU team was solicited for a total of 731 patients, and 511 (69.9%) were refused ICU admission. Patients refused for ICU admission had a mean (± SD) age of 61 ± 17.7 years; mostly male, 298 (58.3%); at least two comorbidities, 475 (93%); World Health Organization performance status score, 2.3 ± 1.2. Calls were mainly from the emergency department, 307 (60.1%) and medical wards, 145 (28.4%). Main reasons for solicitation were respiratory distress, 314 (61.4%); neurological distress, 72 (14.1%) and shock, 69 (13.5%). Reasons of refusal were no beds available, 281 (55.5%); too-well-to-benefit, 91 (17.8%); too-sick-to-benefit, 67 (13.1%); poor prognosis of the underlying condition, 39 (7.6%) and unavailable treatment options, 18 (3.5%). Non-escalation was decided for only 49 (9.6%) patients. Upon reevaluation at day 5 of refusal, overall mortality was at 26%. As for those who were refused for lack of ICU beds, 49 (17.4%) had died; 15 (5.3%), later admitted to our ICU; 52 (18.5%) transferred to another ICU and 147 (51.8%) still at the same department. As for those who were judged as too-sick-to-benefit, 30 (44.8%) patients had died by day 5 and 8 (8.8%) patients judged too-well-to-benefit had died.
**Conclusions:** The current study reveals concerning trends in critical care accessibility and outcomes. High refusal rates, predominantly due to ICU bed shortages, underscore systemic challenges in

healthcare delivery. Moreover, the observed elevated mortality post-refusal emphasizes the urgent need for interventions to enhance ICU capacity.

**Topic:** Health Services Research and Outcome

## 001132

### Potential mechanisms and microRNA interactions in thrombocytopenia among patients with sepsis-induced coagulopathy: a prospective, observational study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001132

**Introduction:** Sepsis often leads to complications in the coagulation system. The mortality rate for patients with sepsis-induced coagulopathy is twice that for patients with sepsis without coagulopathy [1]. Thrombocytopenia can occur during sepsis despite increased platelet consumption via various pathways or owing to decreased platelet production [2]. A higher rate of platelet count reduction, independent of the absolute platelet count, is associated with increased mortality and coagulopathy-induced complications [3].
**Objectives:** To identify the intricate mechanisms underlying thrombocytopenia in patients with sepsis-induced coagulopathy by identifying the genes involved in cellular signaling and microRNA (miRNA) regulation.
**Methods:** This single-center, prospective, observational study included 40 and 73 adult patients with sepsis in the exploratory and validation phases, respectively. Utilizing next-generation sequencing data analysis and software-driven assessment of intracellular signaling pathway activity, we identified mRNA candidates who exhibited different expression levels between patients with sepsis with reduced platelet counts and those without reduced platelet counts in the exploratory phase. The expressions of these candidate mRNA and miRNA that interact with them during the validation phase were quantitatively evaluated using real-time polymerase chain reaction. The protein levels were analyzed using enzyme-linked immunosorbent assay.
**Results:** An increase in the mRNA levels in the key genes, particularly those associated with the inflammasome pathway and cell adhesion pathway, was accompanied by a decrease in miRNA expression, suggesting a potential regulatory role of miRNAs in the reduction of platelet count. The findings of the protein-level analysis corroborate the upregulation of the main genes associated with a decrease in the platelet count [Figs. 1, 2, 3].
**Conclusions:** The activation of intraplatelet pyroptosis-related inflammasome and cell adhesion molecules increases platelet consumption despite the increase in the production of platelets in patients with sepsis who have decreased platelet counts. Furthermore, altered miRNAs may serve as indicators for predicting a decrease in platelet counts.

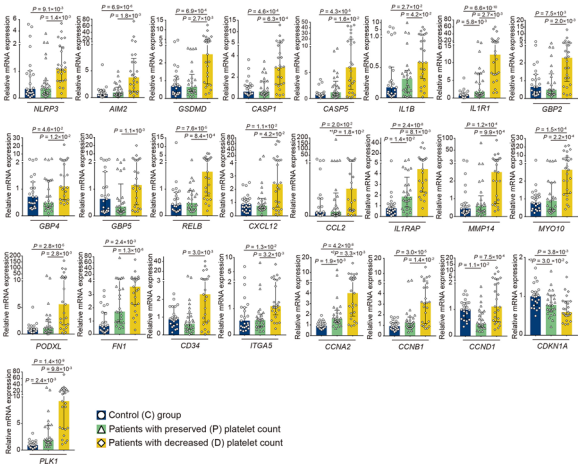


**Fig. 1 (abstract 001132)** Validated quantitative polymerase chain reaction of candidate mRNAs in the exploratory phase
The representative mRNAs related to inflammasome are shown. Values are normalized to the level of Actb and expressed as fold change with respect to the levels in the control (C) group.

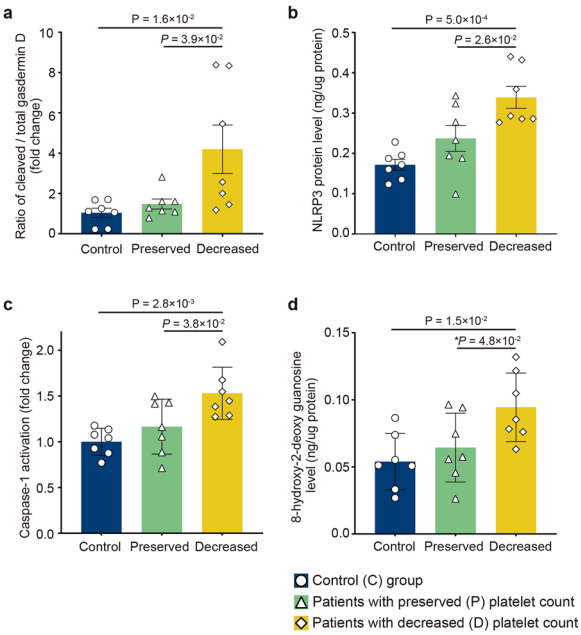


**Fig. 2 (abstract 001132)** Expression of protein levels of specific key genes. **a–c.** An increase in the protein levels of specific key genes that were upregulated in the inflammasome-pyroptosis pathway is confirmed. Values are expressed as fold change with respect to the levels in the control (C) group (**a** and **c**). **d.** Enzyme-linked immunosorbent assay was used to examine the levels of 8-hydroxy-2′-deoxyguanosine, a marker of the primary type of DNA damage caused by reactive oxygen species, in the three groups. *The *P*-value was the result for the preserved (P) vs. decreased (D) group according to the *t*-test. The value for one-way analysis of variance with Tukey's post hoc test was $7.7 \times 10{-}2$

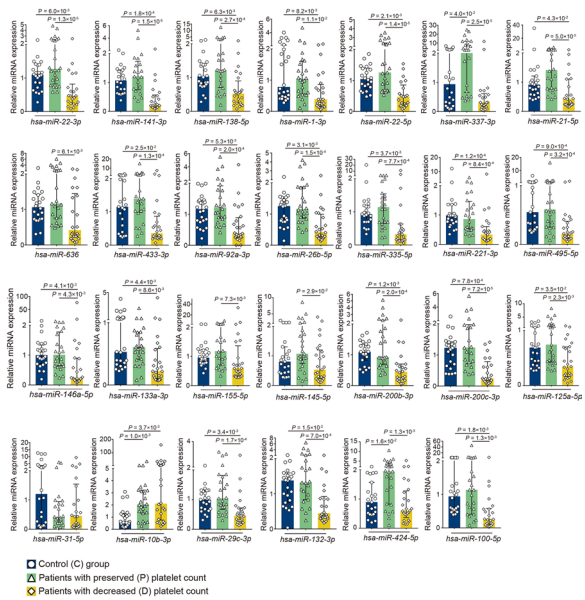


**Fig. 3 (abstract 001132)** Validated quantitative polymerase chain reaction of candidate miRNAs
The results of qualitative polymerase chain reaction (PCR) of microRNAs that were experimentally validated in miRTarBase as having a target for the nominated mRNAs. The values are normalized to spike in control (cel–miR–39) and expressed as fold change with respect to the levels in the control (C) group.

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**Topic:** Sepsis

## 001133 Toxic epidermal necrolysis: clinical characteristics and outcomes in a Tunisian tertiary critical care unit


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001133


**Introduction:** Toxic epidermal necrolysis (TEN) is a rare, potentially life-threatening mucocutaneous disease characterized by widespread epidermal necrosis and mucosal involvement. The incidence of toxic epidermal necrolysis estimated at 0.4 to 1.2 cases per million person-years.
**Objectives:** This study aimed to determine the clinical characteristics and outcomes of patients admitted to the intensive care unit (ICU) with a diagnosis of TEN.
**Methods:** A retrospective study was performed in the critical care of Farhat Hached University Hospital of Sousse between January 1995 and December 2023. Data were collected by reviewing the medical patients' charts. Clinical characteristics, causative drugs, treatment, and outcomes were retrospectively recorded. A multivariate regression analysis was used to identify risk factors for ICU mortality in those patients.
**Results:** Forty patients were recorded. Patients' characteristics were as follows: mean age, 45.8 ± 21.4 years; male, 11 (27.5%); median Charlson Comorbidity Index, 3.5 [0–4]; referred from dermatology department, 20 (50%) and mean SAPSII, 23.8 ± 11.44. The average affected skin area was 50 ± 20.44% of the total body surface area. Mucosal involvement was present in 33 (82.5%) patients, with oropharyngeal involvement in 29 (72.5%), ocular involvement in 21 (52.5%), and genital involvement in 25 (62.5%). Nikolsky sign was positive in 34 (85%) patients. The most common drugs that triggered TEN were antibiotics in 11 (27.5%) cases, allopurinol in 9 (22.5%) cases, anticonvulsants in 9 (22.5%) cases, non-steroidal anti-inflammatory drugs in 9 (22.5%) cases, antipsychotic drugs in 1 (2.5%) case and paracetamol in 1 (2.5%) case. Eighteen (45%) patients required invasive mechanical ventilation (IMV), 10 (25%) vasoactive drugs, and 2 (5%) renal replacement therapy. The mortality rate was 16 (40%), which aligned with the predicted mortality based on the SCORTEN score (a severity-of-illness scoring system for TEN prognosis).
Univariate analysis revealed the following factors to be associated with fatal outcome: skin superinfection (50% vs 4.2%, $p = 0.001$), IMV (12.5% vs 93.8%, $p = 0.001$) and acute renal failure (37.5% vs 75%, $p = 0.02$).
Skin superinfection was the only independent factor of ICU mortality (OR, 23; 95% CI [2.47–213.7]; $p = 0.006$).
**Conclusions:** The present study demonstrated a severe prognosis in TEN patients. Common medications implicated in TEN were antibiotics, allopurinol, anticonvulsants, and non-steroidal anti-inflammatory drugs. Skin superinfection was identified as the sole independent factor associated with mortality.

**Topic:** Systemic diseases

## 001135 Inhibition of the Indoleamine 2,3-dioxygenase 1 in murine endotoxemia


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001135


**Introduction:** The expression of indoleamine 2,3-dioxygenase 1 (IDO1) is upregulated in sepsis and its activity correlates with the degree of hypotension and mortality (1,2). IDO1 catalyzes the conversion of tryptophan to kynurenine, a proposed systemically active vasodilator.
**Objectives:** This study aimed to evaluate the effects of IDO1 inhibitors on endotoxemia.
**Methods:** In vitro, the IDO1 inhibitors Epacadostat (Epa), Linrodostat (Lin) or PF-06840003 were added to primary human pulmonary arterial endothelial cells challenged with interferon-γ. After 48 h, kynurenine in the supernatant was measured photometrically using Ehrlich's reagent.

In vivo, mice were injected intraperitoneally (i.p.) with lipopolysaccharide (LPS). Mice received either Epa, Lin, PF or the vehicle i.p. simultaneously. After 18 h, invasive hemodynamic monitoring and mechanical ventilation were established. Following exsanguination, serum and lungs were frozen in liquid nitrogen. Serum levels of tryptophan and kynurenine were measured using high-performance liquid chromatography coupled with mass spectrometry. Expression of IDO1 in lung homogenates was assessed by Western blot. Serum levels of inflammation-associated cytokines were measured using a fluorescence-encoded multiplex bead assay (LEGENDPLex; Biolegend).

**Results:** All three IDO1 inhibitors suppressed kynurenine production in the inflammatory arterial endothelial cell model in a monotonically increasing dose–response relationship (Fig. 1 A, B, C).

In mice, LPS led to a reduced mean arterial blood pressure (66 ± 15 mmHg vs 87 ± 11 mmHg; $p = 0.03$; Fig. 2A) and an elevated heart frequency (551 ± 55/min vs. 367 ± 81/min; $p < 0.01$; Fig. 2B). Administration of Lin attenuated the decrease in mean arterial blood pressure (Lin: 96 ± 11 mmHg; $p = 0.01$; Fig. 2E), whereas administration of Epa exhibited a similar trend but did not reach statistical significance (85 ± 8 mmHg; $p = 0.09$; Fig. 2E). None of the inhibitors showed any effect on the elevated heart rate (Epa: 533 ± 44/min, Lin: 550 ± 34/min, PF: 494 ± 43/min; Fig. 2F).

The serum of endotoxemic mice showed a tenfold increase in the kynurenine/tryptophan ratio ($p < 0.0001$; Fig. 2C) which was attenuated by all three inhibitors (increase under Epa treatment 3.4-fold, Lin: 4.7-fold, PF: 4.3-fold; $p < 0.0001$; Fig. 2G). The analysis of lung tissue confirmed the up-regulation of IDO1 expression after LPS administration (Fig. 2D).

Endotoxemic animals exhibited a notable increase in inflammatory cytokines IL-23, IL-1α, IFN-γ, TNF-α, MCP-1, IL-12p70, IL-1β, IL-10, IL-6, IL-27 and GM-CSF. Application of Epa or PF seemed to modulate this inflammatory cytokine pattern in a complex way.

**Conclusions:** This study confirms the suppression of kynurenine production by Epa, Lin and PF in both a cell and animal model of inflammation and endotoxemia. In addition, administration of Epa or Lin resulted in the attenuation of LPS-induced hypotension, suggesting a potential therapeutic strategy for managing sepsis-associated hypotension.

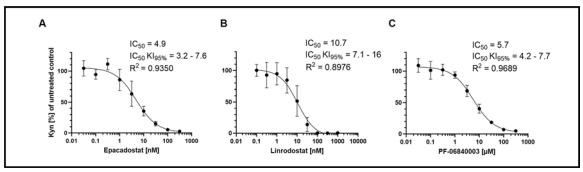


**Fig. I (abstract 001135)** **A–C** Dose–response curves of Epacadostat, Linrodostat and PF-06840003 after challenge of hPAEC with 50 ng/ml IFN-γ; Epa and PF $n = 4$, Lin $n = 6$.

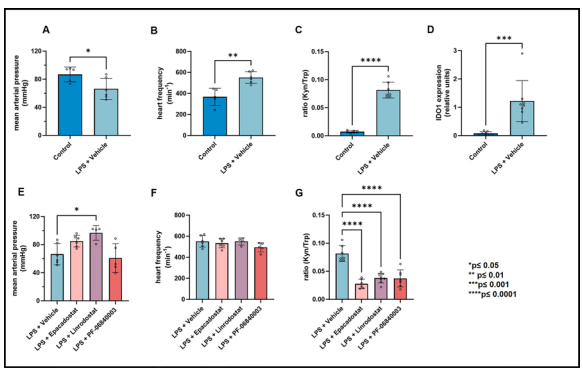


**Fig. II (abstract 001135)** **A**, **E** Mean arterial pressure, invasively measured after instrumentation of animals; $n = 5–6$ per group. **B**, **F** Heart frequency, invasively measured after instrumentation of animals; $n = 5–6$ per group. **C**, **G** Kyn/Trp ratio in sera of animals at the end of experiment, HPLC; $n = 6–7$ per group. **D** IDO1 expression in lung homogenates in relation to vehicle group, Western blot; $n = 6–8$ per group

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3. This project was supported by the Doctoral Thesis Support Scholarship of the Faculty of Medicine, University Leipzig.

**Topic:** Sepsis

## 001136

### Treatable traits (TTs) as a novel comprehensive approach to clinical decision-making, management and prognostication in medical intensive care: a retrospective analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 001136

**Introduction:** At the era of precision medicine, TTs have emerged as an interesting approach that could enhance clinical decision-making procedures and define early therapeutic targets, ultimately improving prognosis by promoting personalized care.

**Objectives:** To describe the typology, prevalence, and distribution of treatable traits among medical critical care patients and to analyze associations with diagnoses and outcomes.

**Methods:** This is a retrospective analysis of prospectively collected data in a medical intensive care unit throughout a 2-year period (2022–2024). All data were collected on a predefined specific data collection form, including patients' characteristics and outcomes. Predefined TTs and their respective biomarkers were identified within the patients' EMRs. Univariate analysis was used to characterize patients and describe the typology, prevalence, and distribution of TTs. Flows and correlations between TTs and diagnoses were performed and depicted in a chord diagram. A binary logistic regression was used to identify TTs independently associated with ICU mortality. TTs with the highest OR were referred to as TTs with leverage effect, and the remaining as TTs of interest.

**Results:** 710 patients were included (respiratory, 456 (64.2%); cardiocirculatory, 88 (12.4%); others, 154 (21.7%)). 239 (33.7%) patients underwent IMV. The mean LOS was 8.54 ± 8.59. 142 (20%) patients were died. 54 TTs were identified in four domains: underlying condition, clinical characteristics, physiological condition, and biological abnormalities. Obstructive ventilatory disorder, rapid-shallow breathing, hyperinflation, and peripheral hypoperfusion were common in this medical intensive care setting. Different TTs correlate with the different diagnostic spectra (Fig. 1). Multivariate analysis identified ten TTs to be independently associated with mortality. Among the strongest, referred to as TTs with leverage effect, were sepsis, peripheral hypoperfusion, arrhythmia, dysoxia, AKI, and seizures (OR [95% CI], p: 3.4 [1.9, 6.1], < 0.0001; 2.7 [1.5, 4.9], 0.001; 4.1 [2.1, 7.9], < 0.0001; 2.8 [1.6, 5], < 0.0001; 3.8 [2.2, 6.6], < 0.0001; 2.9 [1.1, 7.7], 0.036). The remaining TTs were referred to as TTs of interest, respectively, hypoxemia and right heart failure (OR [CI 95%], p: 1.9 [1.1, 3.3], 0.022; 1.9 [1.1, 3.7], 0.036).

**Conclusions:** In this medical ICU setting, the concept of treatable traits encompasses a wide myriad of factors. While some treatable traits are common, others are shared across various diagnoses. When evaluating outcomes, certain traits may be considered of interest, while others may exhibit a leveraging effect.

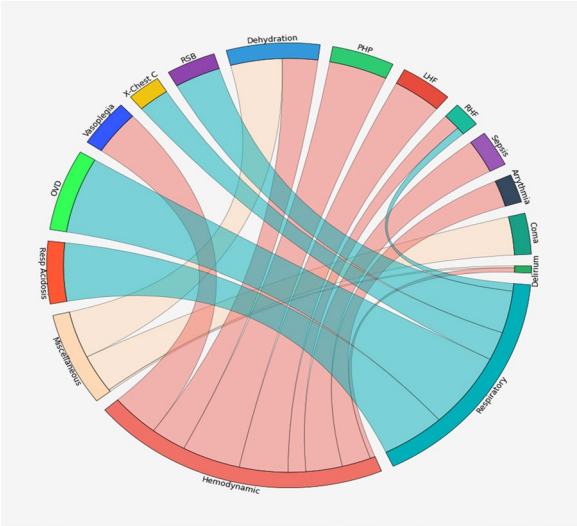


**Fig. 1 (abstract 001136)** Chord diagram plotting correlations between treatable traits and diagnoses
Resp acidosis respiratory acidosis, OVD obstructive ventilator disorder, X-chest C X-Chest ray consolidations, RSB rapid shallow breathing, PHP peripheral hypoperfusion, LHF left heart failure, RHF right heart failure.

**Topic:** Information systems and Data Science

## 001137

### Lung protective ventilation adherence in two UK intensive care units

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001137

**Introduction:** Lung protective ventilation is a crucial aspect of the management for patients who require mechanical ventilation in intensive care. It is particularly important in acute respiratory distress syndrome (ARDS). Several national (1, 2) and international guidelines (3) stress the importance of adhering to safe pressures (plateau pressure [Pplat] < 30 cmH2O) and tidal volumes (6-8 mL/kg predicted body weight [PBW]) to improve outcomes in mechanically ventilated patients.
**Objectives:** We undertook an audit of lung protective ventilation in two separate intensive care units within our hospital trust in order to determine our adherence to the standards set out in the UK Faculty of Intensive Care Medicine's Guidelines for the Provision of Intensive Care Services1 (GPICS).
**Methods:** We conducted a retrospective audit of all mechanically ventilated patients admitted to both intensive care units over a 3-month period (Nov 2022–January 2023). We excluded chronically ventilated spinal injuries patients, patients extubated immediately postoperatively and patients without a recorded weight. Data collected included demographics, diagnosis, ICU mortality, presence of ARDS, hours of mechanical ventilation subdivided by respiratory mode (Hamilton ventilator modes used: DuoPAP, Adaptive support ventilation [ASV], airway pressure release ventilation [APRV] and spontaneous), hours of mandatory (i.e. no spontaneous effort) ventilation, hours of Pplat ≥ 30 cmH2O, hours of tidal volume (VT) > 6 mL/kg PBW (for those with ARDS) and hours of VT > 8 mL/kg PBW (for those without ARDS). Statistical analysis was conducted using Fisher's exact test.
**Results:** During the time period in question, 70 patients requiring mechanical ventilation were admitted to our ICUs. 9 patients were excluded (chronically ventilated spinal patients—2, patients extubated immediately post op—5, patients without a recorded weight—2) leaving 61 patients for analysis. The mean age of this population was 62. 41 were medical patients and 20 were surgical patients. 7 patients fulfilled the Berlin 2012 criteria for ARDS of whom 5 received a diagnosis of ARDS during their ICU stay. Patients were ventilated for a median of 60 h and 14 patients (23%) were mechanically ventilated for more than 1 week. Overall mortality was 39%.
ARDS patients had a Pplat ≥ 30 cmH2O for 19.5% of total ventilated hours. This was significantly higher in spontaneous ventilation mode on the ventilator compared to ASV, APRV and DuoPAP. (31.5% vs 11.8% 12.2% and 12.2% respectively, Fisher's exact test $p < 0.001$).
ARDS patients had VT > 6 mL/kg PBW for 96.7% of mandatory ventilated hours and this was not significantly different between ventilator modes.
Patients without ARDS had a Pplat ≥ 30 cmH2O for 2.9% of total ventilated hours. This was significantly lower in spontaneous ventilation mode compared to DuoPAP and ASV. (0.9% vs 4.7% and 3.8%, Fisher's exact test $p < 0.0001$).
Patients without ARDS had VT > 8 mL/kg PBW for 26.8% of mandatory ventilated hours. This was significantly higher in DuoPAP compared to ASV (29.9% vs 16.8% Fisher's exact test $p < 0.0001$).
**Conclusions:** This audit highlighted a worrying lack of adherence to lung protective ventilation in our patient population. This was particularly pronounced in patients with ARDS for whom the vast majority of mandatory breaths delivered were in excess of 6 mL/kg PBW and unsafe pressures were delivered in one in 5 breaths. In non-ARDS patients, the closed-loop ventilation mode ASV was found to be significantly more likely than DuoPAP to deliver safe VT < 8 mL/kg PBW. On the basis of these results, we have implemented a package of remedial interventions including: first-line use of a volume-controlled ventilation mode in ARDS patients, first-line use of ASV in non-ARDS patients and wide ranging multidisciplinary education. We plan to reaudit in the near future to ensure that these measures have been successful in improving the delivery of lung protective ventilation in our intensive care units.

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4. No money was received for this project

**Topic:** Acute respiratory failure and mechanical ventilation

## 001139

### Ventilatory ratio trends in predicting non-invasive ventilation outcomes in critically ill COPD patients: a preliminary analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001139

**Introduction:** Optimizing ventilation strategies is crucial in critically ill COPD patients on NIV. Pulmonary hyperinflation may worsen the already compromised gas exchange by promoting alveolar dead space through alveolar capillary compression. Ventilatory ratio (VR), offering insights into gas exchange dynamics, is correlated to increased dead space ventilation. Despite the rationale supporting the use of VR as a prognostic marker in acute exacerbation of COPD (AECOPD), its clinical utility in guiding NIV management remains incompletely elucidated.
**Objectives:** To investigating the utility of ventilatory ratio trends in predicting NIV outcomes in COPD patients admitted to the ICU.
**Methods:** This is a preliminary analysis of an ongoing prospective observational trial in the medical ICU of Farhat Hached teaching hospital, Sousse, Tunisia, including all consecutive patients with AECOPD requiring NIV. The trial started on March, 1st, 2022 and the current analysis is performed after 22 months, on December 31st, 2023. Demographic and baseline clinical characteristics were collected. Clinical parameters, NIV-related variables and arterial blood gases were recorded at the start of NIV and hourly until H4. NIV failure was defined as the need for invasive mechanical ventilation. Receiver operating characteristic (ROC) curve analysis was employed to evaluate discriminative properties. Chi-square was used to compare categorical variables and Mann–Whitney *U* test to compare continuous variables. Areas under the ROC curves were compared to examine discriminative properties and identify cutoffs for mortality prediction.
**Results:** 200 were included in this preliminary analysis. Mean ± SD age, 67.6 ± 10.1 years; Charlson Comorbidity Index, 4.1 ± 1.4; mainly GOLD E, 163 (81.5%); baseline dyspnea mMRC 3–4, 124 (62%); under home NIV, 57 (28.5%) and long-term oxygen, 42 (21%). On ICU-admission: SAPS II, 28.9 ± 5.6; high work of breathing, 135(67.5%); hypercapnic encephalopathy, 181 (90.5%); pH, 7.30 ± 0.1 and PaCO2, 66.6 ± 13.3 mmHg. NIV failure, 58 (29%); death, 17 (8.5%). On univariate analysis, VR was significantly associated to NIV failure (median [IQR]) (overall, NIV success group, NIV failure group, p) at H1 of NIV (3.3 [2.7–4.1], 3.3 [2.6–4.1], 3.6 [3.1–4.2], $p = 0.035$); H2, (3.5 [2.8–4.3], 3.3 [2.7–3.9], 4.1 [3.5–5.3], $p < 0.000$); H3, (3.1 [2.6–4.4], 2.9 [2.5–3.9], 4.1 [3.3–5.9], $p < 0.000$) and H4, (3.1 [2.4–4.2], 2.8 [2.3–3.4], 4.6 [4–7.3], $p < 0.000$). ROC curves for VR at H2 and H4 are displayed in Figure 1. Cutoff values for VR at H2 and H4 were, respectively, 3.86 and 3.61. At H2 VR < 3.86 significantly associated to NIV success [86 (81.1%) vs 20 (18.9%), $p = 0.001$] as well as at H4, VR < 3.61 [116 (92.8%) vs 9 (7.2), $p < 0.000$].
**Conclusions:** In this preliminary analysis, we found that elevated VR values were significantly associated with NIV failure in critically ill COPD patients, with identified cutoff values providing potential prognostic markers at different time points during NIV initiation.

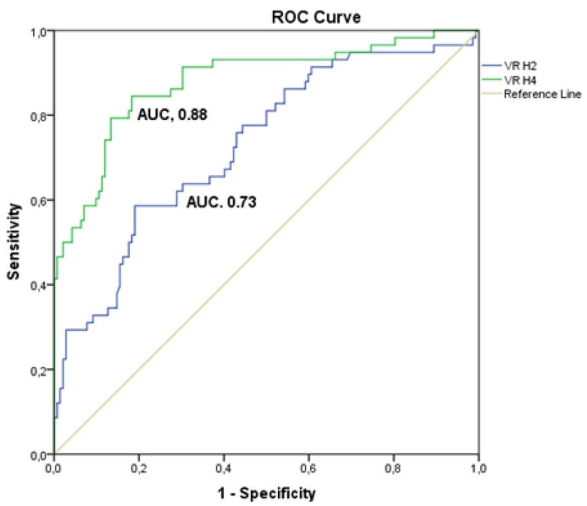


**Fig. (abstract 001139)** ROC receiver operating characteristic, AUC area under the ROC curve, VR ventilatory ratio

**Topic:** Acute respiratory failure and mechanical ventilation

**001141**

## Disparities in arterial blood gas laboratory test ordering by race, ethnicity, and sex persist beyond illness severity

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001141

**Introduction:** The accuracy of pulse oximetry readings varies across races, which underscores the importance of routine arterial blood gas (ABG) testing, the gold standard for assessing arterial oxygen saturation. This study investigates the occurrence, timing, and frequency of ABG tests among critically ill patients.
**Methods:** The study analyzed data from three intensive care unit (ICU) electronic health records databases: MIMIC-III, MIMIC-IV, and eICU-CRD, encompassing records from 2001 to 2019 from 209 U.S. hospitals or ICUs. The analysis included the' first ICU admission of adult patients lasting longer than 12 h. Patients with missing demographic information or sequential organ failure assessment (SOFA) score were excluded.
The study evaluated three primary outcomes related to ABG tests during ICU admissions: the incidence of ABG test; the time to first ABG test; and the frequency of subsequent ABG tests. We adjusted for potential confounders, including illness severity (SOFA), hospital practice (categorized by US region, number of beds, and teaching status), and demographics (age, sex, race and ethnicity). To assess the likelihood of undergoing an ABG test, multivariate logistic regression models were used to compare patients with and without ABG tests across the above-mentioned covariates. The analysis of time until the first AGB test employed fine-gray competing risk models, calculating hazard ratios while considering ICU discharge and mortality as competing risk, with right-censored observations. Finally, multivariate linear regressions were used to compare the frequency in ABG testing among ICU admissions with at least one ABG test.
**Results:** 184,961 ICU stays were considered (MIMIC-III: 14,427; MIMIC-IV: 53,150; eICU-CRD: 117,384). 3,798 (2.1%) patients were Asian, 22,324 (12.1%) Black, 7,439 (4.0%) Hispanic/Latino, and 151,400 (81.9%) White. The median age was 66.0 years [IQR: 54.0, 77.0]; the median SOFA at admission was 4.0 [IQR: 2.0, 6.0]. Among these patients, 51,971 (28.1%) had an ABG collected, with the first ABG test occurring at a median of 4.9 [IQR: 1.3,15.4] hours after admission, and a median average rate of 0.9 [IQR: 0.4,1.6] ABGs per day. ICU mortality was observed in 6,310 (3.4%) patients.
Disparities were noted in the likelihood of undergoing ABG testing among racial groups and sex ($p < 0.0001$). Compared to White and male patients, Asian, Black and female patients were significantly less likely to undergo ABG testing [OR (95% CI): Asian, 0.848 (0.783–0.920); Black, 0.770 (0.743–0.799); Female, 0.914 (0.894–0.935)]. In addition, these groups experienced delays in the first ABG test [HR (95% CI): Asian, 0.860 (0.804–0.919); Black, 0.786 (0.762–0.811); female, 0.927 (0.910–0.944)]. Among patients with at least one ABG, Black and female patients had lower ABG ordering rates [coefficients (95% CI): Black, −0.093 (−0.130, −0.056); female, −0.074 (−0.097, −0.051)].
**Conclusions:** Black and female patients were less likely to have an ABG ordered, had a greater delay to the first ABG, and a lower rate of ABGs, compared to White and male patients.
Clinical implications:
Considering recent literature on similar disparities regarding oxygen therapy and associated outcomes, our findings add a new layer of complexity to inequities in oxygen management.

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3. NIMHD 5U54MD012530

**Topic:** Health Services Research and Outcome

## 001142

### An analysis of potassium supplementation practices in a large cardiac surgical intensive care service in London, UK

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001142

**Introduction:** Serum potassium monitoring and supplementation in intensive care (ICU) settings is well established to improve outcomes (1). In our service, a target a range of 4.5–5.0 mmol/L is recommended to reduce the incidence of post-operative atrial fibrillation (2).
While potassium supplementation has proven benefit, use of concentrated potassium products via the intravenous (IV) route is associated with patient safety risks, and has significant cost and environmental consequences (3).
This service evaluation reviewed potassium supplementation practices during the first 72 h of ICU admission following cardiac surgery.
**Objectives:**
1. Evaluate the frequency of potassium supplementation and the potassium level incrementation achieved.
2. Determine the choice of route for potassium supplementation in the first 24 h, compared to 24–72 h following ICU admission.
3. Determine the cost impact of potassium supplementation and potential cost-saving opportunities.

**Methods:** This study was a retrospective evaluation investigating data from surgical ICU admissions during a 2-month period.
Data were extracted from electronic records, de-identified, password protected, and stored in Microsoft Excel. Data included: potassium formulation(s) (route and dose) during first 72 of admission, and potassium levels (before and throughout the following 12 h). Data were analysed using Microsoft Excel.
**Results:** During the study period, 45 patients (86.5%) received potassium supplementation, with each patient receiving an average of 5.4 doses and most doses administered via IV infusion* (Figure 1).
Patients receiving IV potassium had an average pre-supplementation potassium of 3.99 mmol/L and increased to 4.29 mmol/L at 6–12 h (average increase: 0.296 mmol/L). Patients receiving enteral potassium** had an average pre-supplementation potassium of 3.92 mmol/L and increased to 4.27 mmol/L at 6–12 h (average increase: 0.352 mmol/L).
Expenditure on IV potassium products was £1,686.42 (243 doses), while in this same period, £2.09 was spent on enteral products (15 doses).
*IV potassium infusion administered as 20 mmol in 100 mL sodium chloride 0.9%.
**Enteral potassium doses ranged from 12 mmol to 36 mmol per dose.
**Conclusions:** Potassium supplementation occurred routinely with a comparable increase in potassium level observed with both IV and enteral formulations. Analysis of a greater sample size may produce more reliable efficacy comparisons.
While most patients would have had an enteral route available within 24 h of admission, most patients remained on IV potassium formulations throughout the 72-h period.
In this cohort, switching half of IV potassium doses given in the 24–72 h period to enteral would have reduced total expenditure by 25% (£415.84).
Although not defined in this study, the environmental impact of IV infusions is also considerable, given the number of doses used.
Greater use of enteral supplementation could significantly reduce cost, plastic waste and patient safety risk while having a comparable clinical effect.

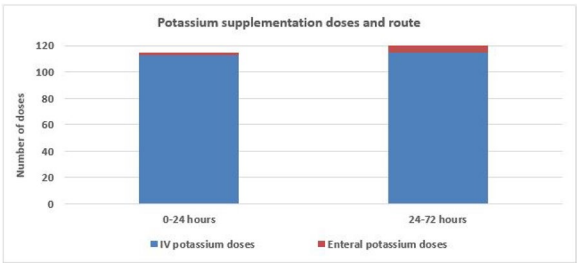


**Fig. 1 (abstract 001142)** Number and administration route of potassium supplementation doses given from 0 to 72 h of admission to cardiac surgical ICU

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**Topic:** Perioperative care

## 001143

### SepsisSCA: a comprehensive database integrating single-cell transcriptome atlas of sepsis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001143

**Introduction:** Sepsis is a leading cause of mortality in the intensive care unit. To date, treatment of sepsis is limited by heterogeneity of immune response and incomplete description of cellular atlas1. Prior bulk-sequencing have identified the host-gene expression profiling of sepsis, but have not resolved signatures in transcriptional states of specific cell types2. Recent advances in single-cell RNA sequencing (scRNA-seq) technology provides an unprecedented opportunity to comprehensively characterize the heterogeneity of immune system in sepsis but poses computational challenges on integrating and utilizing the massive published datasets to inform treatment. Thus, there is an urgent need to build a dedicated resource to decode the various function of immune cells and parenchymal cells in sepsis.
**Objectives:** We developed SepsisSCA (Sepsis Single Cell Atlas), the dedicated database that aims to comprehensively explore the cellular signatures of sepsis at single-cell level.
**Methods:** We systematically collected sepsis-related scRNA-seq datasets in human and mouse from Sequence Read Archive (SRA), Gene Expression Omnibus (GEO). For each dataset, we carefully read the original paper, if available, and extracted the metadata, including the tissue types and potential pathogens, sites of infection. For each dataset, we performed several basic analysis of high-quality cancer single-cell expression, including PCA and t-SNE analysis.
**Results:** We developed SepsisSCA, a large-scale curated database that aims to comprehensively explore distinct functional cellular states of sepsis at single-cell level. SepsisSCA integrates single-cell transcriptomic profiles of nearly 500 thousand cells from 12 high-quality sepsis datasets across 6 tissue types. All the data were uniformly processed with a standardized workflow, including quality control, batch effect

removal, clustering, cell-type annotation, differential expression analysis and functional enrichment analysis. SepsisSCA provides interactive gene expression visualization across multiple datasets at the single-cell level or cluster level, allowing systematic comparison between different cell-types, patients, tissue origins.
**Conclusions:** In summary, SepsisSCA provides a user-friendly interface for systematically visualizing, searching and downloading gene expression atlas in the sepsis from multiple tissues, enabling fast, flexible and comprehensive exploration of sepsis.

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**Topic:** Sepsis

## 001144

### Stratifying risk in ACLF-3 patients for liver transplantation: the impact of cardiac and respiratory failures on 1-year post-transplant outcomes

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001144

**Introduction:** Patients with acute-on-chronic liver failure grade 3 (ACLF-3) are a severely ill patient group [1–3], with 1-year post-liver transplantation (LT) survival rates varying between 50 and 80% [1, 5, 6]. This suggests that some ACLF-3 patients may be unsuitable candidates for LT, a challenge highlighted in the latest European Association for the Study of the Liver (EASL) guidelines [5].
**Objectives:** We aimed to investigate whether certain organ failure (OF) combinations in ACLF-3 patients are associated with higher 1-year post-LT mortality, to improve risk assessment and LT candidacy decisions. We hypothesized that combinations involving circulatory and/or respiratory failures would present worse outcomes. Beyond survival, we also sought to evaluate 1-year post-LT functional status according to OF types.
**Methods:** We used the Scientific Registry of Transplant Recipients (SRTR) database, selecting patients who met the ACLF-3 criteria as per the CLIF-EASL definitions at the time of LT. We categorized patients based on their OF type at the time of LT into three groups: 1) cardiac failure with other OF; 2) both cardiac and respiratory failures with other OF; 3) all other possible combinations. We conducted Kaplan–Meier survival analysis and multivariable Cox regression models adjusting for sex, age, and the number of OF. For functional status 1-year post-LT, we used the Karnofsky Performance Status and performed multivariable logistic regression models, adjusting for sex, age, and pre-LT functional status.
**Results:** We included 5,054 ACLF-3 patients, among which 33.7% were women. Within this cohort, 14% (728/5,054) died within 1-year post-LT. The distribution of patients across the study groups was: 429 patients had cardiac failure with other OF; 1,268 had both cardiac and respiratory failures with other OF; and 3,357 had all other possible combinations of OF. No patients had respiratory failure without accompanying circulatory failure. Our Kaplan–Meier analysis (Figure 1) and Cox models showed that patients with both cardiac and respiratory failures with other OF experienced higher post-LT mortality compared to the other groups. The 1-year hazard ratio (HR) for death for patients with both cardiac and respiratory failures with other OF was 1.51 (95% CI 1.07–2.13, $p=0.02$), compared with those with cardiac failure plus other OF; and 1.27 (95% CI 1.03–1.57, $p=0.02$), compared with those with all other possible combinations of OF. Within the group of cardiac, respiratory, and other OF, there was no significant difference in HR between any combination. Having both cardiac and respiratory failures with other OF was associated with worse functional status compared with those with cardiac failure plus other OF (OR 1.35, 95% CI 1.16–1.52, $p<0.01$).
**Conclusions:** Our findings highlight the importance of OF combinations in assessing LT candidate risk in ACLF-3 patients. Specifically, having both respiratory and circulatory failure at LT time is a poor prognostic sign, regardless of the total number of OF.

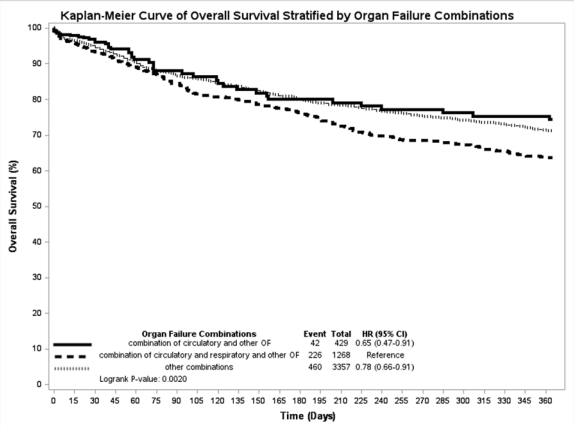


**Fig. 1 (abstract 001144)** Survival analysis of different groups of organ failures and 1-year mortality

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001145

### Neurological complications in adult ECMO patients—retrospective cohort study from an ECMO center

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**Introduction:** Neurological complications represent significant challenges in adult patients undergoing treatment with extracorporeal membrane oxygenation (ECMO) support [1]. According to the Extracorporeal Life Support Organization (ELSO), neurological complications in patients on ECMO support are defined as brain death, seizures, ischemic cerebral vascular events, intracerebral hemorrhage, or diffuse cerebral ischemia [2]. In this retrospective study, we aim to shed some light on the outcome and association between the primary diagnosis of patients in ECMO and neurological complications.
**Objectives:** To characterize the neurological complications and primary diagnosis of adult patients treated with ECMO in a midsize ECMO center.
**Methods:** We conducted a retrospective cohort study based on the review of the clinical records of all patients treated with ECMO in a referral ECMO centre in the Lisbon area. The timeframe for this study is January 2016 until December 2022.
**Results:** We identified 17 in 226 (7.5%) patients with neurological complications, 12 were male (70%). The mean time on ECMO support in days was 22 days with the maximum of 86 days. All patients identified with neurological complications were treated with veno-venous (VV) ECMO. The main diagnosis was pneumonia ($n=16$) and pulmonary embolism ($n=1$). The main neurological complications were intracranial haemorrhage ($n=10$) ischemic stroke ($n=3$) and seizures ($n=4$). A total of 9 patients died (52%). To assess the association between primary diagnostic and neurological complications in patients treated with ECMO, we have apply the Fisher's Exact Test and $p \approx 0.4118$.
**Conclusions:** In this cohort of adult ECMO patients, neurologic complications were associated with high morbidity and mortality, and in ao population, only related with VV ECMO.
We conclude that there is not enough evidence to conclude the existence of a significant association between the primary diagnosis (pneumonia vs pulmonary embolism) and the development of neurological complications during ECMO support.
Our findings emphasize the relevance of vigilant monitoring and proactive management strategies in order to mitigate these complications. Further research is of paramount to address this aspect and improve patient management.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001146

### Post-hoc analysis of the European multicenter AB-PSP-001 study: risk stratification grid of the pancreatic stone protein as a predictive biomarker for nosocomial sepsis diagnosis. Efficacy of PSP in combination with C-reactive protein on the day of sepsis

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**Introduction:** Sepsis management requires accurate and timely diagnosis which remains clinically challenging. In this context, biomarkers might facilitate the identification of patients suffering from sepsis. Pancreatic stone protein (PSP), a remote damage sensing protein, demonstrated promising sensitivity (Se) and specificity (Sp) for sepsis diagnosis. In the study AB-PSP-001 [1], PSP showed a strong association with the clinical diagnosis of sepsis, with a continuous increase in PSP level up to 3 days before diagnosis compared to C-reactive protein (CRP) and PCT.
**Objectives:** This post-hoc analysis aims to assess the Se and Sp of PSP as a predictive tool for sepsis diagnosis before the onset of clinical symptoms with a risk stratification grid at different cutoff levels of PSP and its combination with CRP on the day of sepsis onset. An independent endpoint adjudication committee of 3 ICU experts blinded to PSP, CRP and PCT results evaluated all patients for sepsis onset.

**Methods:** This study involved 14 ICUs in France, Switzerland, Italy, and United Kingdom. Adult ICU patients at risk of nosocomial sepsis and expected to stay at least 7 days and/or to be mechanically ventilated for at least 5 consecutive days were included. A total of 243 participants (190 non-septic and 53 septic patients) were recruited. PSP was measured daily.
We evaluated the Se and Sp of PSP measurements and devised a risk stratification grid (Table 1) for sepsis diagnosis by employing various PSP cutoff levels that could be useful in clinical practice. PSP combined with CRP on the day of sepsis (Day 0) was also evaluated.
**Results:** PSP level ≥ 300 ng/ml significantly enhances the likelihood of sepsis diagnosis with a Sp as high as 83%. In addition, if the level of PSP is ≤ 100 ng/ml prior to the onset of sepsis, it is likely to rule out sepsis. These findings indicate that PSP has potential utility as a predictive biomarker for sepsis.

**Table 1 (abstract 001146)** Conversion table of PSP concentrations into classes expressing sepsis risk. Se and Sp from 3 days before the endpoint adjudication committee diagnosis of sepsis

| PSP concentration [ng/ml] | Risk level | | Day-3 | Day-2 | Day-1 | Day 0 |
|---|---|---|---|---|---|---|
| ≥ 100 | Moderate risk of sepsis | Se | 58% | 67% | 76% | 81% |
| | | Sp | 43% | | | |
| ≥ 200 | High risk of sepsis | Se | 42% | 31% | 57% | 55% |
| | | Sp | 74% | | | |
| ≥ 300 | Very high risk of sepsis | Se | 33% | 27% | 39% | 42% |
| | | Sp | 83% | | | |

PSP combined with CRP on the day of sepsis diagnosis also shows promising result with an improved ROC curve (Figure 1). This combination could be a useful biomarker association.
**Conclusions:** The results of this post-hoc analysis of the AB-PSP-001 study highlight the potential of PSP as a practical tool for early diagnosing sepsis. PSP + CRP could enhance the current diagnostic procedures for sepsis by providing a more accurate diagnosis. Further analyses are needed.

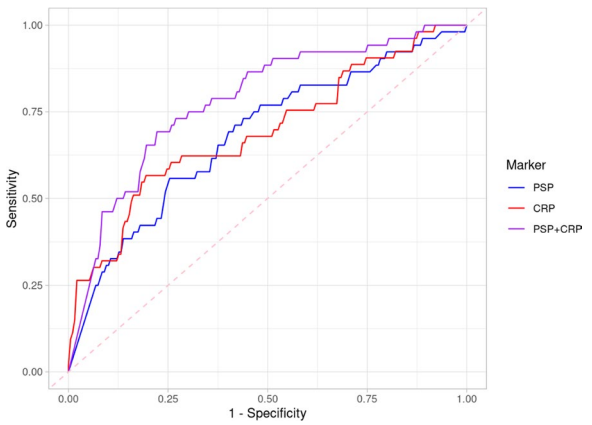


**Fig. 1 (abstract 001146)** Superposition of the ROC curve of PSP, CRP and PSP + CRP

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**Topic:** Sepsis

## 001147

## The incidence of positive lung ultrasound score and/or positive venous excess ultrasound score in critically ill patients: an observational study

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**Introduction:** Lung ultrasound (LUS) and the venous excess ultrasound score (VExUS) are promising tools for evaluating fluid overload (1, 2). LUS assesses pulmonary oedema, whereas VExUS assesses venous congestion. These are similar yet different entities with a possible common pathophysiological pathway. It is unknown, how many critically ill patients with pulmonary oedema also have venous congestion.
**Objectives:** The aim of this study is to investigate the incidence of positive and negative LUS and VExUS findings in the intensive care unit (ICU) and to describe the incidence of 30-day mortality, need for mechanical ventilation and renal replacement therapy for different scores.
**Methods:** This is a preliminary analysis of an ongoing prospective cohort study performed in a tertiary ICU in Amsterdam, the Netherlands. All patients who were expected to be admitted for more than 24 h were eligible for this study. Patients were excluded in case of: a BMI > 40 or where the ultrasound was not obtainable and with a previous history of interstitial lung disease, venous porta obstruction or similar diseases. Ultrasound examinations were performed by a trained operator within the first 48 h of admission. A LUS score of ≥ 13 and a VExUS score of ≥ 2 were considered positive (3, 4). Thus, identifying 4 phenotypes: 1. positive LUS and VExUS, 2. positive LUS (and negative VExUS), 3. Positive VExUS (and negative LUS); and 4. Negative ultrasound findings (negative LUS and VExUS). Descriptive statics were used to describe the incidence of positive and LUS and VExUS findings, mortality and use of renal replacement therapy (RRT).
**Results:** A total of 116 patients were included in this analysis. Median age of the overall cohort was 68 [56–74], median sofa score was 7 [5–10] and 65% were male. Characteristics per phenotype are shown in Table 1. The ultrasound negative phenotype was most frequently encountered in 79 (68%) patients, followed by the positive LUS phenotype 25(22%), followed by the positive VExUS and LUS and positive VExUS phenotype with 6 (5%) patients, as shown in Figure 1. The highest mortality (50%) was encountered in VExUS positive patients, followed by the LUS and VExUS positive phenotype 33%. RRT was used least often in the positive LUS phenotype (12%) and comparably often in the other phenotypes (~ 17%). Results are limited by the small sample size of some of the groups.
**Conclusions:** Incidence of positive LUS and VExUS within 48 h of admission is relatively rare in a general ICU population. However, patients with a positive VExUS and a positive or negative LUS might be at a higher risk of worse outcomes.

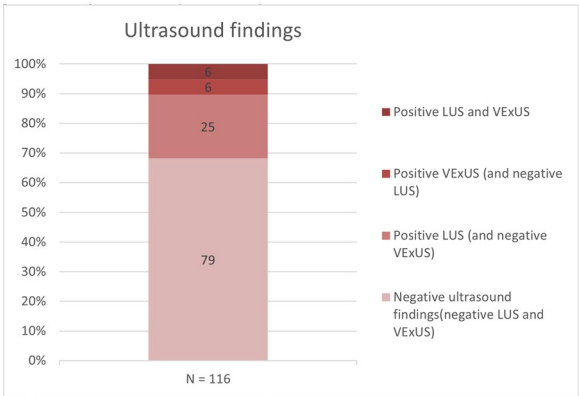


**Fig. 1 (abstract 001147)** Proportion of patients with each ultrasound phenotype. LUS: Lung ultrasound score. VExUS: Venous excess ultrasound

**Table 1 (abstract 001147)** Different phenotypes based on ultrasound. LUS: Lung ultrasound score. VExUS: Venous excess ultrasound

| | Positive LUS and VExUS n=6 | Positive LUS (and negative VExUS) n=25 | Positive VExUS (and negative LUS)n=6 | Negative LUS and VExUS n=79 |
|---|---|---|---|---|
| Sex(male) | 3(50%) | 16(64%) | 4(67%) | 52(65%) |
| age | 66.5[66-68.5] | 73[65-76] | 71[65-76.3] | 66[54-62] |
| Creatinine | 112[91.8-186.3] | 78[60-145] | 194[102-312] | 100[70-152] |
| SOFA-Score | 10[8-11] | 6[4-8] | 10[6-11] | 7[6-9] |
| Renal Replacement therapy | 1(17%) | 3(12%) | 1(17%) | 13(16%) |
| Mortality | 2(33%) | 5(20%) | 3(50%) | 19(24%) |
| Ventilated | 6(100%) | 17(68%) | 5(83%) | 58(73%) |
| Cummulative fluid balance | 3149[1510-4961] | 2640[182-4347] | 815[574-1673] | 1050[-139-2500] |

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**Topic:** Imaging in intensive care

## 001148

### Neuroprognostic evaluation in patient with brain damage after cardiorespiratory arrest

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**Introduction:** The study, prevalence and concern about knowledge of neurological assessment has allowed us to improve the identify the neurological status of our patients after a fatal event, highlighting cardiorespiratory arrest. This advance will allow us to improve the care necessary for a better recovery, even to reduce the rate of the greatest negative event such as the death of this type of patient and to be able to balance the pessimistic prognosis. The main cause of death in these patients is due to the decision to limit or adapt life-sustaining treatment (ALST). Current guidelines recommend a strategy of combining several predictors of poor prognosis included in the examination and complementary tests (EEG, neuroimaging and biomarkers).
**Objectives:** Analyze neuro-prognosis taking the Glasgow Outcome Score as a reference (3–5: good, 1–2: bad).
Analyze the role of enolase as a predictor of neurological prognosis.
**Methods:** Observational, retrospective, single-center study. Patients admitted: recovered CRP since January of 2019, > 18 years are included. We excluded patients with head trauma.
**Results:** N: 127 patients (31.5% women and 68.5% men), mean age 61.18 years (minimum age 21 and maximum age 87). 50.4% occurred in the hospital and 48.8% out-of-hospital settings. Cause: 29.1% due to ACS, 27.6% due to respiratory causes, 5.5% poisoning, 29.1% arrhythmia, 6.3% hemorrhage and 2.4% surgical complication. 32.3% had a good neurological prognosis, with recovery, with the remaining 67.7% having a poor prognosis (of these, 81.4% had ALST performed in the ICU, 7% in the ward, and 11.6% had sequelae). In 36%, the decision for ALST was for neurological involvement, in 50% due to FMO and in 2.3% due to different causes. To make this decision, different predictors of poor prognosis were combined, without being able to establish a clear pattern; 100% of patients with ALST due to neurological involvement had a score > 3 on the GOS. Average limitation time was 3.71 days. Determination of enolase did not follow an established protocol; for this reason, we analyzed the maximum determination recorded in all patients during their evolution, with a general mean of 59.91, this mean being 73.81 in patients with a poor prognosis and 36.80 in patients with a good evolution. Enolase has been recorded in 33 patients who had a good prognosis and 23 patients in whom ALST was decided due to neurological involvement, with the maximum enolase peak being 30.80 in the first group and 82.15 in the second one. We performed ROC Curve with area under the curve of 0.848 so we can conclude that high enolase values can be used to evaluate neurological involvement.
**Conclusions:** Enolase can be a good predictor of poor neurological outcome, so together with the clinical examination (GOS) and other complementary tests such as EEG, N20 and neuroimaging, it can facilitate the decision-making of ALST in patients with poor outcome.

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**Topic:** Neurointensive care

## 001149

### Continuous diaphragm monitoring during the spontaneous breathing trial identifies patients at increased risk of extubation failure

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):** 001149

**Introduction:** In mechanically ventilated (MV) patients, diaphragm dysfunction is associated with a higher risk of weaning failure. Ultrasound studies have shown that decreased diaphragm excursion (DE) at the initiation of the spontaneous breathing trial (SBT) could identify patients at risk of weaning or extubation failure. DXT (Respinor, Norway) is a novel ultrasound-based medical device that provides continuous diaphragm monitoring of DE.
**Objectives:** The aim of the study was to validate whether DE measured with DXT could identify patients at increased risk of weaning failure and extubation failure.
**Methods:** Two multinational, multicenter, prospective, blinded studies (DE-RISK WF and DE-RISK WF II) were performed in 8 European hospitals. Data were pooled for this analysis. Patients on MV who met SBT criteria were enrolled. Continuous DE measurements were conducted during the patients' first SBT. Median DE during the second minute of the SBT was used in the analysis. The primary outcome was weaning failure, defined as SBT failure or reintubation within 48 h following extubation. The secondary outcome was extubation failure rate defined as reintubation within 48 h of extubation. Diaphragm dysfunction was defined as DE < 1.1 cm (DE RISK WF I) or < 1.0 cm (DE-RISK WF II) for the primary outcome and as DE < 1.1 cm for the secondary outcome. The hypothesis was that patients with DE under the threshold will have significantly higher rate of weaning and extubation failure.
**Results:** 304 patients were included in the analysis. 73 patients failed the SBT. Of the 231 patients who succeeded the SBT, 182 were extubated on the same day. Among them, 17 were reintubated within 48 h. Weaning failure rate was 43%. DE was 1.6 cm in weaning success patients and 1.5 cm in those who failed weaning ($p = 0.235$). Diaphragm dysfunction (DE < 1.1 or 1.0 cm) was observed in 44% of weaning success patients and 45% of weaning failure patients ($p = 0.906$), resulting in a relative risk of 1.0 (95% CI 0.8–1.3, $p = 0.906$) for weaning failure. Extubation failure rate was 9%. DE was 1.4 cm in extubation success patients and 0.8 cm in those who failed extubation ($p < 0.001$). Diaphragm dysfunction (DE < 1.1) was observed in 44% of extubation success patients and 88% of extubation failure patients ($p = 0.0004$), resulting in a relative risk of 8.2 (95% CI 1.9–35.1, $p = 0.004$) for extubation failure. No adverse device effects were observed.
**Conclusions:** Continuous monitoring of DE with DXT during the SBT can identify patients at increased risk of extubation failure.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001150

### Prevalence and long-term effects of frailty in elderly ICU patients (The SkrInt-study)

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**Introduction:** In Europe, intensive care unit (ICU) patients older than 80 years have a 30-day mortality rate of 30%, and many survivors are readmitted to hospital or institutionalized [1–3]. It is important to assess therapeutic benefit for elderly patients against their frailty [4–7]. Clinical Frailty Scale (CFS) is a clinically focused frailty screening tool that effectively predicts short-term mortality in elderly ICU patients [6]. However, its use to predict long-term outcomes in this population is less established.
**Objectives:** This study aims to determine if pre-admission assessment of CFS and the health-related quality of life (HRQOL) instrument EQ-5D-5L in elderly patients is associated with 12 months outcome for frailty, HRQOL and mortality.
**Methods:** This is an ongoing observational study that include patients from five Norwegian ICUs, four at university hospitals and one at a local hospital. It plans to enroll 350 patients aged 65 years or older requiring ≥ 24 h of invasive mechanical ventilation.
Patients are assessed for pre-admission frailty (CFS) and HRQOL (EQ-5D-5L) at baseline, as well as 3 and 12 months post-inclusion, with next of kin interviewed if necessary. Follow-ups are conducted via questionnaires and telephone interviews. Post-ICU mortality data are obtained from the National Population Register and medical journals. Secondary measures include patient characteristics, disease severity, ICU treatment and discharge destination.
**Results:** Preliminary results from 278 included patients with a mean age of 74 years (range 65–88), 33% of whom are women, are presented. 96 patients (25%) were excluded, mainly due to missed for inclusion, non-consent and foreign tourists. Cardiac disease was the predominant comorbidity. Only 9 patients (3%) had treatment limitations prior to ICU admission.
At baseline, 147 patients (55%) were living without frailty (CFS 1–3), 114 (42%) with mild to moderate frailty (CFS 4–6) and 7 (3%) with severe frailty or terminal illness (CFS 7–9). The median CFS-score was 3, increasing at 3 and 12 months post-inclusion (Fig. 1). Baseline HRQOL, measured by EQ-5D-5L VAS (visual analogue scale) was 66 (SD = 23). The EQ-5D-5L score for physical function variables was consistent with the frailty score (Fig. 2).
After hospital discharge, 93 patients (33%) had a rehabilitation stay and 20 (7%) were readmitted to the ICU. 123 patients (44%) have died during the study period, and in-hospital mortality is 35%. The preliminary odds of mortality seem to be affected by baseline CFS and age.
**Conclusions:** Preliminary data underscore the utility of CFS and EQ-5D-5L to describe the long-term trajectory of elderly ICU patients.

Frailty prior to severe critical illness seem to influence long-term prognosis. Given the high mortality rate in this cohort, frailty screening upon ICU admission could support patient selection, treatment strategies and long-term follow-up.

The study is registered in ClinicalTrials.gov; NCT06012942.
Keywords:
Intensive care, Critical care, Frail, HRQOL, Life quality, Elderly, Older, CFS, EQ-5D-5L, Mortality.

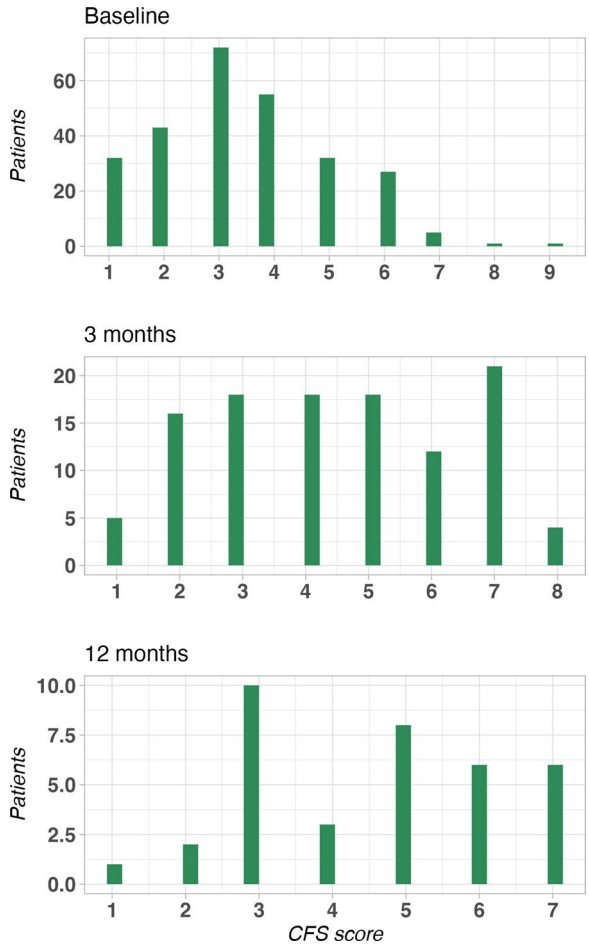


**Fig. 1 (abstract 001150)** CFS distribution at baseline ($n = 268$)), 3 months post-ICU ($n = 112$)) and 12 months post-ICU ($n = 36$). The lower number of patients at 3 and 12 months are due to mortality and the fact that patients have not yet reached the follow-up period

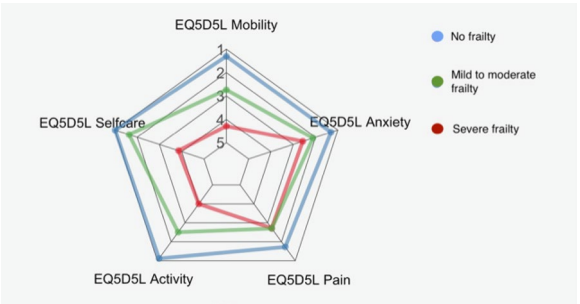


**Fig. 2 (abstract 001140)** Radar diagram showing baseline values for EQ-5D-5L relative to CFS. EQ-5D-5L consists of 5 dimensions: mobility, self-care, activity, pain and anxiety, with a score from 1 to 5 on each of them. Groups of patients with different levels of frailty are indicated by blue, green and red lines

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**Topic:** Health Services Research and Outcome

## 001151

### Clinical impact of adjusted valproic acid level in patients with hypoalbuminemia. A single-center cohort study

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**Introduction:** Valproic acid (VPA) is recognized for its rapid and extensive oral absorption, boasting nearly 100% bioavailability, with approximately 90% of VPA binding to serum plasma proteins, primarily albumin. However, this binding percentage may alert in the presence of hypoalbuminemia or due to competition with other medications, potentially resulting in toxicity and side effects. Therapeutic drug monitoring (TDM) is crucial to ensure efficacy and safety, although the effect of adjusted valproic acid levels has been extensively studied, there is a lack of data regarding patient outcomes in individuals with hypoalbuminemia receiving VPA.
**Objectives:** This study aims to evaluate the impact of adjusted valproic acid levels in predicting effectiveness and potential adverse effects compared to total valproic acid levels in patients with hypoalbuminemia.
**Methods:** This single-center retrospective cohort study investigated adult patients with hypoalbuminemia (albumin level < 35 gm/L) who experienced seizures or epilepsy and received valproic acid treatment between January 1, 2016, and December 31, 2022. Eligible patients maintained therapeutic levels of total valproic acid, with albumin levels measured within 48 h of valproic acid administration. Adjusted

valproic acid levels were calculated based on albumin levels using a Hermida and Tutor derived equation. Patients were followed from the initial therapeutic level of valproic acid until either death or hospital discharge. The primary aim of the study was to assess the impact of adjusted valproic acid levels on predicting effectiveness and potential adverse effects compared to total valproic acid levels. Statistical analyses were performed using receiver operating characteristics (ROC) curves, and differences in the area under the curves (AUCs) by the DeLong method. Safety outcomes such as hepatotoxicity, hyperammonemia, hyponatremia, and thrombocytopenia were considered as primary endpoints, while secondary endpoints included predicting seizure occurrence, status epilepticus, and the requirement for supplementary antiepileptic medications during hospitalization. Approval for the study was granted by the King Abdullah International Medical Research Center (KAIMRC) in January 2023 (reference number: NRC23R/019/01).

**Results:** Out of 1622 screened patients, 71 with hypoalbuminemia received VPA. The ROC analysis results showed that the threshold of aVPAc (154.19 mg/dL) had higher sensitivity (86% vs. 71%) and lower specificity (47% vs. 72%) compared to the tVPA at a threshold of (67.53 mg/dL) in predicting hepatotoxicity with (ROC-AUC 0.64 [CI: 0.41–0.86; $p = 0.51$]; however, the outcome was not statistically significant. In addition, five patients representing (23%) had significant hyper-ammonia during their admission with aVPAc at a threshold level of 188.00 mg/dL, and they exhibited higher sensitivity (100% vs. 40%) and lower specificity (82% vs. 88%) in predicting hyperammonemia compared to the tVPA with a threshold of (74.32 mg/dL) (ROC-AUC 0.95 [CI: 0.87–1.0; $p = 0.02$]. Moreover, 55% of the patients receiving valproic acid required additional anti-seizure, and at aVPAc threshold (131.54 mg/dL) compared to the tVPAc at level (60.32 mg/dL), aVPAc show lower sensitivity (44% vs. 64%) and higher specificity (84% vs. 72%) with (ROC-AUC 0.69 [CI: 0.57–0.82; $p = 0.04$]. In regards to the other outcomes, no statistically significant differences were observed for hepatotoxicity, hyponatremia, or seizure occurrence.

**Conclusions:** Adjusted valproic acid concentrations (aVPAc) have demonstrated increased sensitivity and specificity in predicting hepatotoxicity and hyperammonemia compared to total valproic acid concentrations (tVPAc). This highlights the potential of aVPAc for enhancing safety monitoring in hypoalbuminemic patients.

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10. All authors acknowledge the active participation of investigators from the Saudi Critical Care Pharmacy Research Platform (SCAPE platform) and the Saudi Society for Multidisciplinary Research Development and Education (SCAPE Society).


**Topic:** Neurointensive care

## 001155

### Point-of-care evaluation of fibrinolysis in sepsis: the POCEFIS study


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**Introduction:** Fibrinolysis alterations are very common in septic patients and are associated with worse outcome; however, there is currently no gold standard for the diagnosis of fibrinolysis impairment. The viscoelastic device ClotPro® provides the opportunity to detect fibrinolysis alterations, thanks to the tissue plasminogen activator (TPA) test.

**Objectives:** The POCEFIS study investigates the prevalence of fibrinolysis impairment in septic patients, defined as a prolonged ClotPro® TPA lysis time. The reference range for TPA lysis time is established within a cohort of healthy volunteers. Secondary objectives include examining the relationship between fibrinolysis abnormalities assessed by ClotPro® and standard coagulation tests (PT, aPTT, platelets, fibrinogen, D-dimer), as well as other specific markers (PAI-1, PAI-1 activity, TAFI, protein-C, protein-S, Factor XIII), degree of inflammation (PCR, PCT, IL-1β, IL-6, IL-8, TNF-α, ADM), diagnostic DIC scores, prevalence of multiorgan failure, length of stay in the intensive care unit (ICU), and ICU mortality. Moreover, the study aims to assess the evolution of fibrinolysis abnormalities over time in relation to the course of sepsis.

**Methods:** This is a nonpharmacological, single-center, prospective, cohort study. It includes patients over 18 years old admitted to the General ICU of IRCCS Ca' Granda Ospedale Maggiore Policlinico in Milan, Italy, with sepsis or septic shock, requiring vasopressors to maintain a MAP $\geq$ 65 mmHg despite adequate fluid resuscitation. Patients must be enrolled within 12 h of sepsis/septic shock diagnosis. Exclusion criteria encompass known coagulation disorders, ECMO, and the use of oral anticoagulants. A ClotPro® TPA test is performed at admission and on days 1, 2, 3, and 7. Specific markers of coagulation and inflammation are tested at enrollment and on day 7. Routine laboratory tests are performed daily. The study ends at 28 days or upon ICU discharge.

**Results:** From January 20th to March 30th 2024, 13 patients were enrolled. 54% were female, with a mean age of 68.8 years. Gastrointestinal tract was the most common site of infection (46%), followed by the urinary tract (31%) and lower respiratory tract (15%). Patients' severity was calculated by SOFA score obtaining a median of 9.

ClotPro® TPA decreased during the first 24–48 h, indicating impaired fibrinolysis. Progressive TPA maximum lysis normalization was observed in subjects with favorable outcome, differently from those who died in the ICU ($n = 3$, 23%) (see Graphic 1).

**Conclusions:** The ClotPro® TPA test may be a feasible system that may enable the assessment of fibrinolysis impairment in septic patients. The findings of this study hold promise for advancing early diagnosis, prognostics stratification, and the development of targeted therapeutic options in the field of coagulation for septic patients.

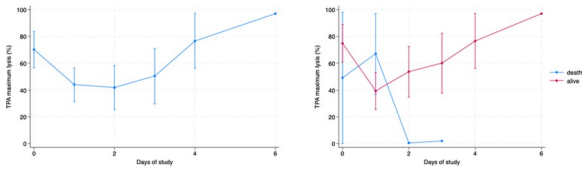


**Fig. (abstract 001155)** TPA maximum lysis over time

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**Topic:** Sepsis

## 001156

### Utility of the cerebrospinal fluid lactate as a biomarker for neurological disease and central nervous system bacterial infections

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**Introduction:** Cerebrospinal fluid (CSF) lactate can be elevated in several neurological disorders. Lactate is an excellent biomarker for diagnosing any neurological disease (ND) and specifically in central nervous system bacterial infections (CNSBI), because its concentration in CSF depends upon cerebral anaerobic glycolysis and is independent to plasma concentration (normal CSF lactate values: 1.2–2.7 mmol/L).
**Objectives:** To evaluate the utility of CSF lactate as a biomarker of any ND or CNSBI.
- To determine a cutoff point for CSF lactate for ND and CNSBI.
**Methods:** Observational and prospective study of patients admitted to 2 Intensive Care Units (ICU) from July 2017 to March 2024, aged 18 years or older who underwent CSF sampling. Demographic variables, ICU mortality and CSF parameters were analysed. Patients were categorized into various subgroups based on their final diagnosis. ND was defined as pathological findings in clinical examinations or complementary tests.
**Results:** We examined 195 CSF samples from 169 patients, with a male majority (67.2%) and a mean age of 55.79 ± 16.7 years. The mortality rate was 27.13%. CSF lactate, glucose, leukocytes and proteins were recorded.
Patients were divided into 2 groups: ND ($n = 138$) and non-ND ($n = 57$). Significant differences were found in lactate and protein levels between the 2 groups (Table 1a). The cutoff point for CSF lactate in ND was 2.94 mmol/L (AUC: 0.845) (Table 2, image 1) with sensitivity of 66.67%, specificity of 98.24%, PPV of 98.92% and NPV of 54.90%.
In the ND group, 42 patients were categorized as CNSBI and 96 as non-bacterial ND. Significant differences were observed in lactate, glucose and protein levels between the 2 groups (Table 1b). The cutoff point for CSF lactate in CNSBI was 5.16 mmol/L (AUC: 0.943) (Table 3, image 2) with sensitivity of 88.10%, specificity of 84.38%, PPV of 71.15% and NPV of 94.19%.

**Table 1**

| | (a) $N = 195$ | | | (b) $N = 138$ | | |
|---|---|---|---|---|---|---|
| | ND ($n = 138$) | Non-ND ($n = 57$) | $p$ | CNSBI ($N = 42$) | Non-CNSBI ($N = 96$) | $p$ |
| Lactate (mmol/L) | **5.5 ± 4.21** | **1.98 ± 0.43** | **< 0.001** | **10.28 ± 4.23** | **3.42 ± 1.83** | **< 0.001** |
| Glucose (mg/dL) | 76.54 ± 70.70 | 90.86 ± 17.86 | > 0.001 | **30.87 ± 37.18** | **96.53 ± 72.71** | **< 0.001** |
| Leukocytes (/mcL) | 1156.98 ± 5330.23 | 18.14 ± 45.87 | > 0.001 | 3300.59 ± 9258.28 | 219.11 ± 1028.95 | > 0.001 |
| Proteins (mg/dL) | **211.32 ± 279** | **73.33 ± 110.47** | **< 0.001** | **466.6 ± 360,50** | **99.63 ± 123.37** | **< 0.001** |

**Table 2**

| $N = 195$ | ND ($n = 138$) | Non-ND ($n = 57$) | |
|---|---|---|---|
| < 2.94 mmol/L | 33.33% (46) | 98.25% (56) | **< 0.001** |
| ≥ 2.94 mmol/L | 66.67% (92) | 1.75% (1) | **< 0.001** |
| Total | 100% (138) | 100% (57) | |

**Table 3**

| $N = 138$ | CNSBI ($N = 42$) | Non-CNSBI ($N = 96$) | $p$ |
|---|---|---|---|
| < 5.16 mmol/L | 11.91% (5) | 84.37% (81) | **< 0.001** |
| ≥ 5.16 mmol/L | 88.09% (37) | 15.63% (15) | **< 0.001** |
| Total | 100% (42) | 100% (96) | |

**Conclusions:** CSF lactate might aid in diagnosing ND, particularly CNSBI. A CSF lactate cutoff above 2.94 mmol/L showed good accuracy, sensitivity, and specificity for any ND diagnosis. Moreover, a cutoff above 5.16 mmol/L aids in distinguishing CNSBI from other NDs, exhibiting favorable sensitivity and specificity.
Further samples are needed to determine if CSF lactate outperforms other biomarkers in CNSBI diagnosis.

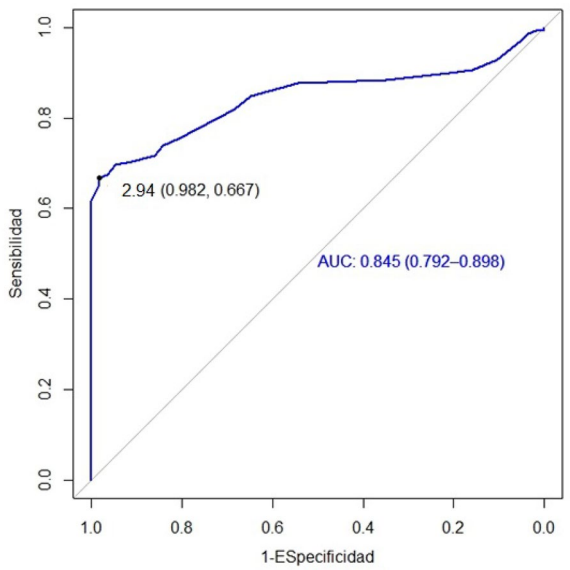


**Image 1 (abstract 001156)** ROC curve. Cutoff point of CSF lactate in ND

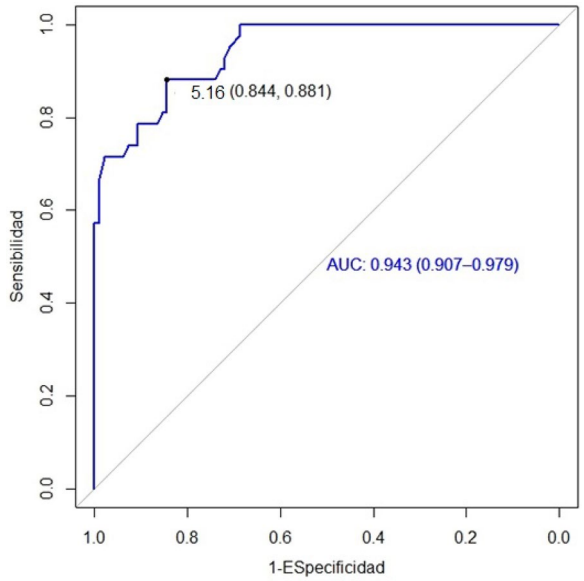


**Image 2 (abstract 001156)** ROC curve. Cutoff point of CSF lactate in CNSBI

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**Topic:** Neurointensive care

## 001157

### The impact of the activation of the rapid response team and critical care outreach team on code status

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**Introduction:** The Rapid Response Team (RRT) and Critical Care Outreach Team (CCOT) are designed to prevent deterioration of patients' condition, resulting in reduction of in-hospital mortality rates. Recent evidence suggests that the activation of the RRS could also play a crucial role in palliative care by promoting end-of-life discussions. However, there is few research reporting on the changes in code status following the involvement of the RRT and CCOT.
**Objectives:** To investigate the characteristics of patients who underwent a change in code status following the intervention of either the rapid response team or the critical care outreach team at our institution.
**Methods:** This is a descriptive study. Chart review was conducted for patients hospitalized in Tokyo Bay Urayasu Ichikawa Medical Center from April 2018 to March 2023. Patients whose code status changed within 72 h of the activation of either the RRT or the CCOT were included. Variables measured included age, gender, primary department (medical or surgical), changes in code status (full code, do not attempt resuscitation (DNAR), limited treatment, or comfort measures only (CMO)), presence of family conferences, the affiliation of the physician providing the family conference (primary physician or RRT), location of the family conference (general ward or ICU), unexpected ICU admissions, unexpected in-hospital cardiac arrests, implementation of palliative care, and discharge route (discharge to home, death, transfer, or discharge to a facility).
**Results:** The RRT was activated for a total of 1579 cases with 33 (2.1%) cases experiencing a change in code status, while CCOT was involved in 6196 cases, with 27 (0.43%) cases experiencing a change in code status. The median age was 82 years (IQR 76–90) for the RRS group and 81 years (IQR 76–86) for the CCOT group. The patients under the service of internal medicine accounted for 24 (72.7%) in the RRT group and 24 (88.9%) in the CCOT group. Family meetings were held by the primary physician after the activation of RRS in 28 (84.8%) cases and CCOT in 26 (96.3%) cases. Code status changed from full code to DNAR or CMO in 22 (66.7%) cases in the RRS group and 24 (88.9%) cases in the CCOT group. Changes from limited treatment to full code were noted in 4 (12.1%) cases in the RRS group and 1 (3.7%) case in the CCOT group. Changes from limited treatment to CMO were seen in 4 (12.1%) cases in the RRS group and 2 (7.4%) cases in the CCOT group. Unexpected ICU admissions were reported in 9 (27.3%) cases in the RRS group and 1 (3.7%) cases in the CCOT group. There were no unexpected in-hospital cardiac arrests in either group. Palliative care was implemented in 19 (72.7%) cases in the RRS group and 12 (44.4%) cases in the CCOT group. Deaths during hospitalization occurred in 18 (54.5%) cases in the RRS group and 11 (40.7%) cases in the CCOT group.
**Conclusions:** Although changes in code status following the involvement of the RRS and CCOT were infrequent, the findings suggest that the RRS and CCOT may have facilitated appropriate changes in code status, potentially leading to the provision of appropriate palliative care or treatment for the patients. Further research is needed to explore role of RRT and CCOT more comprehensively.

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**Topic:** Ethics and end of life care

## 001158

### High-volume plasma exchange in acute liver failure: a retrospective assessment

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**Introduction:** Acute liver failure (ALF) presents a grave risk to patient survival. High-volume plasma exchange (TPE-HV) has emerged as a potential therapeutic intervention for either bridging patients to transplantation or aiding in recovery. Despite demonstrated benefits in randomized controlled trials [1], the adoption of TPE-HV remains challenging in Latin America, where acute kidney injury frequently complicates ALF, with conventional extracorporeal support primarily focusing on renal replacement therapy, showing limited efficacy [2].
**Objectives:** Evaluate whether TPE-HV improves 30-day survival in non-transplanted ALF patients.
**Methods:** A retrospective study was conducted involving 20 ALF patients: 12 receiving standard medical treatment (SMT) and 8 receiving SMT in combination with TPE-HV. TPE-HV was administered at a volume of 8–12 or 15% of body weight, using fresh frozen plasma as replacement fluid [3]. Baseline clinical data were compared using the Mann–Whitney test, mortality was assessed using the Chi-square test, and survival analysis of mechanical ventilation days between groups was conducted using the Kaplan–Meier test. In addition, a binary logistic model was utilized to evaluate mortality probability in SMT and TPE-HV groups and its interaction with hepatic encephalopathy (HE).
**Results:** Baseline clinical characteristics were comparable between the two groups, except for higher hepatic encephalopathy (HE) in the TPE-HV group ($p=0.027$) and lower sodium levels in the same group ($p=0.032$, Table 1). The 60% of the etiology of ALF was hepatitis, followed by DILI (20%), mycetism (15%) and ALL (2%). Overall survival was significantly higher in the TPE-HV group (87.5%) compared to the SMT group (50%, $p=0.0001$). Though the median duration of mechanical ventilation was shorter in the TPE-HV group (2 days) compared to the SMT group (3 days), statistical analysis did not reveal significant differences ($p=0.63$, Fig. 1). The probability of mortality decreased from 60% in SMT group to less than 10% in the TPE-HV group. No interaction effect with HE was found (Fig. 2).

**Table 1 (abstract 001158)** Baseline clinical characteristics of the two groups; SMT and TPE-HV

| | SMT ($n=12$) | TPE-HV ($n=8$) | *p* value |
|---|---|---|---|
| Gender/female | 4 (33%) | 8 (100%) | |
| Age | 23 (22–33) | 31 (25–33) | 0.660 |
| Body mass index | 27.5 (26.8–28.9) | 25.7 (24.2–27-8) | 0.230 |
| APACHE II | 17.5 (10.0–23.5) | 17.0 (9.8–20.8) | 0.985 |
| Kings College | 2.0 (1.0–3-0) | 1.5 (1.0–2.3) | 0.634 |
| SOFA | 7.5 (5.3–9.3) | 7.0 (6.8–10.3) | 0.809 |
| MELD SCORE | 33.5 (30.75–40.3) | 37.5 (33.8–44.5) | 0.175 |
| Mort MELD | 0.65 (0.55–0.65) | 0.53 (0.53–0.71) | 0.932 |
| Hepatic encephalopathy | 2.0 (0.0–2.3) | 4.0 (3.0–4.0) | **0.027** |
| Creatinine | 2.4 (0.8–3.2) | 1.4 (1.0–1.6) | 0.647 |
| Lactate | 4.7 (3.2–8.3) | 7.9 (4.7–12.5) | 0.473 |
| Bilirubin | 10.6 (7.3–15.4) | 12.4 (11.5–15.3) | 0.208 |
| INR | 3.4 (2.8–5.1) | 6.0 (3.5–7.2) | 0.208 |
| DHL | 490.0 (383.5–1308.3) | 573.0 (369.5–801.0) | 0.835 |
| TGO | 696.5 (525.8–25,248) | 1884.0 (1435.8–2774.0) | 0.427 |
| TGP | 1549.0 (314.0–2669.0) | 4665.0 (2873.3–6070.8) | 0.057 |
| Sodium level | 139.5 (133.0–144.3) | 132.0 (131.0–136.3) | **0.032** |

**Conclusions:** These retrospective findings suggest that TPE-HV may improve survival outcomes in non-transplanted ALF patients. Prospective analyses are warranted to validate these results.

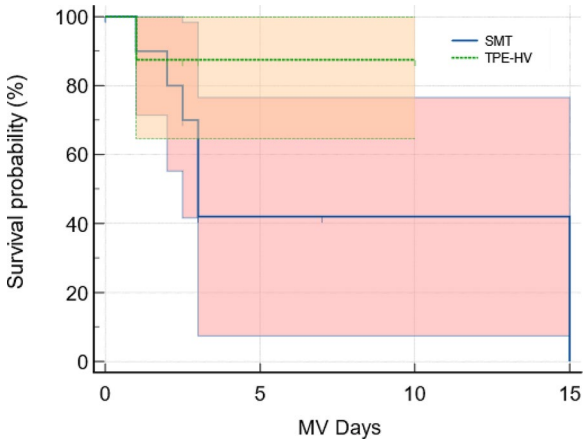


**Fig. 1 (abstract 001158)** Mechanical ventilation (MV) days survival analysis in SMT compared to TPE-HV group

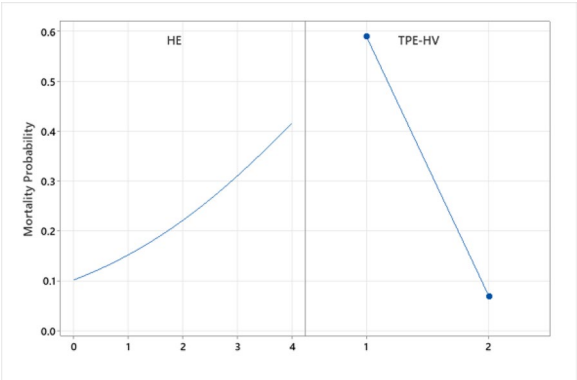


**Fig. 2 (abstract 001158)** Binary logistic model plot of the mortality probability in SMT (1) and TPE-HV (2)

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001159

### Role of femoral vein pulsatility in the prediction of acute kidney injury in patients with peritonitis and abdominal sepsis: interim analysis of a prospective observational study

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**Introduction:** There is good physiological basis to understate that excess fluid administration increases both right and left atrial pressures, resulting in venous congestion, tissue edema leading to increased rates of acute kidney injury(1). At bedside, in patients with poorly accessible thoracic and abdominal wall examination after sternotomy, thoracotomy, or laparotomy; transthoracic echocardiographic (TTE) and venous excess ultrasound (VEXUS) examinations might be challenging because of suboptimal echogenicity, due to unfavourable anatomy and sometimes, positive pressure ventilation (2). A recent observational study identified that nearly 25% of their patients in their cohort had inadequate renal Doppler scans (3). In these instances, the femoral vein, which is an easily accessible site for venous catheters, is easily available for ultrasound evaluation. A good correlation has also been demonstrated between Femoral Vein Doppler and VEXUS to identify venous congestion in patients after a major cardiac surgery (4). Visual assessment of the femoral vein flow could be used to binarily note if the patient has a congestive state or not. We hypothesized that the presence of a pulsatile femoral vein flow could predict the onset of AKI in the subsequent 7 days in patients with complicated intra-abdominal infections and abdominal sepsis.
**Objectives:** To determine the association between femoral vein pulsatility measured (measured by Doppler ultrasonography) within 24 h of ICU admission and development of acute kidney injury within 7 days, in patients with complicated intra-abdominal infections and abdominal sepsis i.e. complicated intra-abdominal infections leading to sepsis, as defined by Sepsis-3.
**Methods:** 30 adult patients, aged 18–65 years diagnosed with complicated intra-abdominal infections and abdominal sepsis (complicated intra-abdominal infections leading to sepsis and septic shock) were included after institutional ethics committee approval. Patients with inadequate window for USG, patients in respiratory distress (respiratory rate > 35/min, accessory muscles of respiration in use), patients with liver cirrhosis, portal thrombosis, deep vein thrombosis of lower limb, pregnancy, chronic venous limb disease, chronic kidney disease, patients with AKI on admission, patients with unilateral nephrectomy and renal malignancies were excluded. USG examination for femoral vein pulsatility was done by a trained intensivist with more than 5 years' experience in bedside ultrasound. Normal femoral vein Doppler (FVD) was defined as antegrade mildly pulsatile uninterrupted pattern with respiratory variation and retrograde flow of less than 1/3rd of antegrade flow. FVD was considered suggestive of venous congestion if either of the criteria was fulfilled: i) pulsatile in nature; ii) retrograde flow velocity of more than 10 cm/s; iii) retrograde flow velocity being more than 1/3rd of antegrade flow velocity (flow reversal).
**Results:** FVD was described as normal, pulsatile, or pulsatile with flow reversal. Pulsatile and pulsatile with flow reversal FVD patterns were considered suggestive of venous congestion. Out of 30 patients included in the interim analysis, 18 patients (60%) developed AKI as defined by KDIGO criteria. AKI stage 1 in 8 patients, AKI stage 2 in 8 patients, AKI stage 3 in 2 patients. FVD patterns consistent with congestion were seen in 12 patients (66.6%) out of 18 patients who developed AKI. Pulsatile FVD was seen in 7 patients, retrograde flow velocity of more than 10 cm/s in 3 patients, retrograde flow velocity being more than 1/3rd of antegrade flow velocity (flow reversal) in 2 patients. The presence of a pulsatile femoral vein flow could predict the onset of AKI in the subsequent 7 days in patients with complicated intra-abdominal infections and abdominal sepsis with a sensitivity of 66%, specificity of 83%, positive predictive value of 85%, and a negative predictive value of 62.5%
**Conclusions:** The presence of a pulsatile femoral vein flow could predict the onset of AKI in the subsequent 7 days in patients with complicated intra-abdominal infections and abdominal sepsis with a PPV of 85% and NPV of 62.5%.

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**Topic:** Acute Kidney Injury and haemofiltration

## 001160

### Relationship between dynamics of plasma heparin binding protein and prognosis of patients with sepsis

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**Introduction:** Sepsis is life-threatening organ dysfunction due to a dysregulated host response to infection and is an important global health problem [1]. For instance, sepsis continues to be the leading cause of in-hospital deaths in China, where the overall mortality is still as high as 35–45% [2]. An in-depth exploration of novel therapeutic targets for sepsis is urgently needed. Heparin-binding protein (HBP) is precomposed and mainly exists in the azurophilic granules and secretory vesicles of neutrophils [3]. Previous research demonstrated that the strongest indicator of the development of sepsis is an elevated plasma HBP level in cases of sepsis with organ failure [4], [5]. Given that HBP can assess vascular leakage and infection in patients, it might become potential marker to monitor patients with sepsis and septic shock.
**Objectives:** To investigate the relationship between the dynamics of HBP and prognosis of patients with sepsis.
**Methods:** This single-center, prospective and observational clinical study included 110 patients who met the Sepsis-3.0 diagnostic criteria in the ICU of Zhongda Hospital affiliated to Southeast University. All patients were followed up to 28 days. Plasma levels of HBP on admission day1, 3 and 7 were recorded, as well as procalcitonin (PCT), high-sensitive C-reactive protein (hs-CRP) and clinical characteristics.
**Results:** The baseline HBP level between two groups showed no difference. Different to survival group, the HBP level of non-survival group decreased gradually. The clearance rate of 3-day HBP (HBPc-3d) and 7-day HBP (HBPc-7d) in survival group were significantly higher than those in non-survival group ($p < 0.001$). The area under the ROC of HBPc-3d (cutoff $\leq$ 43%) and HBPc-7d (cutoff $\leq$ 14%) was 0.857 and 0.890, respectively. The PCT and hs-CRP level had no correlation with dynamics of the HBP level.
**Conclusions:** The dynamics of plasma heparin binding protein level have a good predictive value for the 28-day prognosis of sepsis patients. The continuous increase of HBP level indicates poor prognosis.

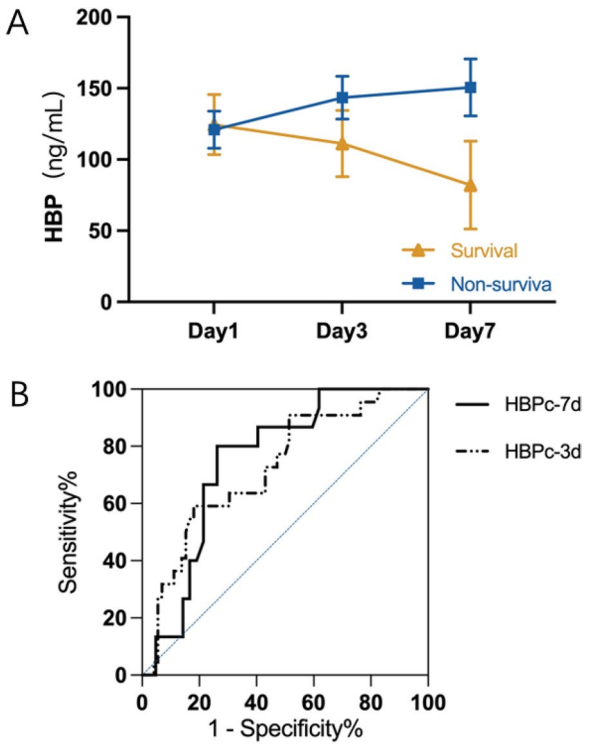


**Fig. (abstract 001160)** Dynamics and predictive value of HBP: A: There was no significant difference in the level of D1 HBP. The plasma heparin binding protein levels of D1, D3 and D7 in survival group decreased gradually, while the plasma heparin binding protein levels of D1, D3 and D7 in the death group increased gradually. B: The AUCs of plasma HBPc-3d and HBPc-7d predicting 28-day mortality of sepsis were 0.857 (95% CI 0.770–0.921) and 0.890 (95% CI 0.779–0.958), respectively

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**Topic:** Sepsis

## 001161

## Need for new criteria for ventilator associated pneumonia to standardize evaluation of clinical cure

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**Introduction:** Despite the need for new preventive and curative interventions in ventilator-associated pneumonia (VAP), very few have been evaluated and implemented in clinical practice in recent years. This may be partly due to the required VAP criteria used by regulatory authorities for the approval of interventions. Signs and symptoms for VAP diagnosis defined by the FDA, include hypothermia, hypotension, hypoxia or tachypnea, which are often irrelevant in the Intensive Care Unit (ICU), where these vital parameters are artificially controlled, while other eligible symptoms are non-specific (leukocytosis, purulent secretions, and fever).

**Objectives:** We hypothesise that FDA criteria could overestimate VAP diagnosis compared to clinical assessment by bedside physicians limiting the potential for future drug approval in clinical trials.

**Methods:** The European-wide Perpetual Observational Study on VAP (POS-VAP) [1] within ECRAID-Base prospectively enrolls patients under invasive mechanical ventilation (IMV), collecting routine clinical and microbiological data about VAP. Patients included in the study are over 18 years old and at risk of VAP, i.e. admitted to the ICU and under IMV for at least 48 h. The VAP population was defined as patients who met the FDA criteria for VAP diagnosis [2]. Clinical cure was defined as a combination of resolution of signs and symptoms present at VAP onset, survival and/or ICU discharge alive between days 7 and 10 from VAP diagnosis [3]. At ICU discharge, bedside physicians were asked whether they diagnosed VAP during the patients' stay. Completion of antibiotic treatment for VAP by day 10 in patients alive 72 h after the end of treatment was considered as physician-defined VAP resolution.

**Results:** From August 2022 to September 2023, 984 eligible patients provided informed consent and were enrolled, of which 228 patients had a FDA-defined VAP after a median of 7 [IQR 5–11] days of IMV. Overall, 22/228 FDA-VAP were not considered as VAP by clinicians, while 26/232 clinical VAP did not fulfill FDA criteria. Clinical cure was attained in only 22% ($n=50$) of FDA-VAP, whereas 47% ($n=107$) of FDA-VAP patients completed VAP-related antibiotic treatment within 10 days of VAP onset. Symptoms most frequently persistent in the non-cured population were leukocytosis 70% ($n=124$), purulent secretions 48% ($n=85$) and fever 42% ($n=74$).

**Conclusions:** Unlike our hypothesis, FDA-VAP correlated well with clinical-VAP diagnosis (10% discordance in both directions). However, FDA clinical symptoms underestimated clinical cure compared to treatment criteria (22% vs. 47%). Low clinical cure rates might be a reflection of VAP misdiagnosis, rather than treatment failure. Thus, new criteria are needed to improve the evaluation of VAP clinical cure in clinical trials. In-depth review of discrepant cases may help identify better criteria.

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4. The research leading to these results was conducted as part of the ECRAID-Base consortium. For further information please refer to www.ecraid.eu. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 965313.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001162

### Predicting the risk of venous thromboembolism in critically ill patients (PROVE-IT): a model development and validation study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001162

**Introduction:** Venous thromboembolism (VTE) is a serious complication of critical illness, and despite guideline-adherent thromboprophylaxis, the risk of VTE in critically ill patients remains substantial. Potentially, this is the result of thromboprophylaxis failure in patients at particularly high risk of VTE. Following this, a personalized assessment of VTE risk may facilitate patient-specific interventions and lower the risk of VTE in critically ill patients.
**Objectives:** We aimed to develop and externally validate a prognostic model for VTE in critically ill patients including known prognostic factors (the PROVE-IT model). Furthermore, we aimed to assess the external validity of existing models.
**Methods:** We included critically ill patients admitted to the intensive care unit (ICU), excluding patients with planned admissions, stays under 24 h, ages below 18 years, recent VTE, or therapeutic anticoagulation within 24 h of ICU admission.
The outcome was VTE after ICU admission as detected in clinical practice. Prognostic factors were selected from a recent meta-analysis. Multiple logistic regression was used to estimate model coefficients. The C-statistic was used to measure discrimination, calibration plots, the integrated calibration index (ICI), the E50, the E90, and the Emax were used to assess calibration. Decision curve analysis (DCA) was performed to evaluate clinical usefulness. Existing models identified by a literature search were externally validated for comparison.
**Results:** In total, 26.218 patients were included in the development cohort, and 1.983 were included in the external validation cohort. The PROVE-IT model incorporates predictors collected within 24 h of ICU admission, including central venous line placement, personal history of VTE, active malignancy, changes in body temperature, respiratory rate, lactate, white blood cell count, surgical ICU admission, use of vasopressors, mechanical ventilation, thromboprophylaxis, weight, heart rate, and mean arterial blood pressure.
The external validation of the PROVE-IT model yielded a C-statistic of 0.629, an ICI of 0.00664, an E50 of 0.00447, an E90 of 0.00131, and an Emax of 0.154. Upon external validation of an existing prognostic model, the ICU-VTE score, we found a C-statistic of 0.600, an ICI of 0.0119, an E50 of 0.0118, an E90 of 0.0251, and an Emax of 0.932.
Figure 1 illustrates the calibration of the PROVE-IT model and the ICU-VTE score. Upon DCA, it was found that the PROVE-IT model may yield a higher net benefit than default treatment strategies at risk thresholds of approximately 1–5%, though this did not reach statistical significance (Figure 2).
**Conclusions:** The PROVE-IT model performed well in the development cohort. In the external validation cohort, its performance was marginally worse but still promising. However, the PROVE-IT model exhibited unclear clinical usefulness upon DCA and is thus inadequate for clinical implementation. An existing prognostic model, the ICU-VTE score, exhibited inadequate performance as well. Accordingly, there is currently no appropriate method to assess individual risk of VTE in critically ill patients. Future research should focus on investigating novel prognostic factors to improve risk stratification and other means of improving the safety and efficacy of thromboprophylaxis in critically ill patients.

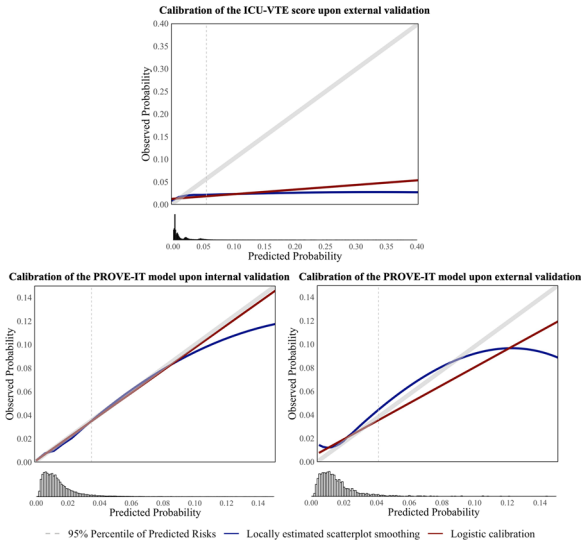


**Fig. 1 (abstract 001162)** Calibration plots of the ICU-VTE score and PROVE-IT model. Top-middle: calibration plot of the ICU-VTE score upon external validation; bottom-left: calibration plot of the PROVE-IT model upon internal validation; Bottom-right: calibration plot of the PROVE-IT model upon external validation

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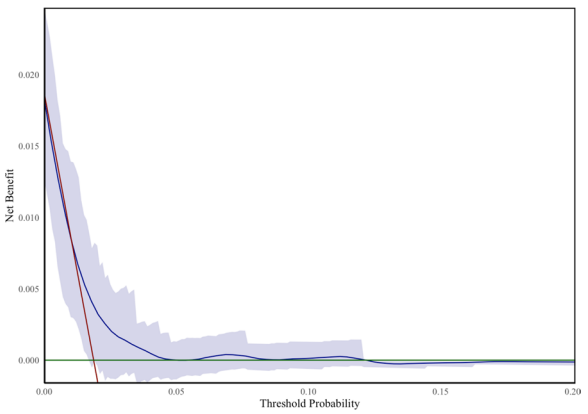


**Fig. 2 (abstract 001162)** Decision curve analysis of the PROVE-IT model in the external validation cohort. DCA of the PROVE-IT model in the external validation cohort showing net benefit at risk thresholds of approximately 1–5%, though this did not reach statistical significance

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**Topic:** Transfusion and haemostasis disorders

## 001163

### Tidal ventilation promotes a fibroproliferative response and delay in epithelial-related lung repair in ex vivo wound healing models

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**Introduction:** Cardiogenic pulmonary edema (CPE) occurs as a result of an increase in hydrostatic pressure at the capillary level, leading to impaired gas exchange and requirement for mechanical ventilation. This support can trigger a complex molecular response to mechanical stretch known as ventilator-associated lung injury (VALI), which may lead to extensive pulmonary fibrosis due to ineffective lung repair.
**Objectives:** Our main objective is to study the impact of mechanical stretch on different cell types and to identify the molecular mechanisms involved in lung repair during mechanical ventilation.
**Methods:** Bronchoalveolar lavage fluid (BALF) samples were obtained from patients undergoing either protective mechanical ventilation (tidal volume 6–8 ml/Kg, PEEP 5 cmH2O) or continuous positive airway pressure (CPAP) of 5 cmH2O. The impact of both conditions (cyclic stretching versus static) was evaluated using wound healing assays (Figure 1) with epithelial cells (BEAS-2B) and fibroblast (MRC5) supplemented with 10% of BALF. RNA was extracted from both cellular types in each experimental condition 24 h after wounding. RNA sequencing was performed and differentially expressed genes were identified with DESeq2. To analyze the molecular pathways involved and gene interactions, gene set enrichment analysis (GSEA) and STRING interaction database were used, respectively.
**Results:** Supplementation with BALF from patients undergoing cyclic stretch resulted in a slower wound closure rate in epithelial cells, compared to the static condition. Fibroblasts exhibited the opposite behavior, with proliferative response to cyclic stretch. A total of 154 and 583 genes with differential expression were identified, showing dysregulation in interleukin 6 (*IL6*) pathway in BEAS-2B and Leukemia Inhibitory Factor (*LIF*) pathways in MRC5. In addition, the epidermal grow factor receptor (*EGFR*) pathway was affected in BEAS-2B line (Figure 2).
Adding tocilizumab, an antagonist of *IL6* family members receptors, to BEAS-2B (Figure 1.B) and MRC5 (Figure 1.E) medium, reverted the differences between conditions, as well as amphiregulin (AREG), an *EGFR* agonist, in the epithelial line (Figure 1.C).
**Conclusions:** Tidal ventilation may promote a fibroproliferative response and a delay in epithelial-related lung repair. The transcriptomic response to mechanical stress indicates the implication of *IL6, LIF,* and *EGFR* pathways. Tocilizumab and amphiregulin could attenuate mechanical ventilation-associated lung injury.

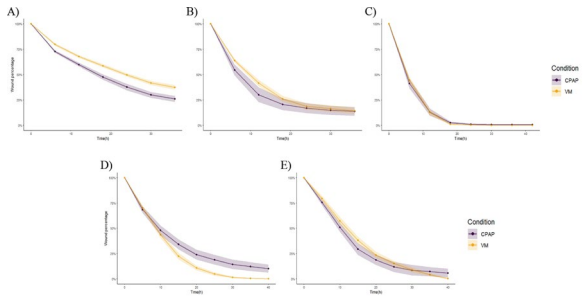


**Fig. 1 (abstract 001163)** Wound healing assays. A) BEAS-2B cell line wound healing supplemented with BALF from patients undergoing conventional ventilation compared to BALF from CPAP ($p$ value < 0.0001, repeated measures ANOVA) B), conditioned with tocilizumab (10 µg/mL) ($p$-value = 0.259, repeated measures ANOVA) C), conditioned with AREG (200 ng/mL) ($p$-value = 0.811, repeated measures ANOVA). D) MRC5 cell line wound healing supplemented with BALF from patients undergoing conventional ventilation compared to BALF from CPAP ($p$-value < 0.0001, repeated measures ANOVA) E), conditioned with tocilizumab (10 µg/mL) ($p$ value < 0.927, repeated measures ANOVA)

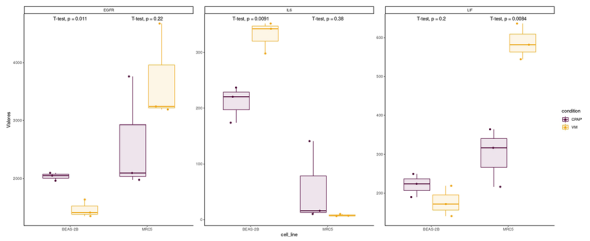

**Fig. 2 (abstract 001163)** Box plots of differential expression of the *EGFR*, *IL 6* and *LIF* genes in our two different cell types in the clinical conditions studied (statistical t-test)


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6. Instituto de Salud Carlos III (PI20/01360)
7. Centro de Investigación Biomédica en Red de Enfermedades Respiratorias (CB17/06/00021) and Instituto de Salud Carlos III (PI20/01360)


**Topic:** Acute respiratory failure and mechanical ventilation

## 001165

### Frail participants in randomized controlled trials of ARDS


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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001165



**Introduction:** Frail patients are increasingly recognized as a previously overlooked and vulnerable intensive care unit (ICU) population based on data from observational studies [1,2]. Data from randomized controlled trials on the representation and mortality of frail patients are missing. In addition, there are limited data on the association between frailty and clinical outcomes of patients with acute respiratory distress syndrome (ARDS), a syndrome with considerable attributable mortality [3].
**Objectives:** We aimed to estimate temporal trends of representation and mortality of frail participants in randomized controlled trials of ARDS.
**Methods:** We performed a secondary analysis of individual patient-level data from five ARDS Network and Prevention and Early Treatment of Acute Lung Injury (PETAL) Network randomized controlled trials (specifically: FACTT, ALTA, EDEN, SAILS, and ROSE) [4–8] published between 2006 and 2019. Based on requirement for everyday help (i.e., "assisted living") prior to hospitalization, which corresponded to a clinical frailty scale (CFS) of 5 or more, we categorized study participants into frail versus non-frail. We estimated the pooled representation of frail participants across trials of ARDS through proportional meta-analysis using inverse variance weights and random-effects. We estimated the representation of frail participants over time via a meta-regression analysis. Using a binary logistic regression model, we assessed the association between frailty and 90-day mortality after adjustment for age, sex, comorbidity, baseline oxygenation and baseline organ failures.
**Results:** Out of 3630 participants with ARDS included in our analysis, 701 (19.3%) were frail. Pooled representation of frail participants in clinical trials was 18.7% (95% confidence interval 14.8%-23.0%). Representation of frail participants in clinical trials increased over time ($p = 0.001$) [Figure], while their mortality remained stable ($p = 0.403$) and as high as 41%. Frail versus non-frail participants were older ($p < 0.001$), more likely to have aspiration as ARDS risk factor ($p < 0.001$), more likely to have at least one comorbidity ($p < 0.001$) and more likely to have cardiovascular ($p < 0.001$) or renal failure ($p = 0.007$) at baseline. Among non-survivors, end-of-life decisions did not differ between frail and non-frail ($p = 0.579$). Frail participants exhibited fewer ICU-free days ($p < 0.001$), fewer ventilator-free days ($p < 0.001$) and higher mortality (41.4% vs 26.8%, $p < 0.001$) than non-frail participants. Frail, as opposed to non-frail, participants were more likely to have subsequent disability.
**Conclusions:** In randomized controlled trials of ARDS, representation of frail participants increased over time, while their mortality remained stable and as high as 41%. Frailty was independently associated with poor clinical outcomes, including mortality, duration of organ support and subsequent disability, in ARDS.


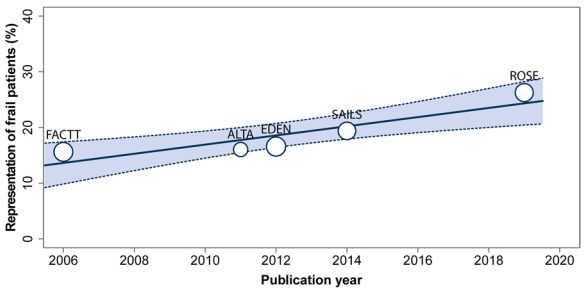


**Fig. (abstract 001165)** Representation of frail participants in randomized controlled trials of ARDS increased over time ($p = 0.001$)


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9. This study was supported by a grant to Dr Siempos from the Hellenic Thoracic Society (2023). The authors acknowledge the incredible work by the ARDS Network and PETAL Network researchers, without which this analysis would not have been possible. This secondary analysis was prepared by using the FACTT, ALTA, EDEN, SAILS and ROSE PETAL trial research materials obtained from the National Heart, Lung, and Blood Institute Biologic Specimen and Data Repository Information Coordinating Center. The article does not necessarily reflect the opinions or views

of the researchers who performed these trials or the National Heart, Lung, and Blood Institute.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001166

### Epidemiology and outcome of *Candida* bloodstream infections: a single-center study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001166

**Introduction:** Invasive candidiasis including candidemia remains the most frequent invasive fungal infection in the hospital setting [1]. Moreover, mortality associated with invasive candidiasis is around 47% [1,2]. *C. albicans* remains the most common species causing candidemia, yet *non-albicans Candida* has been rising [2–4].
**Objectives:** To describe the epidemiology and outcome of candidemia in a cohort of critically ill patients.
**Methods:** This is a single retrospective study conducted from 2007 to 2020 in a University Hospital in Brussels, Belgium. All consecutive patients who were diagnosed with blood stream infection due to *Candida species* were included. A multivariate analysis was performed to assess risk-factors associated with mortality at 30 days.
**Results:** A total of 74 patients (64.9% males) were identified with a mean age of 59 (±14) years. The most frequent comorbidities were solid-organ transplantation ($n=23$, 30.7%), diabetes ($n=15$, 20.3%), chronic kidney ($n=15$, 20.3%) or liver diseases ($n=14$, 18.7%) and solid cancer ($n=14$, 18.7%). *C. albicans* and *C. glabrata* were the most frequent pathogens ($n=26$, 34.7% and $n=25$, 33.3%). There were no significant differences in common risk factors for candidemia between *C. albicans* and *C. non-albicans* infections. Central venous catheters ($n=7$, 35% vs. $n=13$, 65%) and intra-abdominal infections ($n=6$, 46.1% vs $n=8$, 61.5%) were the most frequent sources of candidemia for *C. albicans* and *C. non-albicans*, respectively. Resistance to fluconazole was present in 13 *C. non-albicans* isolates (27.1%). Echinocandin therapy was used in 15.4% ($n=4$) of infections due to *C. albicans* and in 31.2% ($n=15$) due to *C. non-albicans.* Mortality at 30 days was 46% (33/74), with 40% of cases directly related to candidemia. Mortality was similar across different *Candida* species (Fig. 1). In a multivariate analysis adjusted for source control, immunosuppression and Sequential Organ Failure Assessment (SOFA) score, *C. non-albicans* bloodstream infection was not independently associated with mortality.
**Conclusions:** In this cohort, *Candida non-albicans* was more frequently isolated in blood cultures than *Candida albicans*. The type of *Candida* isolate was not associated with 30-day mortality.

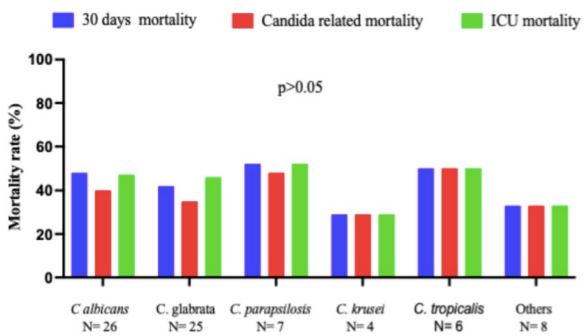


**Fig. 1 (abstract 00116)** Mortality rate according to different *Candida* species

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**Topic:** Sepsis

## 001167

### Conscious sedation during bronchoscopic procedures: Midazolam versus Ketamine

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001167

**Introduction:** Conscious sedation is a commonly used technique during medical procedures (diagnostic or therapeutic) that could be uncomfortable or painful. It allows patients to remain responsive to verbal and physical stimuli, keep the upper airways open with a spontaneous ventilation, and provide a certain degree of analgesia. It has been proven effective in various fields such as thoracic drainages or trans-esophageal echocardiograms, but its use remains limited during bronchoscopic procedures.
**Objectives:** To compare two methods of conscious sedation using midazolam and ketamine during bronchoscopic procedures.
**Methods:** This was a prospective interventional comparative bicentric study conducted in the intensive care unit (ICU) and the pneumology department of Zaghouan's regional hospital from September 2023 to March 2024. We included all patients over 18 years old who have an indication for bronchoscopic examination for diagnostic or therapeutic purposes.
Two groups were randomized in a 1:1 ratio as following: Group 1(G1): received conscious sedation with midazolam: the maximum dose was calculated at 0.05 mg/kg. Administration was by boli of 1 mg every 5 min. Group 2 (G2) received conscious sedation with ketamine at a dose of 0.3 mg/kg. All included patients underwent a medical consultation including a physical examination and a check for contraindications to midazolam or ketamine sedation prior to bronchoscopic examination. Oxygen therapy equipment and an emergency cart equipped with intubation materials, vasoactive drugs, and antidotes were available. During the procedure, patients were continuously monitored. All patients provided informed consent before the procedure.
**Results:** During the study period, 50 patients were enrolled. Gender ratio was 11.5. Median age was 66 [56–74] years in G1, and 61 [48–73] in G2. There were no significant differences in comorbidities: diabetes (8% vs 6%; $p=0.68$), chronic respiratory illness (22% vs 18%; $p=0.30$) and hypertension (14% vs 10%; $p=0.50$).

The main indications for bronchoscopy were transbronchial biopsies and the investigation of hemoptysis. Median doses used were 18 mg of ketamine [16.7–20.7] and 1 mg [0.75–1.75] of midazolam. Median duration of the procedure was 4 min [3–6] in G1 and 4 min [3–5] in G2. The operator expressed dissatisfaction regarding the use of midazolam compared to ketamine ($p = 0.04$) in terms of easiness. There was also a significant difference in the degree of sedation: patients in G1 were not adequately sedated according to the MOASS score ($p = 0.019$) and those in G2 experienced less pain referring to the EVA scale ($p = 0.01$).
There were no significant differences in observed adverse effects, except for tachycardia during the bronchoscopy which was more frequent with the use of ketamine ($p = 0.038$).
**Conclusions:** Both molecules shared a common goal ensuring the comfort and safety of patients throughout the medical procedure. Ketamine distinguished by its ability induce a state of sedation with a rapid and effective relief.

**Topic:** Sedation, analgesia and delirium

## 001168

### Use of Clevidipine for the control of arterial hypertension in critically ill patients

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**001168

**Introduction:** Clevidipine, the first third-generation calcium channel antagonist, has a rapid onset and offset of effect and reduces blood pressure (BP) by decreasing arteriolar resistance without affecting venous capacitance vessels.
**Objectives:** To present our experience with the use of Clevidipine in continuous infusion in critically ill patients for the control of arterial hypertension.
**Methods:** This is a retrospective, observational study conducted on patients admitted to critical care units of Hospital Gregorio Marañón in the year 2023. Epidemiological variables, comorbidities, severity scales, clinical characteristics, and complications were collected. Descriptive analysis of the sample was performed. Quantitative variables were expressed as mean (SD) if their distribution was normal or median (IQR) otherwise. Qualitative variables were expressed as percentages.
**Results:** A total of 26 patients were included, of whom 9 were women (34.6%) and 17 were men (65.4%), with a mean age of 57 ± 15 years. Upon admission, patients had a Charlson comorbidity index of 1 (± 2), SOFA (Sepsis Organ Failure Assessment) of 3 (± 5), APACHE II (Acute Physiology and Chronic Health Disease Classification System II) of 12 (± 6.25). Prior to Clevidipine administration, patients remained hypertensive for 4.5 h (± 19.75). The most frequent reason for admission was neurological, accounting for 57.7% of the total. 88.5% of the patients were medical, and only 11.5% of the sample were surgical patients.
65.4% of the patients had previously diagnosed arterial hypertension, of which 41% were taking 2 antihypertensive drugs as routine treatment, 29% were taking 1 drug, 17% were taking 3 drugs, and 5% were taking 4 drugs. 15.4% had diagnosed chronic kidney disease upon admission. The indication for Clevidipine was in 38% of neurological patients; in 15.4% were patients with hypertensive crisis with target organ damage; as the first option in non-surgical patients in 7.7%, and in 38.5%, it was used as rescue after failure with other drugs.
In 7 patients, it was used as the first option, accounting for 27% of the total. However, 2 drugs were tried in 34.6% (either bolus or infusion) and up to 4 drugs in 2 patients (7.7%).
The time required for infusion until achieving the target blood pressure was 120 min (± 232.5), the dose at which the target was achieved was 10 (± 15.25), with a total Clevidipine administration time of 20 h (± 34).
There was an incidence of arrhythmias of 11.5%, with atrial fibrillation being only 3.8%. The incidence of hypotension after starting Clevidipine was 31%, and patients developed hypertension after discontinuing Clevidipine infusion in 30% of cases. 65% did not experience hypertension rebound in the following 6 h after discontinuing the infusion. Of all patients, 46% were sedated. There were 19 patients on mechanical ventilation, with a median of 1 day of ventilation (± 16). ICU stay was 10 days (± 18). The mortality of these patients was 23%, with all deaths occurring in the Intensive Care Unit.
**Conclusions:** This study is a first approach to the use of Clevidipine in our unit, showing our experience since its inception. A more protocolized use will allow for better control of blood pressure in the future.

**Topic:** Cardiovascular issues in ICU

## 001170

### Evaluation of stress levels under different lighting conditions in mechanically ventilated critically ill patients

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**001170

**Introduction:** Inadequate lighting conditions in the intensive care unit (ICU) are supposed to promote chronodisruption and poor outcomes in critically ill patients [1]. A recent study has shown that light therapy could potentially reduce delirium incidence in ICU patients by modulating circadian melatonin rhythms [2]. However, light therapy, when applied through devices with a small light-emitting area, might not be effective due to the potential for causing stress through glaring effects [3,4].
**Objectives:** To evaluate stress levels under different lighting conditions in mechanically ventilated critically ill patients.
**Methods:** In a prospective, randomized controlled trial (NCT05556811), approved by the ethics committee of Charité Universitätsmedizin Berlin (EA4/104/22), we investigated stress levels as a secondary endpoint under bright-light therapy applied with a dynamic lighting system (DLS, VitalSky Advanced, Philips). Light intensity was determined using circadian effective irradiance (EC), calculated from spectral lighting data at the patient's eye level weighted by the action spectrum of melatonin suppression [5]. Mechanically ventilated patients expected to stay in the ICU for more than 5 days were included. Stress levels were assessed using the Distress Thermometer, a 0 to 10 visual analog scale [6]. They were measured once daily during the peak of EC (12 pm–4 pm) over four 24-h periods only for patients with a Richmond Agitation Sedation Scale (RASS) score greater than -4 and without delirium or subsyndromal delirium. Sixty patients were randomized into three groups, each exposed to a specific light scheduling algorithm (LSA, 1–3), a data-driven protocol designed to dynamically modulate the spectral composition and intensity of artificial lighting systems in alignment with human circadian rhythms. Group 1 (LSA-1) received high EC supplemented with episodes of blue-enriched white light (BAW-P). Group 2 (LSA-2) experienced high EC without BAW-P enhancement, while Group 3 (LSA-3), the control group, was exposed to lower EC similar to conventional hospital lighting. We compared the stress levels among these groups.
**Results:** Data from 42 patients were analyzed (LSA-1 $n = 13$, LSA-2 $n = 12$, LSA-3 $n = 17$). Stress levels were consistently low across all groups with different ECs. These preliminary results suggested that high EC (LSA-1, LSA-2) did not increase stress levels compared to lower EC (LSA-3). Patients in all groups experienced a pronounced decline in stress levels during the study period (Figure 1).
**Conclusions:** Bright-light therapy is feasible and may not significantly increase stress levels in ICU patients. This could be attributed to the technical features of the DLS, which emitted high EC from a large surface without entering the area of absolute glare. Additional data analysis and larger studies are needed to validate these findings.

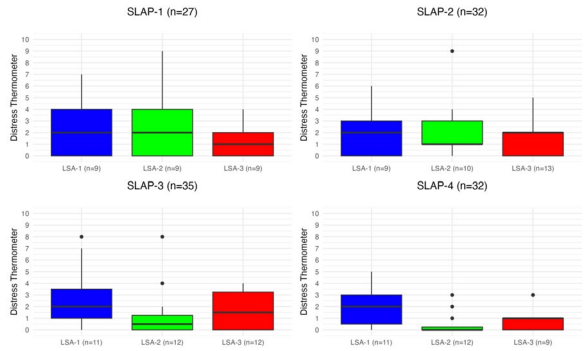


**Fig. 1 (abstract 001170)** Evaluation of stress levels in ICU patients once daily over four 24-h periods (SLAP, Stress Level Assessment Periods 1–4) using the Distress Thermometer. This assessment was conducted under a dynamic lighting system (DLS) using three different light scheduling algorithms (LSA-1, LSA-2, and LSA-3). LSA-1 involved high circadian effective irradiance (EC) with blue-enriched white light episodes (BAW-P); LSA-2 involved high EC without BAW-P; and LSA-3 simulated conventional hospital lighting with significantly lower EC, serving as the control group. Median, interquartile range (25th–75th percentile), and the 5th and 95th percentiles are reported

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001171

### Characterizing unplanned ICU admissions from surgical wards—a single center retrospective observational study

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**Introduction:** Unplanned referrals of surgical ward patients make up a sizable proportion of ICU admissions. Whether directly from the operating room, early in the postoperative period or during non-operative management, these patients may benefit from ICU admission for adequate resuscitation, advanced monitoring or organ support. In order to maximize patient benefit and resource management, clinicians should be aware of key factors that may predict ICU admission, length of stay (LOS) and mortality.

**Objectives:** To describe the population of patients with unplanned admissions to the ICU from surgical wards and evaluate their clinical outcomes.
**Methods:** We conducted a retrospective observational study of all patients admitted to a polyvalent intensive care unit between 01/01/2022 and 31/12/2023.
**Results:** From a total of 2432 individual admissions, 240 admissions (9.8%) were unplanned admissions originating from surgical wards. 168 patients (70%) had been emergency admissions and 72 (30%) had been elective admissions. Patients were mostly men ($n=152$; 63%), had a median age at admission of 70 (range 20–93), had a median Clinical Frailty Score of 3 (range 1–7), and had a median Charlson Comorbidity Index of 4 (range 0–15). Prior to ICU referral, patients had been admitted for a median of 4 days (range 0–170). Sepsis/septic shock was the most frequent cause of ICU admission ($n=93$; 39%), followed by hemorrhage/hemorrhagic shock ($n=25$; 10%). On ICU admission, the average SOFA score was 4.8 (range 0–15) and average APACHE II score was 14 (range 0–43). Subsequent average ICU length of stay was 5.4 days (range 1–40). 64 patients required IMV (26%) only; 33 patients (14%) required NIMV only; 17 patients (7%) required both; and 126 patients (52%) required neither. The pooled average duration of IMV/NIMV was 4.5 days (range 1–30). On follow-up, ICU mortality, 28 day mortality and in-hospital mortality were 10% ($n=25$), 14% ($n=33$) and 22% ($n=52$), respectively.
The presence of infection on ICU admission was significantly associated with ICU mortality, 28-day mortality and in-hospital mortality (OR 3.71 [95% CI 1.49–9.26], OR 2.51 [95% CI 1.17–5.38] and OR 2.74 [95% CI 1.45–5.17], respectively). Unplanned ICU referral following elective admission was also significantly associated with ICU mortality (OR 2.44 [95% CI 1.05–5.65]). Both the APACHE II score and the SOFA score were good predictors of ICU mortality (ROC-AUC 0.91 [95% CI 0.82–0.99] and 0.77 [95% CI 0.67–0.86], respectively). Gender and duration of IMV/NIMV were both significantly correlated with ICU LOS (Spearman-R 0.18, $p=0.006$ and Pearson-R2 0.17, $p<0.001$, respectively).
**Conclusions:** In addition to representing an important added workload in the ICU, unplanned ICU admissions from surgical wards for infectious complications and after elective hospital admission were independent risk factors for mortality. Strategies should be developed for the early identification of deteriorating patients in surgical wards.

**Topic:** Perioperative care

## 001173

### Urine CD163 levels at ICU admission as a predictor of persistent acute kidney injury

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**Introduction:** Acute kidney injury (AKI) is a frequent complication of critical illness. Persistent AKI, lasting more than 48 h from onset, is associated with increased morbidity and mortality compared to transient AKI which is reversed within 48 h. Timely recognition of patients with persistent AKI is crucial due to its poor prognosis and the potential effectiveness of prompt interventions in altering its course. Cluster of differentiation (CD)163 is a transmembrane molecule of macrophages and monocytes, that is cleaved in response to pro-inflammatory stimuli and tissue damage forming soluble CD163 (sCD163). sCD163 can be detected in the urine (uCD163) and is associated with sepsis-AKI.
**Objectives:** We hypothesize that CD163+ macrophages in the kidney might be associated with persistent renal injury in patients with AKI. The aim of this study was to investigate the predictive value of uCD163 for persistent AKI and renal recovery.

**Methods:** For the URIthmICS prospective cohort study, we collected urine samples and clinical data from adult patients acutely admitted to the ICU. Patients with chronic kidney disease or without a urine catheter were excluded from this study. AKI was defined based on the KDIGO criteria. uCD163 was measured by ELISA using the human sCD163 Duoset (DY1607) from R&D Systems. uCD163 concentrations were adjusted using urine creatinine levels to correct for the water content in the urine (cuCD163) and both parameters were used for the analysis.
**Results:** 104 patients were included: 68 (65%) men and 36 (35%) women. The median patient age was 62 years (IQR 49–71). 59 patients (57%) met the AKI criteria within the first 7 days of ICU admission: 25 patients (42%) with stage I, 16 patients (27%) with stage II, and 18 patients (31%) with stage III. Transient AKI was observed in 19 patients (32%), while persistent AKI was observed in 24 patients (41%). 14 patients were discharged from the ICU and 2 patients died within 48 h. The uCD163 levels at admission were higher in AKI patients compared to non-AKI patients (median: 371.5 vs 114.2 pg/ml, IQR: 131.5–1258.2 vs 28.7–466.1, $p = 0.01$). uCD163 was also associated with AKI severity during ICU stay. The median uCD163 in patients with AKI III, at the moment of maximum AKI stadium, was higher than those in patients with AKI I and II (median: 1518.1 vs 743.6 and 333.8 pg/ml respectively, IQR: 342.5–3175.6 vs 459.9–1283.6 and 161.8–655.8, $p = 0.04$ and 0.04, respectively). Median cuCD163 levels at the onset of AKI during ICU stay were higher in patients with persistent AKI than patients with transient AKI (median: 65 vs 31 ng/mmol, IQR: 36.2–333 vs 10.1–103.3, $p = 0.01$).
**Conclusions:** uCD163 levels at admission were associated with AKI onset during the first 7 days of ICU stay. Moreover, uCD163 levels were associated with AKI severity and cuCD163 levels at AKI onset with persistent AKI.

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**Topic:** Acute Kidney Injury and haemofiltration

## 001174

## Assessment of influence of patient position on noninvasive lower leg arterial pressure measurements: semi-recumbent versus horizontal

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**Introduction:** For noninvasive arterial pressure (AP) monitoring, when access to the upper arm is unavailable, the oscillometric cuff is frequently placed on the lower leg (1). Due to the invasive nature of arterial catheterization, it is often not the preferred option (2). Except during invasive procedures, patients are typically in a semi-recumbent position, meaning the lower leg is not at the level of the heart. This may introduce a substantial bias in AP readings compared to measurements taken at heart level (3). Only a limited number of studies have assessed the reliability of lower leg AP measurements compared to the invasive reference, and none have investigated how patient positioning affects AP readings (4,5).
**Objectives:** The objective of this prospective study was to assess the influence of patients' position (horizontal or semi-recumbent) on lower leg AP measurements.
**Methods:** This study received approval from the Comité de Protection des Personnes Ouest IV on July 4th, 2023, under the identification number RCB:2023-A01099-36, and was registered on clinicaltrial.gov (NCT06032169). Adult patients with a radial catheter and stable AP were eligible for inclusion. Patients were excluded if they had cardiac arrhythmia, contraindications to cuff placement, interarm asymmetry (mean AP > 5 mmHg), or required urgent treatment. The sequence of patient positions (supine horizontal followed by semi-recumbent, or vice versa) was randomly assigned. Three sets of simultaneous and consecutive noninvasive and invasive measurements were obtained in each position. The measurement error (noninvasive − invasive arterial pressure) was calculated for each pair. The bias, determined by the mean measurement error, was used to assess systematic measurement error (6). Statistical comparisons were conducted using the Fisher exact test, Student's t-test, and Wilcoxon test, with a significance level set at $p < 0.05$.
**Results:** Fifty patients from two intensive care units were enrolled (Table 1) between October and December 2023, resulting in the collection of 150 pairs of arterial pressure measurements for each position: horizontal (backrest angle 0° [IQR 0;0]) and semi-recumbent (40° [IQR 40;45]). Regarding mean AP, there was a greater ($p < 0.0001$) measurement bias in the semi-recumbent position (bias ± SD = + 13.3 ± 10 .5 mmHg) compared to the horizontal position (bias ± SD = + 3.8 ± 1 0.4 mmHg). This difference amounted to + 10 mmHg [95% CI: 8; 11].
For systolic and diastolic AP, the concordance between noninvasive and invasive readings was poor, particularly worsening when in the semi-recumbent position.
**Conclusions:** The patient's position significantly influenced the measurements of arterial pressure in the lower leg. In order to address this positional impact, we suggest consistently subtracting 10 mmHg from the indicated value of mean AP when measured in the semi-recumbent position.

**Table 1 (abstract 001174)** Patients' characteristics

| Variable | Patients (n = 50) |
|---|---|
| Main reason for admission to the ICU | |
| Post-operative care | 30 (60 %) |
| Coma | 4 (8 %) |
| Circulatory failure | 3 (6 %) |
| Renal failure | 1 (2 %) |
| Other | 12 (24 %) |
| Age (years) | 65 [53 ; 71] |
| Males | 37 (74 %) |
| SAPS II | 28 [20 ; 34] |
| Body mass index (weight [kg] height [m] $^{-2}$) | 26 [22 ; 28] |
| Mechanical ventilation | 9 (18 %) |
| Delay between arterial catheter insertion and measurements (days) | 1.5 [0.7 ; 2.7] |
| Catecholamines | |
| Norepinephrine (µg kg$^{-1}$ min$^{-1}$) | 0.10 [0.06 ; 0.20] N=14 (28 %) |
| Dobutamine (µg kg$^{-1}$ min$^{-1}$) | 2 [2 ; 2] N=4 (8 %) |
| Ongoing antihypertensive medication | 21 (42 %) |
| Heart rate (beats per minute) | 80 [72 ; 88] |
| Systolic invasive AP (mm Hg) | 136 [122 ; 148] |
| Diastolic invasive AP (mm Hg) | 65 [56 ; 72] |
| Mean invasive AP (mm Hg) | 88 [76 ; 96] |
| Circulatory failure [a] | 18 (36 %) |
| Septic shock & severe sepsis | 1 (2 %) |
| Cardiogenic shock | 7 (14 %) |
| Effects of mechanical ventilation & sedation | 8 (16 %) |
| Other | 2 (4 %) |

AP, arterial pressure. SAPS II, simplified acute physiology score II. ICU, intensive care unit.
Results are expressed as either median [interquartile range] or count (%).
a: Circulatory failure at the time of the measurements was defined by the presence of at least one of the following criteria: hypotension (invasive systolic SAP < 90 mm Hg and/or mean BP < 65 mm Hg), oliguria (< 0.5 ml kg h − 1) considered to be related to circulatory failure, arterial lactate > 2.5 mmol litre − 1, skin mottling, or vasopressor and/or inotropic drug infusion.

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**Topic:** Cardiovascular issues in ICU

## 001175

### Intrathecal alteplase for treatment of obstructive hydrocephalus due to intraventricular haemorrhage: one year experience of a dedicated centre – safety and functional outcome


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**Introduction:** Hydrocephalus is a commons complication of subarachnoid haemorrhage (SAH) and intracerebral haemorrhage, which leads to poorer outcomes (1, 2). Several therapeutic strategies have been studied to improve patients' survival and functional status (3). Evidence suggests that removal of intraventricular haemorrhage leads to a reduction in the degree of hydrocephalus and consequent better outcome (2). Although it appears to be safe, intraventricular fibrinolysis (IVF) appears to lead to increased survivors' functional dependence (4).
**Objectives:** To evaluate the clinical outcomes and complications of patients treated with intrathecal alteplase for hydrocephalus.
**Methods:** Retrospective analysis of all patients treated with intrathecal alteplase along a one-year period from October 2022 to October 2023.
**Results:** Seven patients were treated (71% male), aged 32 to 77 y-o (median 56 y-o). The most frequent diagnosis on admission was intraparenchymal haemorrhage (4 patients, 57%) and 3 patients presented with SAH due to arterial aneurism rupture. Pre-admission modified Rankin scale (mRS) ranged from 0 to 3 (median 0). Considering SAH, all of them were classified as 4 in Fisher scale, Hunt & Hess scale ranged from 2 to 4 and World Federation of Neurological Surgeons ranking system ranged from 1 to 4. All patients had tetraventricular haemorrhage with hydrocephalus. On hospital admission, patients' Glasgow coma scale (GCS) ranged from 8 to 15 (median 10). Considering treatment, best medical care was implemented in all the patients and an external ventricular drainage catheter was surgically placed. Alteplase 1 mg was administered once in 4 patients, twice in 2 patients and 3 times in one of them. There were no immediate complications upon administration. One patient developed a ventriculitis due to Klebsiella pneumoniae, unrelated to alteplase administration (there was a negative cerebrospinal fluid culture in-between). No other infections were documented. Regarding patients' outcomes, 2 of them died (20 and 148 days after alteplase administration, unrelated deaths). No deaths were documented in the 6 months following hospital discharge. mRS in the 3–6 months period after discharge ranged from 2 to 5 (median 3). mRS 1 year after, was available in 3 patients and ranged from 1 to 4. The patient that scored 4 showed no improvement along the follow-up time (mRS 4 at 3–6 months follow-up) and the other 2 patients showed a reduction in 1 point in mRS.
**Conclusions:** Our data confirm the previously reported safety of IVF. Despite the limitation of the small number of treated patients, no complications were reported. Considering functional outcome, there is a reduction in mRS in 2 patients (3–6 months vs 1 year), but mRS did not return to baseline values. Our data are in line with previously reported series. IVF seems to be safe but further studies are required to prove its value in improving functional outcomes.

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**Topic:** Neurointensive care

## 001176

### Fluid resuscitation in ICU: Do we meet the guidelines?—a tertiary centre study

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**Introduction:** Critically ill patients receive IV fluids in four forms: resuscitation, maintenance, replacement fluid, or nutritional 1. In the resuscitation phase, the therapeutic goal is rapidly reversing hypoperfusion by administering fluid boluses. A fluid bolus is the administration of a larger volume of IV fluid over a relatively short period, to increase intravascular volume and cardiac output. 1 According to NICE guidelines, resuscitation should be done with volume of 250 mL or 500 mL of crystalloids administered in 15 min. 2
**Objectives:** To acknowledge the practice of administering resuscitation fluids in an intensive care unit in a tertiary hospital.
**Methods:** We selected level II and III patients admitted to the Intensive Care Unit (ICU), between April 30th and June 30th of 2023. Every resuscitation fluid was justified in a prescription sheet and compared with the NICE guidelines during the first three days.
**Results:** We admitted 123 patients who needed level II or III care to the ICU for two months. From these, 41 patients required resuscitation fluids in the first 72 h of ICU admission, with 67 registered fluid bolus prescriptions. 56% were men, with an average age of 61 ± 17 years. Of the studied comorbidities, the most frequent were heart failure and chronic kidney disease. Most patients in need of resuscitation presented with septic shock at admission (39%).
Plasma-lyte was the most prescribed crystalloid (85%), followed by Ringer's lactate (4%) and normal saline (3%). Albumin was the preferred choice in 8% of cases.
The amount of fluid bolus prescribed was variable. Most physicians prescribed fluid bolus doses of 250 mL or 500 mL of crystalloid (26% and 42%, respectively). But 19% of prescriptions bolus were above 1000 mL.
Considering the duration of perfusion, 88% of the 250 mL volume dose was prescribed to be perfused in 15 min. On the contrary, only one 500 mL bolus was prescribed for 15 min. The remaining fluid boluses were done in 30 min (69%) or more (10%). 76% of fluid boluses were prescribed either for a longer time or higher volumes.
The most frequent justifications for fluid bolus were hypotension (44%), oliguria (19%), and tachycardia (18%). Although more than one reason could be selected, hypotension was chosen in 25% of prescriptions as the only justification.
In 99% of prescriptions, clinicians considered patients to be hypovolemic, evaluating clinical criteria only (1% considered normovolemic). Compared with NICE guidelines, resuscitation fluids were prescribed correctly for hypovolemic patients and the majority were with balanced solutions (Plasma-Lyte). Although the amount of fluid bolus was mostly well prescribed, only 24% of prescriptions were in the 15 min, suggested by the guidelines.
**Conclusions:** In this centre, resuscitation fluid bolus was prescribed according to the guidelines regarding volemic status, type of fluid and volume of fluid. However, the duration of bolus perfusion should be adjusted according to the guidelines and hemodynamic assessment should integrate beyond clinical evaluation.

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**Topic:** Cardiovascular issues in ICU

## 001177

### Implementation of clinical practice guidelines for the management of pain, sedation and delirium in critical ill patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001177

**Introduction:** Optimizing sedoanalgesia practice and detection of patients at risk of developing delirium is essential to reduce morbidity, mortality, improve patient comfort and reduce health care costs.
**Objectives:** The aims of this study were to unify criteria for the management of pain, sedation and delirium, within the safe practices developed in the ICU based on quality indicators of SEMICYUC (1), reduce patients complications, and increasing patient safety and well-being; implementing a protocol based on evidence-based Clinical Practice Guidelines for the management of sedoanalgesia and delirium in critically ill adult patients (2).
**Methods:** This is a prospective, observational study. During two-year period (January 22-December 23), the ICU quality group developed a protocol for the management and treatment of pain, sedation and delirium. We undertake a number of specific actions: a systematic review of the literature was carried out. The scales to be applied were evaluated (to assess: pain in patients who can communicate with Visual Analogue Scale (VAS), and in patients who cannot communicate with Scale of Behavior Indicators of Pain (ESCID); sedation with RASS scale, and Bispectral Index (BIS) during the use of neuromuscular blockers; delirium with Confusion Assessment Method for the ICU (CAM-ICU). A record of activities was elaborated and integrated into the ICU computer management system. We hold training sessions for ICU staff and checked the compliance with the protocol measures every three months. We monitored the following indicators of compliance with the protocol based on Quality Indicators of SEMICYUC, percentage of: professionals receiving formation; monitoring pain at least once every 8 h shift; evaluation of the level of sedation every 8 h in patients with mechanical ventilation and continuous sedation, and considering interruption of sedation daily; patients who receive neuromuscular blockers and are monitored with BIS; patients assessed for the presence of delirium and risk factors for developing it at least

once a day. Adverse events were registered. Finally, we confirmed compliance with treatment protocol. Clinical Practice Guidelines were applied to each patient admitted more than 24 h to the ICU in 2023.
**Results:** A total of 161 patients were admitted more than 24 h to the ICU in 2023, and were included in the study. All the equipment of the ICU received formation on the measures included in the protocol. 84 patients were on mechanical ventilation and there were 757 days of mechanical ventilation. 93% of non-communicative and 94% communicative patients were monitored for pain at least once every 8 h shift. 99% of sedated patients with mechanical ventilation the level of sedation was assessed every 8 h, and considered interruption of sedation daily. 100% of patients who received neuromuscular blockers were monitored with BIS. 93% of patients were evaluated for the presence of delirium and the risk of developing it at least once a day. There were only 12 device withdrawals. In addition, there was 95% of compliance with the treatment protocol.
**Conclusions:** The implementation of these Clinical Practice Guidelines has allowed the early identification of analgesia and sedation needs, and the prevention and identification of delirium, and has made it possible to unify management and treatment, increasing the quality of care and safety of patients admitted to the ICU.

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**Topic:** Sedation, analgesia and delirium

## 001180

### Views and barriers to achieving a Richmond Agitation Sedation Scale (RASS) score of zero in Adult Intensive Care Unit (AICU): a qualitative and quantitative survey

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**Introduction:** Sedation is used in mechanically ventilated critically ill patients for comfort and to facilitate care. However, deep sedation is associated with adverse effects such as increased mechanical ventilation duration and tracheostomy rate. Light sedation is recommended by international guidelines (Devlin et al., 2018), and is incorporated into OUH AICU's sedation policy (Tan et al., 2023). The proportion of AICU patients attaining the target RASS score of zero (unless contraindicated) is low.
**Objectives:** To explore the views and identify barriers faced by clinical staff in AICU when optimising mechanically ventilated critically ill patients' sedation target to a RASS score of zero.
**Methods:** An existing multi-professional sedation working team constructed a survey to investigate views and potential barriers towards good sedation practice. The survey used both qualitative and quantitative approaches utilising Microsoft forms as a data collection platform. The survey consisted of 8 to 10 questions, dependent on profession. The platform was piloted, and edited based on feedback received. The final survey was distributed to AICU doctors, pharmacists and nurses via email. Data collection ran for 10 days, two reminder emails were sent. Quantitative data were analysed using Microsoft Excel, qualitative data were analysed using thematic analysis (Braun and Clarke, 2022), with review by a second healthcare professional.
**Results:** The response rate was 53/201 participants. Respondents were doctors (9), pharmacists (3) and nurses (41). Overall, 30 were aware of the AICU sedation policy, and 17 stated they would always use it when caring for mechanically ventilated patients. Reasons reported for not using the policy included patient safety concerns, poor skill mix, and finding the policy to not be comprehensive enough. Some 34 respondents knew that the unit default RASS was zero. Out of 41 nurses, 15 nurses agreed or strongly agreed they had received enough guidance on sedation strategies during ward rounds. In addition, 6 doctors and a pharmacist felt somewhat confident or very confident formulating a sedation plan. Barriers to achieving a consistent default RASS included staff challenges with difficult to manage patients, operational challenges impacting sedation holds, and lack of confidence to perform sedation holds. More education, ward round guidance, and reinforcement of the unit's sedation policy were suggested as ways to improve sedation practice.
**Conclusions:** Despite evidence demonstrating benefits of light sedation and sedation holds, and an established unit sedation policy, there are still barriers to ensuring that AICU patients' sedation management is optimised. A programme of readily accessible education targeted at caregivers, rescue strategies for difficult-to-sedate patients and clear patient-specific strategies discussed at bedside during ward round are required.

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**Topic:** Sedation, analgesia and delirium

## 001181

### Early versus late vasopressin introduction in septic shock

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**Introduction:** Vasopressin is recommended by 2021 Surviving Septic Shock guidelines (1) as second-line vasopressor for patients presenting hypotension refractory to norepinephrine. The proposed cutoff defining refractory hypotension ranges from 0.25 to 0.5 mcg/kg/min but there is no clear indication on the timing of introduction. Recent data (2–4) suggest that both norepinephrine threshold and timing of introduction can impact patient outcome. We conducted a meta-analysis of existing studies to evaluate the role of norepinephrine dose threshold and timing, respectively.
**Objectives:** To evaluate the role of norepinephrine dose threshold and timing on mortality in patients with septic shock.
**Methods:** We searched the PubMed, Cochrane, and Embase databases for randomized controlled trials (RCTs) and cohort studies from January 2000 to end of December 2023, according PRISMA guidelines. Research was restricted to studies in adult septic shock patients receiving vasopressin in addition to norepinephrine. Studies including subgroups data characterizing vasopressin introduction were identified. Primary outcome was defined as ICU, hospital or 28-day mortality.

**Results:** Sixteen studies were identified of which six of them used norepinephrine dose threshold and 10 using vasopressin timeline introduction to define "early" or "late" subgroups. The majority of studies were retrospectives studies with only 1 prospective randomised controlled trial (5), which included both information on dose and timing, 1 prospective cohort (13), the remaining being retrospective cohorts. Most studies (6–9) used dose threshold based upon the lower cutoff proposed by SCC 2021 guidelines (0.25 mcg/kg/min) with the exception of original VASST study 5 (15 mcg/min) and one study (0.4 mcg/kg/min) 10, while studies based upon timing used a timeline cutoff for vasopressin introduction ranging from 3 h up to 12 h from shock onset or vasopressor initiation (11–20). Early introduction based upon norepinephrine dose was associated with a OR value of 0.573 [0.475–0.691] $p < 0.001$; I2 = 62% while early introduction based upon timing was associated with a OR of 0.707 [0.597–0.839]; $p < 0.001$; I2 = 0%. The heterogeneity of the former subgroup was reduced (I2 = 0%) when removing the study which used a higher dose cutoff. The overall OR based upon 14 studies (2 studies using MIMIC data for dose or timing were removed to avoid double-counting) was in favor of early introduction of vasopressin with an OR value of 0.595 [0.503–0.705]; $p < 0.001$; I2 = 41.5%.
**Conclusions:** Early introduction of vasopressin, either based on lower norepinephrine dose or shorter time introduction, was associated with lower mortality. However, these results are mainly based upon retrospective cohorts and need to be confirmed by larger randomised controlled trials.

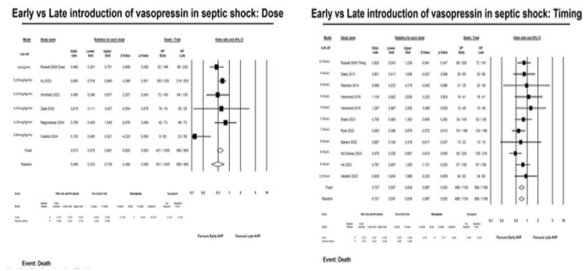


**Fig. (abstract 001181)** Forrest plot: introduction based on dose (left) or timing (right)

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**Topic:** Sepsis

## 001182

### Utility of diaphragmatic ultrasound in patients with acute respiratory failure

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**Introduction:** Acute respiratory failure (ARF) is a frequently encountered critical medical condition, stemming from various underlying causes. The evaluation of diaphragm function using ultrasound has been gaining traction, serving as a valuable resource for offering supplementary anatomical and functional insights into numerous acute respiratory illnesses.
**Objectives:** To assess the performance of diaphragmatic ultrasound, by measuring different parameters (diaphragmatic excursion (DE), inspiratory time (IT), and thickening fraction (TF)) for predicting intubation during acute respiratory failure.
**Methods:** This is a prospective study conducted over nine-month period, in the ICU of Zaghouan's regional hospital, including patients presenting with acute respiratory failure. Diaphragmatic ultrasound was performed as part of the patient's initial examination prior to mechanical ventilation. The ultrasonographic examinations were performed by the same operator using a commercially available echocardiograph machine (Vivid T8). The function of right hemi-diaphragms was assessed by measuring diaphragmatic excursion (DE), inspiratory time (IT) and thickening fraction (TF). Measurements were made in a sitting position and were averaged from at least three different

respiratory cycles. Subsequently obtained ultrasound measurements and clinical parameters were recorded and analyzed. Two groups were identified: G1 = patients who did not need invasive mechanical ventilation (IMV) and G2 = use of IMV. Patients who had received mechanical ventilation prior to diaphragmatic ultrasound were excluded from the study.
**Results:** During the study period, 45 patients were enrolled. Mean age was 59 years [16–90]. Gender ratio was 6.5. Acute respiratory failure was, respectively, secondary to: community acquired pneumonia ($n = 23$), acute exacerbation of chronic obstructive pulmonary disease ($n = 10$), acute pulmonary edema ($n = 4$), pulmonary embolism ($n = 3$) and post-traumatic pulmonary contusion ($n = 3$), acute asthma exacerbation ($n = 1$) and respiratory distress syndrome secondary to acute pancreatitis ($n = 1$). Among the 45 patients, 18 required IMV. Intubation occurred with a mean delay of 3 days ± 1. When comparing the two groups, patients who did not require invasive mechanical ventilation were younger (55 ± 16 vs 65 ± 8; $p = 0.008$), had fewer comorbidities and lower severity scores (APACHEII (8 ± 5 vs 15 ± 5; $p = 0.000$), SAPSII (36 ± 15 vs 23 ± 10; $p = 0.008$). By comparing ultrasound measurements between the two groups, we noted that DE was greater in G1 (2 cm [0.8–3.6] vs 1.9 cm [0.8–3.75]; $p = 0.74$) and IT was longer in G1 (0.79 s [0.40–1.6] vs 0.6 s [0.3–1]; $p = 0.028$). TF was higher in G1 (24.6% vs 38.2%; $p = 0.008$).
**Conclusions:** Diaphragmatic ultrasound seems a promising tool for predicting outcomes in patients with acute respiratory failure; however, further studies with large number of patients are needed to validate its efficiency.

**Topic:** Acute respiratory failure and mechanical ventilation

### 001184

### Design and implementation of a simulation-based curriculum for intensive care medicine residents at a tertiary hospital

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**Introduction:** Intensive care medicine demands a high level of both technical and non-technical skills; traditional teaching methods may not be sufficient to prepare resident physicians adequately. Simulation has been established as an educational tool that allows for the acquisition and practice of skills in a controlled and safe environment.
**Objectives:** To implement simulation as a teaching methodology and integrate it into the curriculum for resident training.
**Methods:** A training program for intensive care residents was established at Vall d'Hebron University Hospital in Barcelona, a tertiary care facility. The program accepts three residents annually over a five-year period. An assessment was performed to identify competencies suitable for training with simulation as the methodology. Scenarios were developed based on the classifications of simulation zones. Zone 1 workshops focused on acquiring instrumental technical skills. Zone 2 introduced low-fidelity scenarios to provide a clinical context, while Zone 3 aimed to develop non-technical skills such as teamwork, situational awareness, and leadership. The module selection was guided by the "Competency-based Training in Intensive Care Medicine in Europe" (CoBaTriCe) initiative. Learning objectives were tailored to each year of residency. Six modules were meticulously designed to comprehensively cover the curriculum.

| | |
|---|---|
| SimZone 1—technical skills | Central line placement airway management EEG basic interpretation |
| Sim Zone 2—technical with clinical context | Asynchronies identification and treatment |
| Sim Zone 3—technical and non-technical skills | Approach to the patient in shock approach to the neurocritical patient<br>1. Approach to the patient with acute respiratory failure<br>1. Sedation, analgesia, and delirium management |

**Results:** Sessions took place in the advanced clinical simulation center during the academic year 2022–2023. In versatile classrooms, and in a box set up as an ICU for high-fidelity scenarios. Each scenario lasted 1 h, with two scenarios per session, held once a week every 15 days, with a maximum of 6 residents per scenario. Sessions were designed and led by intensivist trained as simulation instructors. In total, 25 sessions were conducted, totaling 50 training hours. R1 and R2 residents participated in modules on technical instrumental skills, attending 9 sessions (18 h of training); R2–R3 residents participated in 8 sessions (16 h); and R4 and R5 residents had 8 sessions designed for their learning objectives. Competency acquisition was assessed using checklists and evaluation rubrics at the end of scenarios. Upon completion of the training course, a satisfaction survey was conducted, completed by 14 residents. 100% of the residents stated that the practical activities were suitable and beneficial for learning, and they would recommend the program to other residents.
**Conclusions:** The implementation of a simulation-based curriculum is feasible in a tertiary hospital and has a high level of acceptance among residents.

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**Topic:** Information systems and Data Science

### 001185

### Consultation factors for ICU in patients with decompensated cirrhosis

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**Introduction:** In recent years, the concept of acute-on-chronic liver failure (ACLF) has emerged. It is important to note that the severity of patients developing ACLF can vary; some studies have shown that up to 20% of patients with ACLF grade 3 can improve or resolve their condition.1,2 Therefore, it is crucial to consider admitting these patients to the ICU or at least evaluating them by the ICU team for the management of such organ failures. Initial severity, rather than the underlying disease, has been described as determining the prognosis of patients

with ACLF in the ICU. Recent studies have revealed that mortality and length of stay in the ICU for these patients are comparable to those of ICU-admitted patients without chronic liver disease but with equal severity of critical illness.3 In this context, it is essential to examine demographic characteristics, organ failures, and relevant differences between patients with chronic liver disease who were consulted with the ICU and those who were not during the years 2022 and 2023 in our center.

**Objectives:** To determine differences between patients with acute decompensations of liver cirrhosis admitted to the digestive ward that are consulted with ICU and those who are not.

**Methods:** This is a retrospective study on a cohort of patients with cirrhosis admitted to the ward due to acute decompensation during the years 2022 and 2023 ($N=318$). Differences between patients who were consulted with the ICU ($N=36$) and those who were not ($N=282$) were studied. Descriptive study of patients' demographic characteristics, severity scales, and organ failures (hemodynamic, respiratory, renal, and neurological). Comparative analysis by groups. Multivariate logistic regression model, model discrimination capacity assessed by AUC.

**Results:** A total of 318 patients were admitted to the ward, of which only 36 were consulted with ICU (11.3%). The mean age of the patients was 64.52 (SD ± 12.40). In univariate analysis, significant differences were observed between age, presence of ACLF, and organ failure between both the groups (Table 1). A multivariate logistic regression model was performed, including age < 75 years, female sex, respiratory failure, neurological failure, ACLF > 1 at admission, which showed high discriminative capacity to determine which patients were consulted with ICU (AUC 0.8, 95% CI 0.714–0.887).

**Table 1 (abstract 001185)** Demographic and clinical characteristics of study population ($n=318$)

| Variables | Total 318 ($N=$) n% | UCI consultation (36) 11,3 | NO UCI consultation (282) 88,7 | *P* value |
|---|---|---|---|---|
| Age (mean ± SD) | 64.52 ± 12.40 | 60.42 ± 10.79 | 65.94 ± 12.51 | 0.022 (a) |
| Sex male | 249 (79.4) | 25 (60.4) | 224 (79.4) | 0.197 |
| ACLF(b) | | | | < 0.001 |
| YES | 68 (21.4) | 22 (61.1) | 46 (16.3) | |
| NO | 250 (78.6) | 14 (38.9) | 236 (83.7) | |
| ACLF(b) grade | | | | < 0.001 |
| 0 | 250 (78.6) | 14 (38.9) | 236 (83.7) | |
| 1 | 34 (10.7) | 6 (16.7) | 28 (9.9) | |
| 2 | 17 (5.3) | 8 (22.2) | 9 (3.2) | |
| 3 | 17 (5.3) | 8 (22.2) | 9 (3.2) | |
| Organ failure | | | | < 0.001 |
| YES | 83 (26.1) | 27 (75) | 56 (19.9) | |
| NO | 235 (73.9) | 9 (25) | 226 (80.1) | |
| NºOrgan failure | | | | < 0.001 |
| 0 | 236 (74.2) | 10 (27.8) | 226 (80.1) | |
| 1 | 46 (14.5) | 9 (25) | 37 (13.1) | |
| 2 | 18 (5.7) | 9 (25) | 9 (3.2) | |
| 3 | 18 (5.7) | 8 (22.2) | 10 (3.5) | |
| Hosp. mortality | 29 (9.1) | 12 (33.3) | 17 (6) | < 0.001 |

Statistical significance with Pearson's Chi-square, except(a)with Student's t-test. (b): Acute on chronic liver failure (ACLF)

**Conclusions:** Only 11.3% of patients were consulted with ICU. Female sex, respiratory and neurological failure, ACLF > 1, and age < 75 years were independently associated with ICU consultation.

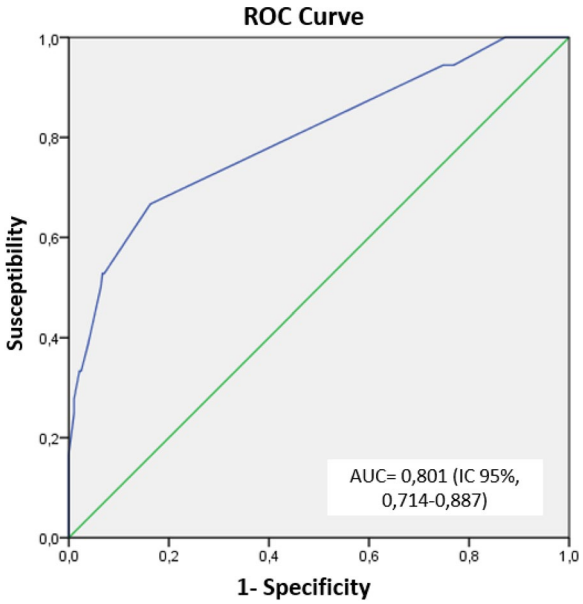


**Fig. (abstract 001185)** ROC Curve of the multivariate model presented

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001187

### Management of diabetic ketoacidosis in patients admitted to intensive care unit: the NEEDED Survey

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**Introduction:** The level of evidence on the management of patients admitted to intensive care unit (ICU) for severe diabetic ketoacidosis (DKA) is low to moderate, as indicated by the current British and American recommendations (1, 2).

**Objectives:** The aim of this survey was to get an up-to-date picture of the management of patients admitted to ICU for severe DKA.
**Methods:** International survey endorsed by the European Society of intensive Care Medicine disseminated worldwide. The survey consisted of 24 items divided into 3 parts: (i) baseline characteristics of respondents and criteria for admission to ICU, (ii) modalities of the various aspects of management and (iii) biological monitoring. All items were selected according to the different areas of uncertainty and research identified from current international recommendations. One response per intensivist was expected.
**Results:** Overall, 522 intensivists from 57 different countries responded to the survey: 295 (57%) worked in Europe, 86 (16%) in North America, 25 (5%) in South America, 52 (10%) in Africa, 52 (10%) in Asia and 12 (2%) in Australia, 72% of intensivists worked in a teaching hospital and 39% of them worked in an ICU treating > 20 patients with severe DKA per year. The criterion for admission to ICU was pH for 362 (69%) intensivists with a threshold < 7.20, while ketonemia, blood glucose level and insulin dose were not used as criteria for admission to ICU for 486 (93%), 509 (97%) and 258 (49%) intensivists, respectively. Concerning fluid resuscitation, 290 (56%) intensivists had a dedicated protocol, 135 (26%) administered saline exclusively, 176 (34%) balanced solution exclusively, 153 (29%) both types of solution and 154 (30%) administered sodium bicarbonate. Concerning insulin therapy, 355 (68%) intensivists had a dedicated protocol, 228 (44%) administered an initial bolus, 221 (42%) used a fixed dose of 0.1 UI/kg/h and 159 (30%) titrated the insulin dose to the patient's blood glucose level. Intravenous insulin therapy was started as soon as the patient was admitted to ICU by 230 (44%) intensivists, after initial fluid resuscitation by 147 (28%) intensivists and after potassium supplementation in the event of kalemia < 4.5 mmol/L by 84 (16%) intensivists. Intravenous insulin dose was reduced as soon as blood glucose level was < 10 mmol/L by 159 (30%) intensivists, when ketones disappeared by 243 (57%) intensivists, 12 h after ketones disappeared by 45 (8%) intensivists and 24 h after ketones disappeared by 14 (3%) intensivists. Concerning biological monitoring, 394 (75%) intensivists routinely performed blood gases to manage severe DKA, which were arterial blood gases in 42% of cases.
**Conclusions:** The management of patients with severe DKA remains heterogeneous across the world, both in terms of fluid resuscitation and insulin therapy. These results will support future randomized clinical trials especially on the management of fluid resuscitation and the nature of fluids to use in these patients.

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3. None

**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001188

## Influence of inflammatory and nutritional status on volume overload: logistic regression study in a retrospective cohort

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**Introduction:** Hydric management in critically ill patients poses a complex aspect in routine practice within Intensive Care Unit (ICU), often regarded as challenging [1]. This complexity arises from the intricate and dynamic pathophysiology of our patients, influenced by multiple factors, notably including the inflammatory and nutritional status [2], [3]. Consequently, currently, we lack sufficient evidence to define a duration or quantity of fluid overload (FO) detrimental to patient prognosis.
**Objectives:** To determine the influence of inflammatory and nutritional markers during admission on fluid overload (FO) during ICU stay, analytical values were collected upon admission, on the 7th and 14th days. Acute inflammation was indicated by C-reactive protein (CRP) levels > 100 mg/L, persistent inflammation by Ferritin (FRT) levels > 1000 ng/mL, and nutritional status by prealbumin (pALB) levels < 15 mg/dL. In addition, FO was defined as an accumulated fluid balance (AFB) > 2000 ml upon ICU admission, while on the 7th and 14th days, it was defined as an accumulated weight-adjusted fluid balance (AFB) exceeding 10% of the patient's weight at ICU admission.
**Methods:** Single-center retrospective cohort study of patients admitted for more than 14 days for any reason to a polyvalent ICU between January 2022 and December 2023. Clinical and demographic data were recorded. Logistic regression analysis was performed to correlate fluid overload (FO) with CRP, FRT, and pALB collected upon admission, on the 7th and 14th days post-admission.
**Results:** A total of 146 patients were included, with 77.4% being male. Admission reasons were respiratory in 34.2%, neurological in 28.7%, infectious in 23%, cardiac in 7%, polytrauma in 15%, and digestive in 4.1% cases. The mean APACHE-II score upon admission was 14 (1–31).
The patients presented levels of pALB, CRP, and FRT at admission, 7th day, and 14th day of 17.3 mg/dL (2–26 mg/dL), 18.9 mg/dL (1–1200 mg/dL), and 19.1 mg/dL (3–49 mg/dL) for pALB; 96.7 mg/L (0–650 mg/L), 111 mg/dL (0–352 mg/L), and 95.7 mg/dL (0–633 mg/dL) for CRP; and 1061 ng/dL (3–23,000 ng/dL), 772 ng/dL (50–7200 ng/dL), and 1041 ng/dL (11–14,000 ng/dL) for FRT.
The logistic regression values are shown in Table 1.

**Table 1**

| | Crp-admission OR (IC-95%) p | FRT—14 d OR (IC-95%) p | pALB—7 d OR (IC-95%) p |
|---|---|---|---|
| FO 24 h | 2.2 (1.1–4.7) p 0.03 | 1.28 (0.6–2.7) p 0.5 | 0.6 (0.3–1.2) p 0.32 |
| FO 7 d | 2.8 (1.4–5.8) p 0.06 | 1.7 (0.8–3.6) p 0.15 | 0.45 (0.2–0.9) p 0.03 |
| FO 14 d | 2.2 (1.1–4.4) p 0.03 | 2.1 (1.0–4.4) p 0.03 | 0.7 (0.3–1.4) p 0.3 |

**Conclusions:** A CRP level > 100 mg/L upon admission, indicative of acute inflammation, is an independent risk factor for fluid overload (FO) throughout the admission.

- An FRT level > 1000 ng/mL on the 14th day, indicating chronic inflammation, is an independent risk factor for elevated FO on the 14th day of admission
- A low pALB level as a marker of malnutrition on the 7th day is an independent risk factor for FO on the 7th day.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001189

### Impact of inotropic agents on extravascular lung water index measured by thermodilution in patients with systolic dysfunction

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**Introduction:** Systolic dysfunction occurs in different pathologies in the Intensive Care Unit, the most frequent being septic cardiomyopathy, ischemic heart disease, and chronic congestive heart failure, requiring the administration of inotropes to improve cardiac function and patient survival. Following the administration of inotropes, the impact on the decrease in extravascular lung water Index (EVLWI) will be evaluated, since a value > 10 mL/Kg has been correlated with an increase in mortality; this decrease is achieved after the improvement of the filling pressures of the left cavities, according to the primary pathophysiology of these diseases.

**Objectives:** To describe the changes in EVLWI measurements by thermodilution following the administration of inotropic agents in patients with systolic dysfunction.

**Methods:** This is a observational, cross-sectional, and prospective analytical study. Five patients with a diagnosis of systolic dysfunction were evaluated, requiring an inotropic agent (Levosimendan) and placement of minimally invasive monitoring for transpulmonary thermodilution (Edwards Lifesciences®). Ultrasonographic measurements of systolic function were performed: LVEF (Left Ventricular Ejection Fraction), FS (Fractional shortening), TVI (time-velocity integral), SV (Systolic Volume), CO (Cardiac Output), and MAPSE (Mitral Annular Plane Systolic Excursion) and the EVLWI value was obtained by thermodilution. Friedman test was performed, evaluating the doses of 0.05 mcg/kg/min, 0.1 mcg/kg/min, and 0.2 mcg/kg/min for 24 h.

**Results:** Of the total of patients evaluated, four of them were female and the main diagnosis was septic shock of abdominal origin plus septic cardiomyopathy (60%). A decrease in EVLWI and the use of inotrope was evident in these patients with systolic dysfunction ($p < 0.05$) (Figure 1).

In addition, the administration of inotrope agents was correlated with the systolic function variables, demonstrating an increase in LVEF ($p = 0.016$), FS ($p = 0.016$), and SV ($p = 0.03$) following the administration of levosimendan, but not for the remaining of the variables (TVI, CO, and MAPSE) (Table 1, Figure 2).

**Table 1 (abstract 001189)** Systolic function variables in relation to the administration of Levosimendan

| Variable | 0.05 mcg/kg/min | 0.1 mcg/kg/min | 0.2 mcg/kg/min | *P*-value |
|---|---|---|---|---|
| LVEF | 33 ± 10 | 42 ± 11 | 44 ± 9 | 0.016 |
| FS | 22 ± 3 | 27 ± 3 | 33 ± 2 | 0.007 |
| TVI | 17 ± 5 | 20 ± 7 | 19 ± 6 | 0.247 |
| SV | 44 ± 19 | 50 ± 24 | 52 ± 20 | 0.03 |
| CO | 3.1 ± 1 | 3.6 ± 1 | 3.8 ± 1 | 0.143 |
| MAPSE | 14 ± 1 | 14 ± 1 | 15 ± 5 | 0.165 |

As part of the treatment of systolic dysfunction, medications that could alter the EVLWI, such as the use of loop diuretics, did not generate any modification, however, it is necessary to increase the sample number for a more detailed analysis.

**Conclusions:** It was determined that the use of levosimendan decreases the EVLWI value and improves some variables of systolic function using ultrasonography; however, in this study, an association with mortality could not be established due to the sample size. It is important to highlight that the lack of availability of resources in Intensive Care Units in Latin America limits the combined use of ultrasonography and transpulmonary thermodilution, with the latter monitoring being one of the most accurate methods of measuring EVLWI. Nevertheless, large samples are needed to elucidate the role of other variables that may contribute to the success or failure of the hemodynamic support.

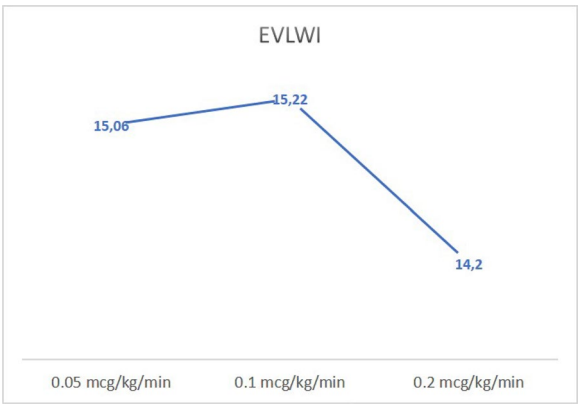


**Fig. 1 (abstract 001189)** Mean EVLWI at different doses of levosimendan ($p < 0.05$)

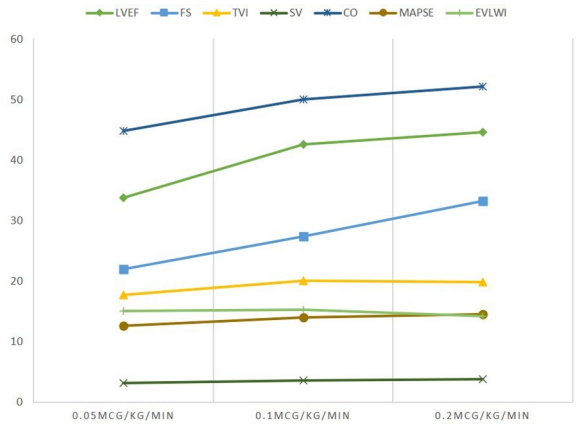


**Fig. 2 (abstract 001189)** Mean systolic function variables and EVLWI related to levosimendan doses

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9. Special thankfulness to Hospital Juárez de México and to my family

**Topic:** Cardiovascular issues in ICU

## 001190

### Venous excess ultrasound score (VEXUS Score) for prediction of acute kidney injury (AKI) in critically ill septic patients: a prospective observational study

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**Introduction:** Despite significant improvement in therapeutics over the decades, the mortality and morbidity associated with sepsis-induced AKI remain high. Increased venous pressure has been suggested as one of the in the culprit in the pathogenesis of AKI. Over the past decade, renal Doppler ultrasonographic parameters like renal resistive index (RRI) has provided insights into changes in the blood flow profile of the intrarenal arcuate or interlobar arteries. Recently, VEXUS Score was proposed to quantify the systemic congestion, which is also a promising tool for assessing kidney congestion. However, the correlation between VEXUS and AKI has not been evaluated in patients of sepsis or septic shock.
**Objectives:** The primary objective of study is to examine the correlation between serial VEXUS scores and AKI in patients with sepsis or septic shock. We also try to evaluate the impact of adding RRI to the VEXUS score in terms of sensitivity for predicting AKI. The relationship between VEXUS score and the need for renal replacement therapy (RRT), length of ICU stay and mortality were also evaluated.
**Methods:** Forty patients, age > 18 years, with a diagnosis of sepsis or septic shock (Sepsis 3 criteria), were included in this study. The components of the VEXUS score and Renal RRI were obtained serially on day 0 (upon admission to the ICU), 2, 3, and 5 after admission. In addition, clinical and laboratory data were collected to find out the onset of AKI.
**Results:** Twenty-three patients (57.5%) developed AKI as per the KDIGO guidelines. VEXUS, Modified VEXUS, RRI, all exhibited a significant positive correlation with the development of AKI. The combination of VEXUS and RRI displayed the highest correlation with a correlation coefficient of 0.74. Combination of VEXUS and RRI provided the highest AUROC (0.861), indicating its superior predictive value for AKI development. VEXUS score did not have any correlation for the requirement of RRT, duration of ICU stay, and 28-day mortality. The VEXUS score (grade 2/3) exhibited changes with a mean duration of 30.78 ± 16.97 h before any discernible change in creatinine levels, reflecting the onset of acute kidney injury (AKI).
**Conclusions:** The VEXUS score at ICU admission demonstrated a reasonably predictive capability for the development of AKI in septic patients, providing valuable lead time for intervention. Furthermore, the addition of the renal resistive index (RRI) to the VEXUS score improved its sensitivity while maintaining a reasonable level of specificity.

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**Topic:** Acute Kidney Injury and haemofiltration

## 001191

### Ventilatory weaning: contribution of ultrasound in assessing diaphragmatic function

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**Introduction:** Diaphragmatic dysfunction is identified as the main cause of weaning failure.
Recently, evaluation of diaphragmatic contractile structure and function using ultrasound during spontaneous breathing trial (SBT) has been used to guide weaning from invasive mechanical ventilation (IMV).
Its role in predicting weaning difficulties has not been clearly demonstrated, and its contribution compared to standard methods is still debated.
**Objectives:** To evaluate the use of diaphragmatic ultrasound in predicting respiratory weaning failure.
**Methods:** It was a prospective study conducted in the ICU of Zaghouan's regional hospital between January 2023 and March 2024. We included all the patients who responded to the criteria of weaning from IMV.
Diaphragmatic ultrasound was carried out in a semi-recumbent position (30°) at 30 min onset of SBT. Diaphragmatic function was evaluated by measuring diaphragmatic excursion (DE), diaphragmatic thickening (DFT) and inspiratory time (Ti). Echographic parameters were averaged from at least three different respiratory cycles. Subsequently obtained ultrasound measurements and clinical parameters were recorded and analyzed.
Weaning failure was defined as the reintroduction of mechanical ventilation within 48 h following extubation.
A DE < 10 mm and/or DTF < 30% were considered to define diaphragmatic dysfunction but does not impact the decision of extubation.

Secondary, two groups were identified and compared: Group 1: successful weaning from IMV; Group 2: failed weaning from IMV.
**Results:** During the study period, 39 patients were included. Median age was 52 years [35–52] and gender ratio was 2.5.
The main indication for IMV was acute respiratory failure secondary to community-acquired pneumonia ($n=3$), acute exacerbation of chronic obstructive pulmonary disease ($n=7$), acute pulmonary edema ($n=2$), post-traumatic pulmonary contusion ($n=3$) and acute asthma exacerbation ($n=4$). Weaning was initiated within a median period of 6 [4–9] days.
Among 39 patients, 24 patients were successfully extubated.
Patients were younger in group 1 (44 vs 62 years, $p=0.001$), had fewer comorbidities such as chronic obstructive pulmonary disease ($n=2$ vs $n=5=$, $p=0.08$) and lower IGS II and APACH II scores ($p=0.036$ and $p=0.003$, respectively).
Patients in the group 2 received more neuromuscular blocking agents (9 vs 2 days, $p=0.01$) and corticosteroids (10 vs 6 days, $p=0.006$), and the initiation of weaning was not significantly later than group 1 (8 vs 5 days, $p=0.076$).
For diaphragmatic function, DD, DFT and TI were higher for group 1 but it did not differ significantly (2.2 cm [2–2.48] vs 1.7 cm [1.04–2.4], $p=0.23$, 35% [28–42] vs 31% [26–38], $p=0.78$ and 0.9 s [0.6–1] vs 0.6 s [0.4–0.9]; $p=0.11$, respectively).
The proportion of diaphragm dysfunction did not differ significantly between group 1 and group 2 (33% vs 40%, $p=0.67$).
**Conclusions:** Diaphragmatic excursion DFT and TI were not the most reliable predictors of weaning outcomes. However, prospective studies with a larger sample size would be necessary to evaluate the role of diaphragmatic ultrasound in ventilatory weaning.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001192

### The cell landscape of ventilator-induced lung injury

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**Introduction:** Mechanical ventilation is a lifesaving technique that may cause damage (VILI: ventilator-induced lung injury) by submitting lung tissue to excessive mechanical stress. The specific responses of each lung cell to mechanical injury have not been dissected using single-cell technologies.
**Objectives:** To create a lung atlas of the effects of VILI by characterizing the transcriptomic responses to mechanical stretch with cell precision.
**Methods:** Nine mice were anesthetized and randomized to high-pressure mechanical ventilation (peak inspiratory pressure 25 cmH2O, PEEP 0, $n=4$) or spontaneous breathing ($n=5$) for two hours. Then, animals were sacrificed, and lung samples collected. Lung tissue nuclei were separated and labelled, and RNA of each one extracted and sequenced. RNA lectures were filtered for quality, normalized, and used to cluster lung cells using Seurat software for R and canonical markers for lung cell populations. Proportions in cell populations were compared using t tests. Differences in expression between cells and ventilatory conditions were assessed after creation pseudo-bulk transcriptomes for each cell population, using a two-factor model with the DESeq2 algorithm. The involved molecular pathways were identified using a Gene Set Enrichment Analysis (GSEA).
**Results:** Mechanical ventilation increased the proportion of specific clusters of club and alveolar type 2 cells. One thousand and fifteen molecular pathways were activated in in alveolar (type 1 and 2) and club cells. Four hundred and thirty-four pathways were enriched in the three cell types, including response to TGFb (Enrichment score 0.51, $p<10–9$) and apoptosis (Enrichment score 0.50, $p<10–5$). Pathways exclusively enriched in alveolar type 1 cells were related to immune response, including response to type II interferon (Enrichment score 0.59, $p<10–8$). Pathways specific for alveolar type 2 cells were related to DNA damage and repair (Enrichment score 0.48, $p<10–5$) and cell differentiation and epithelial to mesenchymal transition (Enrichment score 0.52, $p<10–8$). Finally, club cells showed specific enrichment of pathways related to Type I interferons (Enrichment score 0.50, $p<10–6$) and cell proliferation.
**Conclusions:** Mechanical ventilation modifies lung cell dynamics. Despite a common set of stretch-activated pathways, each distal epithelial cell type has also specific features. These results may help to identify cell-specific therapeutic targets to treat VILI.

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**Topic:** Translational biology

## 001193

### Skeletal muscle single-nuclei transcriptomic profiling in ARDS survivors with persistent weakness

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**Introduction:** Survivors of acute respiratory distress syndrome (ARDS) may develop intensive care unit-acquired weakness (ICUAW). ICUAW prognosis ranges from complete recovery to persistent weakness. Molecular mechanisms behind these outcomes remain unclear.
**Objectives:** To investigate molecular mechanisms of ICUAW development and recovery in ARDS survivors using whole blood and skeletal muscle transcriptomics at ICU admission and during follow-up.
**Methods:** We conducted a prospective observational study. COVID19 ARDS patients who survived to their ICU stay were recruited and followed-up at 3 and 6 months after discharge. Clinical variables related to muscle performance during follow-up were included in a latent class model to classify patients in persistent weakness (PW) and strength recovery (SR) groups. Whole-blood transcriptomes (WBT) were obtained at ICU admission. Skeletal muscle samples (SKM) were collected at admission and 3 mo for single nuclei RNA sequencing (snRNA-seq). Samples with low-quality RNA and < 250 nuclei were

discarded. Differences between groups were assessed with parametric or non-parametric tests as appropriate. Differential gene expression, functional gene enrichment and skeletal muscle snRNA-seq were explored. All analysis were performed with R.
**Results:** 90 survivors completed follow-up (64 [57–73] year-old, 27.52% female). PW [$n=31$, 34%] and SR [$n=59$] groups showed no significant differences in clinical variables, apart from muscle performance. In WBT, we identified 24 differentially expressed genes between groups, related to immune response, muscle morphogenesis and transmission of nerve impulse. After quality control, 43 SKM samples were kept for snRNA-seq analysis, revealing 22 cellular populations (Fig. 1) with distinct dynamics between timepoints in PW and SR groups. PW showed a significant decrease in myonuclei 3 mo after admission, not observed in SR group, indicating potential differences in muscle recovery capacity. An increased proportion of immune cells at 3-mo versus admission was observed only in the SR group. Compared to admission, new ligand–receptor interactions emerged at 3 mo in PW group between satellite cells and FAPs, and between myonuclei, endothelial cells and pericytes. In SR, we observed new interactions at 3 mo in lymphatic endothelial with myonuclei and endothelial cells, which could suggest active tissue remodeling in the SR group. Differences in transcriptional patterns between groups and timepoints were also observed, involving pathways related to immune response, muscle differentiation and myoblast cell fate.
**Conclusions:** Transcriptomics at ICU admission may help to identify pathogenetic molecular mechanisms leading to persistent muscle weakness in ARDS survivors. PW and SR groups show different cellular dynamics that may be related to development and recovery from ICUAW.

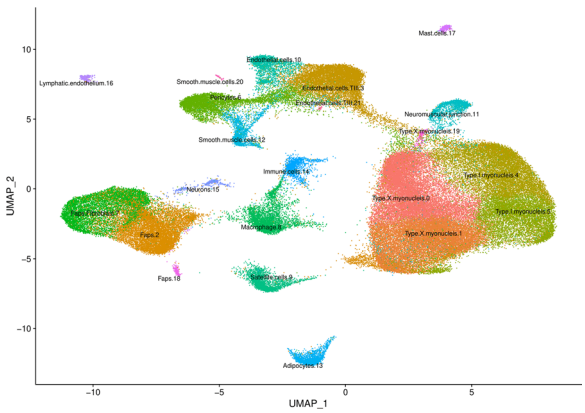


**Fig. 1 (abstract 001193)** UMAP dimplot of the 22 cellular clusters

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6. Centro de Investigación Biomédica en Red de Enfermedades Respiratorias (CB17/06/00021)

**Topic:** Acute respiratory failure and mechanical ventilation

## 001194

### Tracheostomy to decannulation in DIPRECA hospital: a retrospective cohort review of clinical factors and outcomes

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001194

**Introduction:** The literature presents varied approaches to the management of tracheostomized patients, yet there is limited evidence focusing specifically on the elderly. Successful decannulation requires a comprehensive rehabilitation process that includes the assessment of airway patency, secretions, cough reflex, consciousness level, and swallowing. At our center, the rehabilitation begins with the quantification of secretions to identify patients eligible for early decannulation, thereby reducing the duration of occlusion in the selected individuals (Figure 1 and 2).
**Objectives:** To offer an epidemiological overview of the characteristics of patients undergoing tracheostomy, as well as the outcomes of implementing standardized management for successful decannulation.
**Methods:** Retrospective cohort design. Data were collected from clinical records.
**Results:** 139 clinical records out of a total of 141 tracheostomies in adults (71% male, 29% female) were reviewed. The average patient age was 60 years, 50% elderly. 91% of these patients were admitted to the Intensive Care Unit (ICU), with prolonged ventilation (45%) and neurological compromise (28%) being the primary reasons for tracheostomy. 9% of patients were from general wards, with indications related to extrinsic airway compression or subglottic stenosis. In 96% of cases, the cannula size was 8 or larger. In the ICU, the average pretracheostomy ventilation period was 20 days, and the average time until weaning off ventilation post-tracheostomy was 18 days. Out of the 141 tracheostomies performed, 22 did not proceed to decannulation. The rehabilitation process averaged 25 days, with partial occlusion in 70% of cases and complete occlusion in 30%; the average time to occlusion before decannulation was 10 h. The decannulation success rate was 98%.
**Conclusions:** Given that the study focused on a geriatric population, which inherently has less functional reserve, the high success rate underscores the effectiveness of our hospital's management approach, indicating that it does not increase risks.

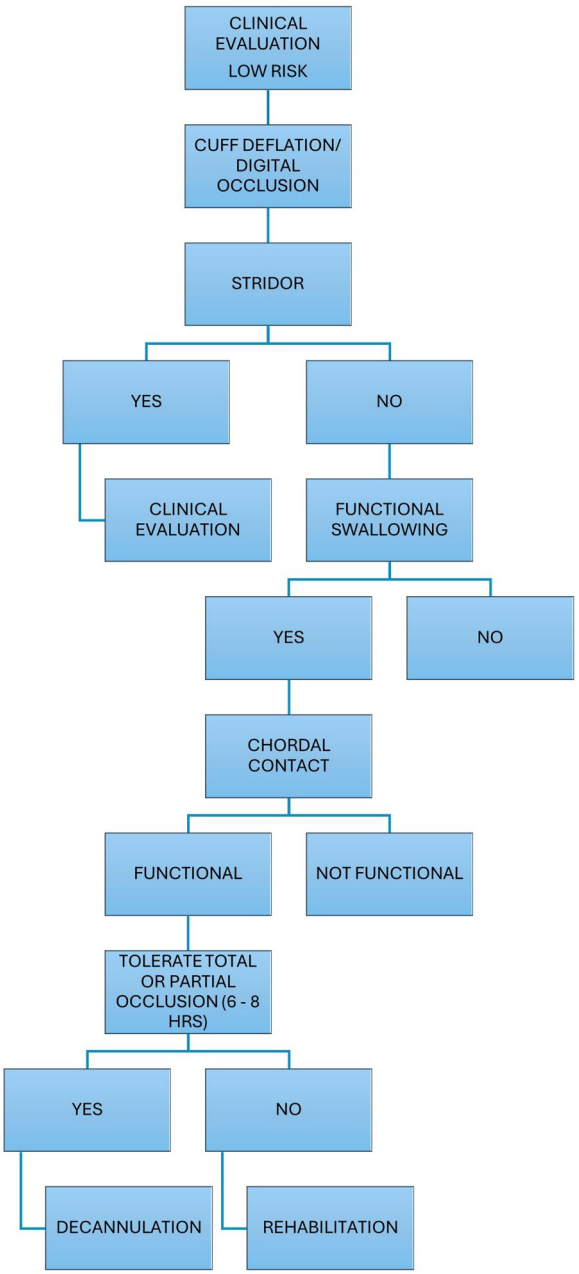


**Fig. 1 (abstract 001194)** Low-risk management due to minimal respiratory secretions

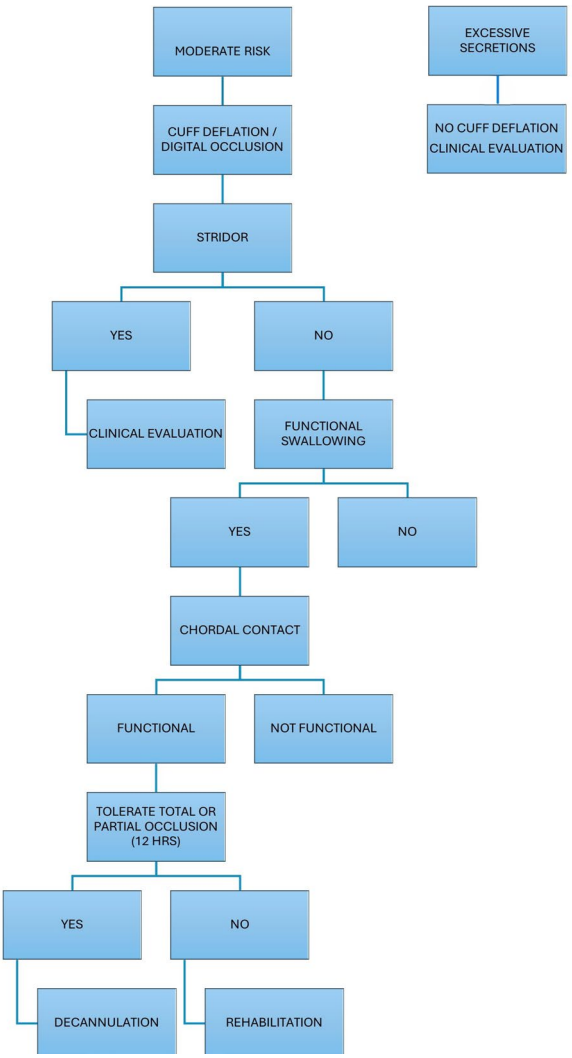


**Fig. 2 (abstract 001194)** Managing moderate to high-risk based on secretion volume

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**Topic:** Nursing care and physiotherapy

## 001195

### Predictive value of neutrophil-to-lymphocyte ratio (NLR) to predict the new onset of atrial fibrillation (NOAF) in patients with septic shock

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001195

**Introduction:** Atrial fibrillation is the commonest arrhythmia in septic shock. In septic shock, there is myocardial dysfunction due to contracting and relaxing abnormality. In addition to this, electromechanical abnormality also exists. An exact cause of this is not known, although inflammation is the proposed cause by many.
Neutrophil to lymphocyte ratio (NLR) is emerging as a new, cost effective marker in various illnesses including inflammation and sepsis.
**Objectives:** Since the proposed mechanism of new onset of atrial fibrillation (NOAF) is inflammation, we conducted a prospective observational study to evaluate the predictive value of NLR to predict NOAF in septic shock.
**Methods:** 97 patients, who were admitted with septic shock or developed septic shock during their ICU stay, were included in the study assuming NOAF developing in 40% of all cases and a drop out rate of 10%. A written informed consent was obtained from relations. NLR values were obtained from the hemogram on day 1, 3 and 5 of septic shock.
Our exclusion criteria were age < 18 years, pregnancy, neutropenia (ANC < 1500), patients with pre-existing valvular heart disease, immunocompromised status due to radiotherapy, steroids (long term), stem cell transplant and shock due to other causes.
Continuous ECG monitoring was done to detect new onset of atrial fibrillation (NOAF). Patients with NLR value > / = 3.53 were considered as having test positive.
Sensitivity, specificity, positive predictive value and negative predictive value were calculated using SPSS software from true positive, false positive, true negative and false negative test. Using different NLR thresholds, receiver operating characteristic (ROC) curve was constructed.
**Results:** We found that, in our study, 47 patients out of 97 (48.5%) had NOAF. Most of the patients with NOAF were in the age group 31–40 years (31.9%). Mean NLR was high on day 1 (20.04 ± 11.9) compared with day 3 (19.7 ± 11.5) and day 5 (16.6 ± 9.9) in patients who had NOAF. Considering the cutoff value for NLR as 3.53, sensitivity of NLR to predict NOAF was high on day 3 (95.6%) compared with day 5 and day 1. The specificity was on highest on day 1 (20%) compared with day 3 and day 5. Positive predictive value (PPV) was highest on day 1 (51.8%) and negative predictive value (NPV) was highest on day 3 (77.8%).
Receiver operating characteristic (ROC) curve analysis showed that area under curve (AUC) on day 1 was 0.61, on day 3 was 0.61 and on day 5 was 0.57.

**Table 1 (abstract 001195)** Sensitivity and specificity of NLR in patients with NOAF

| | Day 1 | Day 3 | Day 5 |
|---|---|---|---|
| Sensitivity | 91.5% | 95.6% | 90.2% |
| Specificity | 20% | 14.6% | 17.7% |
| Positive predictive value(PPV) | 51.8% | 51.7% | 50% |
| Negative predictive value (NPV) | 71.4% | 77.8% | 66.6% |

**Table 2 (abstract 001195)** ROC curve analysis

| Day | AUC | Standard error | p value | 95% CI |
|---|---|---|---|---|
| Day 1 | 0.611 | 0.064 | 0.088 | 0.486–0.735 |
| Day 3 | 0.610 | 0.064 | 0.089 | 0.486–0.735 |
| Day 5 | 0.575 | 0.065 | 0.250 | 0.448–0.702 |

**Conclusions:** Neutrophil-to-lymphocyte ratio (NLR) with a cutoff value of 3.53 has good sensitivity on day 3 to predict the NOAF in patients with septic shock. In addition, AUC had a good value on day 3. Further trials with larger sample size are required to prove its effectiveness in predicting NOAF in septic shock.

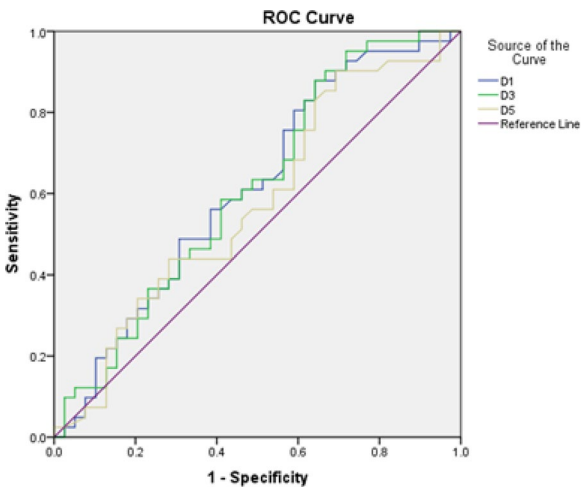


**Figure ! (abstract 001195)** Receiver operating characteristics (ROC) analysis for NLR in patients with NOAF in septic shock on days 1, 3 and 5

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**Topic:** Cardiovascular issues in ICU

## 001196

### Predictors of acute kidney injury in ICU surgical patients: a retrospective analysis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001196

**Introduction:** Acute kidney injury (AKI) is a deterioration of kidney function that can develop in hours, days or weeks and affects 30% of patients admitted to the Intensive Care Unit (ICU), contributing to morbidity and mortality. Mortality can reach 50–80% despite the use of dialysis technique, especially if associated with multiple organ failure (MOF). In patients undergoing emergency surgery, AKI is a common postoperative complication. The identification of high-risk patients may facilitate the implementation of important procedures to prevent and treat AKI in patients undergoing surgery.
**Objectives:** The objective of this study was to find predictors of AKI following ICU admission in urgent surgical patients and to verify whether there is a relationship between AKI development and the prognosis of the patient.
**Methods:** This is a retrospective single-center study evaluating surgical patients admitted to a Portuguese ICU in 2023. Patient variables were divided in demographic (age, sex), past medical history, emergency department (ED) related (vitals, creatinine, C-reactive protein (CRP), lactate, and pH), surgical procedure related (time from admission, duration of surgery, use of vasopressors, and fluid balance) and ICU related (SOFA, vitals, diuresis at 6 and 24 h). Primary endpoint was defined as development of acute kidney injury and secondary endpoints as death and need for renal replacement therapy (RRT).
**Results:** A total of 95 patients was selected, 44.2% female with a mean age at admission of 62.8 ± 28.2 years. AKI occurred in 55.8% of these patients with 8% requiring RRT. Development of AKI during UCI stay was associated with past medical history of heart failure ($\varphi = 0.26$, $p = 0.02$), mean arterial pressure under 65 mmHg at ED admission ($\varphi = 0.34$, $p < 0.01$), and need for vasopressors during surgical procedure ($\varphi = 0.34$, $p < 0.01$). Patients who developed AKI were older (73.9 vs. 48.7 years, $p < 0.01$) showed higher values of lactate (4.55 vs. 2.37, $p = 0.02$), creatinine (4.38 vs. 2.22 mg/dL, $p < 0.01$), CRP (15.5 vs. 8.96 mg/dL, $p = 0.03$) and lower pH (7.10 vs. 7.40, $p = 0.04$), and mean arterial pressure (MAP) (75.6 vs. 86.9 mmHg, $p < 0.01$) at admission. Mean fluid balance during procedure was positive in the AKI group, without achieving statistical significance (+435 vs −0.06 L, $p = 0.08$). There was an association between development of AKI and inpatient mortality ($\varphi = 0.36$, $p < 0.01$). Moreover, patients evolving to death showed a higher mean value of creatinine (2.9 vs. 1.9 mg/dL).
**Conclusions:** This study underlines the association between AKI and mortality and helps prevent and early diagnose AKI in patients undergoing surgery.
According to the results obtained in this study, the probability of developing AKI is higher in older patients, with higher lactate and CRP values and/or lower pH and MAP values. Although the results obtained are in agreement with the results obtained in the few studies carried out in this area, the present study still reveals some limitations.

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**Topic:** Acute Kidney Injury and haemofiltration

## 001197

### Surface HLA-DR dynamics and functionality of monocytes in pneumonia-induced sepsis

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001197

**Introduction:** Sepsis is a life-threatening and heterogeneous clinical syndrome characterized by concomitant inflammatory and immunosuppressive mechanisms. (1,2) The latter is associated with occurrence of nosocomial infections, viral reactivation, and poor outcomes. Administering biomarker-guided immunotherapy to patients at the appropriate immunological phase has the potential to be a significant breakthrough in sepsis treatment. (3) Decreased human leukocyte antigen (HLA)-DR expression on antigen-presenting cells, including monocytes, is advocated as a hallmark of sepsis-induced immunosuppression. (4) Knowledge on the relationship between surface HLA-DR expression and cytokine production capacities of monocytes purified from sepsis patients remains limited.
**Objectives:** Here, we sought to evaluate the association of monocyte surface HLA-DR expression to ex vivo cytokine production capacities.
**Methods:** This study was part of the Molecular Endotype-Specific Dynamics of Lung Endothelial Barrier Integrity in Sepsis (MENDSEP) project, a prospective single-centre study in the mixed ICU of a teaching hospital in Malta (Mater Dei hospital; NCT01905033). Sepsis ($n = 14$) was defined as the presentation of community- or hospital-acquired pneumonia diagnosed on ICU admission based on evident new or progressive infiltrate, consolidation, cavitation, or pleural effusion on the chest X ray or CT scan. Age- and sex-matched control participants ($n = 16$) were recruited from a long-term care facility in Malta (Saint Vincent de Paul hospital). All patients and control participants provided informed consent. Monocytes were purified from heparinised blood. Flow cytometry was utilized to profile CD14 and HLA-DR surface expression. Monocytes were exposed to 10 ng/mL *E. coli* lipopolysaccharide (LPS) for 24 h, and IL-1β was quantified in supernatants by ELISA. Data were analysed using Wilcoxon rank sum or Spearman's correlation tests. $P < 0.05$ demarcated significance.
**Results:** The monocytes of patients with sepsis showed a significant decrease in the levels of surface CD14 + HLA-DR + (double positive) compared to the control participants. Following a 24-h exposure to LPS, monocytes from sepsis patients exhibited a significant decrease in the production of IL-1β compared to the control group. Correlation tests revealed a direct relationship between percent CD14 + HLA-DR + and IL-1β production for either sepsis patients (rho = 0.5) or control subjects (rho = 0.42).
**Conclusions:** Septic monocytes are characterized by decreased levels of surface HLA-DR, and reduced production of IL-1β in response to LPS, which are in line with several reports. Production of IL-1β was directly related to the extent of HLA-DR expression on monocytes. Our

findings lend weight to the utility of monocyte HLA-DR in identifying sepsis-induced immunosuppression.

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5. MCST Research Excellence Program (REP-2023-049)
6. ESICM Established Investigator Award 2022.

**Topic:** Sepsis

## 001198

## Vasoactive Ventilation Renal Score as a predictor of mortality in septic shock in the Intensive Care Unit

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**Introduction:** Septic shock represents a frequent entity in the Intensive Care Unit (ICU), with an estimated incidence in different cohorts of 35.3% and an overall mortality of 63.4% (1). The Vasoactive Ventilation Renal Score (VVR), which has been widely applied to evaluate outcomes in post-cardiac surgery patients (2), may represent a valid index to predict outcomes in the evaluation of septic shock because it integrates the cumulative dose of vasopressor or inotropic agent, creatinine delta and ventilatory dynamics (3), which reflect the severity of the disease. It should be noted that a specific association has not been established in critically ill patients with septic shock (4), so it could be a tool that could allow the estimation of mortality risk in this group of patients.

**Objectives:** To evaluate if the Vasoactive Ventilation Renal Score is useful in predicting mortality in patients with septic shock in the Intensive Care Unit.

**Methods:** This is a prospective, longitudinal, analytic clinical assay. We included patients with septic shock admitted to the ICU. We calculate the VVR Score at admission to the ICU and 24 h later. The VVR was calculated as follows: Vasoactive Inotropic Index (VIS)+Ventilation Index (VI)+Renal Score (change in serum creatinine (Cr) from admission × 10). VIS was calculated using the following equation: Dopamine dose (µg/kg/min)+Dobutamine dose (µg/kg/min)+100 × Epinephrine dose (µg/kg/min)+10 × Milrinone dose (µg/kg/min)+10,000 × Vasopressin dose (µg/kg/min)+100 × Norepinephrine dose (µg/kg/min) (5). VI was calculated using the following formula: VI=(respiratory rate x (Maximum pressure − PEEP) x PaCO2)/1000, when the patient was not ventilated, the score was 0. Δ creatinine was calculated by subtracting the serum creatinine (in mg/dL) at 24 h of admission from the serum creatinine at the admission to the ICU. The VVR was calculated using the following formula: VVR=VIS+VI+(ΔCr × 10) (6). We measured APACHE II, SOFA and SAPS II.

**Results:** We evaluate a total of 30 patients, 43.3% ($n=13$) were males and 56.7% ($n=17$) were females, of which 83.3% ($n=25$) survived and 16.6% ($n=5$) died. The etiology of the septic shock was mostly abdominal (50%). The median of VVR calculated at the time of admission was 30.9 and 67.8 (survivors and non-survivors), and at 24 h were 21.35 and 88.5 (survivors and non-survivors) both measurements with statistical significance ($p=0.021$ survivors and $p=0.047$ in non-survivors). By applying Youden test, we calculate a value of VVR of 41.7 at admission and 47.9 24 h later, with the area under the curve for VVR at the time of admission was 0.95 ($p=0.001$) and at 24 h of 1.0 ($p=0.001$).

**Table 1 (abstract 001198)** Median scores and standard deviation at the time of ICU admission for all patients; comparison of all variables between ICU survivors and ICU non-survivors

| Variable | Total | ICU survivors—median (SD) | ICU non-survivors—median (SD) | *p* |
|---|---|---|---|---|
| APACHE II | 22.10 ± 9.74 | 21.4 (0.90) | 25.6 (1.80) | 0.738 |
| SOFA | 12.33 ± 5.28 | 11.68 (1.84) | 15.60 (2.70) | 0.004 |
| SAPS II | 38.47 ± 18.78 | 36.04 (1.14) | 50.06 (0.144) | 0.233 |

**Table 2 (abstract 001198)** Median of VIS, VI, Creatinine and VVR measurements at the time of admission and 24 h later and its relationship with mortality

| Variable | Admission ICU survivors Median (SD) | 24 h ICU survivors Median (SD) | *p* | Admission ICU non-survivors Median (SD) | 24 h ICU non-survivors Median (SD) | *p* |
|---|---|---|---|---|---|---|
| VIS | 15.17 (1.77) | 9.92 (1.74) | 0.033 | 52.40 (1.17) | 65.60 (2.07) | 0.000 |
| VI | 12.88 (2.19) | 8.52 (1.19) | 0.050 | 18.62 (1.65) | 26.10 (3.9) | 0.000 |
| Creatinine | 1.93 (1.18) | 1.64 (1.16) | 0.001 | 3.90 (0.55) | 4.22 (0.67) | 0.000 |
| VVR | 30.9 (1.25) | 21.35 (0.13) | 0.021 | 67.8 (1.25) | 88.5 (4.37) | 0.047 |

**Conclusions:** Since there is lack of evidence of the utility of this index in adult patients in the context of septic shock, we conclude with this clinical assay that the VVR Score is an useful tool, with high specificity and sensibility, to predict mortality in patients with septic shock admitted to the ICU when measured at the time of admission and 24 h later.

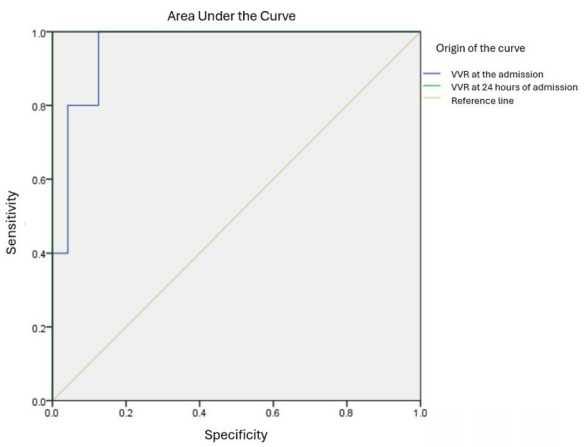


**Fig. 1 (abstract 001198)** Area under the receiver-operating characteristic curves expressing the VVR at the time of admission and 24 h later

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8. Special thanks to the Hospital Juárez of México and the staff involved in this assay

**Topic:** Sepsis

## 001199

### Characteristics and outcomes of super elderly patients with community-acquired pneumonia: a multicenter study of 10,763 patients in Brazilian ICUs

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**Introduction:** Community-acquired pneumonia (CAP) is a major cause of Intensive Care Unit (ICU) admission for elderly patients worldwide. The biological and functional heterogeneity of very old patients presents a major challenge for prognostication and patient management in ICUs. A knowledge gap exists in the evidence supporting triage and care planning for elderly patients.
**Objectives:** The goal of this study was to describe clinical characteristics and outcomes and identify phenotypes associated with in-hospital mortality.
**Methods:** We prospectively included consecutive patients from 147 ICUs (60 Hospitals). Anonymized data were collected (2019 and 2022 and 2023, January to July). The study was approved by the IRB (CAAE: 17079119.7.0000.5249). Super-elderly were defined as 80 years old and more. The outcome of interest was hospital mortality. We described the super-elderly patients according to clinical characteristics, resource use, and hospital outcomes. Descriptive statistics were used for all variables. Parametric tests were used to determine group differences. For subgroups identification, we used a modified K-means clustering algorithm. We assessed the phenotypes characteristics and their ability to discriminate between outcomes.
**Results:** From 307,554 patients, 18,017 had more than 65 years old and had CAP as the admission diagnosis. The super-elderly group had 10,763 patients presenting a median SAPS score of 57 (IQR 54;62) and 2605 (24%) were frail. Performance status before admission was "independent" 2821 (35.6%), "partially dependent" 4483 (41.65%) and 2448 was "bedridden" (22.75%). Median ICU length of stay (LOS) was 5 (IQR 3;9) days. Median hospital LOS was 10 (IQR 7;17) days. ICU and hospital mortality were, respectively, 10.31% and 17.94%. Of the super-elderly patients, 1151 (10.31%) were mechanically ventilated, 405 (3.76%) received renal replacement therapy, 1324 (12.3%) received vasopressors. For mechanically ventilated (MV) patients, the hospital mortality was 67.76% (780 patients). Higher SOFA score, frailty, and poor functionality were associated with higher mortality for super elderly in the univariate analysis (Fig. 1). Preliminary cluster analysis showed two groups. Cluster "2" was associated to a higher hospital mortality (22%), have distinct characteristics: higher median age, higher frequency of Neurologic disfunction at admission, poor functional status and dementia (Table 1). The resource use was different for RRT and tracheostomy. There was no difference for SAPS 3 score, frequency of MV at admission, vasopressor use, ICU and Hospital LOS between the groups.
**Conclusions:** This multicenter study identified significant heterogeneity among super-elderly patients with CAP admitted to ICUs. By applying a modified K-means clustering algorithm, we found two distinct patient phenotypes. The cluster characterized by older age, more frequent neurological dysfunction at admission, dementia, and poor functional status had worse hospital outcomes. These findings can be useful as prediction tools, paving the way to more informed and rational ICU resource allocation for this vulnerable group.

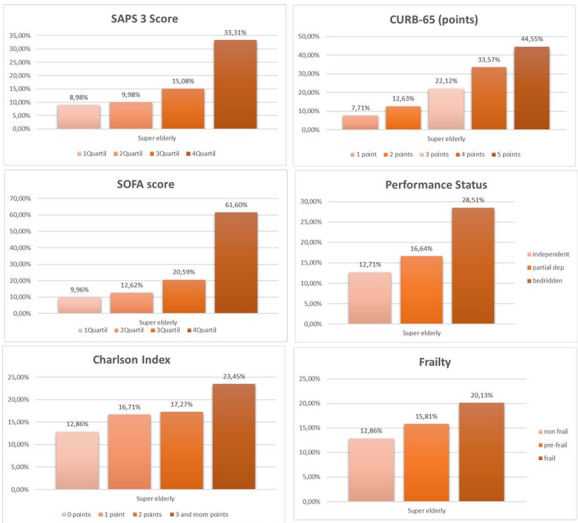


**Fig. 1 (abstract 001199)** Clinical characteristics and outcomes

**Table 1 (abstract 001199)** Cluster analysis. Variables that showed significant differences between groups

| | | Cluster 1 | Cluster 2 |
|---|---|---|---|
| | age (median, IQR) | 84 (82;86) | 91 (89;94) |
| Acute disfunction at admission | Neurologic | 29% | 40% |
| Geriatric assessment | Dementia | 26% | 37% |
| Performance status | Bedridden | 18% | 28% |
| Vital suport | Renal Replacement Therapy | 4.6% | 2.9% |
| ICU Interventions | Tracheostomy | 2.4% | 1.2% |
| Outcome | Hospitalar death | 14% | 22% |

**Topic:** Ethics and end of life care

## 001200

### Vasopressin use in patients with septic shock: the PRESS Survey

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**Introduction:** Vasopressin is currently suggested as a second-line vasopressor in patients with septic shock on norepinephrine and persistent arterial hypotension instead of increasing norepinephrine dose (1). Nevertheless, the place of vasopressin and its analogues in patients with septic shock is still debated with significant heterogeneity between intensive care units (ICU).
**Objectives:** The aim of this survey was to obtain an up-to-date picture of the use of vasopressin and terlipressin in patients with septic shock.
**Methods:** This is an international survey endorsed by the European Society of Intensive Care Medicine disseminated worldwide. All items were selected according to the different areas of uncertainty and research identified from current international recommendations. One response per intensivist was expected.
**Results:** Overall, 461 intensivists from 72 different countries responded to the survey: 303 (66%) worked in Europe, 158 (34%) worked in non-European countries and 226 (49%) worked in a teaching hospital. Vasopressin or analogues were available in 91% of cases. The reported indications for vasopressin or terlipressin were refractory septic shock (66% of cases), catecholamine sparing in all types of refractory shock (56% of cases), refractory vasoplegic shock (other than septic) without reduced systolic function (52% of cases) and septic shock with high cardiac output and low systemic vascular resistance (49% of cases). The main reported contra-indication for vasopressin or terlipressin was non-occlusive mesenteric ischemia (39% and 32% of cases, respectively). Overall, 342 (74%) intensivists used vasopressin or terlipressin, mainly as a second-line vasopressor after initial resuscitation with fluids and norepinephrine (93% of cases). The main trigger for vasopressin or terlipressin use was low mean arterial pressure (MAP) (90% of cases) and the main goals were to increase blood pressure and decrease the catecholamine load. When the duration of administration was not considered, a norepinephrine base dose between 0.25 and 0.50 µg/kg/min was the most frequent trigger for vasopressin or terlipressin administration (52% of cases). When the duration of administration was considered, a norepinephrine base dose > 0.25 or > 0.50 µg/kg/min for > 2-6 h was the most frequent trigger (59% of cases). The most frequent initial doses of vasopressin were 0.01 or 0.03 UI/min (27% of cases for both doses) and were mainly titrated thereafter to target MAP. The main triggers for tapering vasopressin or terlipressin were MAP level (84% of cases) and first-line vasopressor dose (59% of case). Vasopressin or terlipressin were tapered after the dose of the first-line vasopressor was lowered below a predefined threshold in 40% of cases with a progressive decrease in doses in 84% of cases.
**Conclusions:** There is still a significant heterogeneity in the use of vasopressin in patients with septic shock. The survey is still ongoing.

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2. None

**Topic:** Cardiovascular issues in ICU

## 001202

### Evaluation of the similarity of AMR patterns in clinical isolates and the ICU-built environment isolates in two ICUs in Cape Town, South Africa

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**Introduction:** The physical environment of the ICU is an under-appreciated reservoir of resistant organisms growing on surfaces as biofilms. As such, the ICU acts as an incubator for resistant pathogens and plays a role in antimicrobial resistance (AMR). AMR is a problem in Africa, where a lack of surveillance data hinders intervention activities.
**Objectives:** The objective is to evaluate whether the AMR patterns in clinical isolates are similar to those of viable microbes in the ICU-built environment.
**Methods:** A prospective study was conducted in 2 ICUs at a public and private hospital in Cape Town. Patient culture results, taken as part of patient treatment from 1 February to 31 March 2022, were included. Microbiological samples were collected from various "high-frequency" touch surfaces, water sources, faucet outlets and wastewater drains in the ICUs on two occasions during the study period.
**Results:** ICU A admitted 328 cardiothoracic and vascular surgery patients, the mean (SD) age was 65 (14) years, 119 patient specimens, 63 surface swabs and 14 water specimens (sampling 1) and 66 surface swabs and 17 water specimens were collected. ICU B admitted 128 trauma and surgical patients; the mean (SD) age was 44 (16), 374 patient specimens, 47 surface swabs and 10 water specimens (sampling 1) and 48 surface swabs and 9 water specimens were collected. Summary of main results in table.

| | Organism | Clinical source | Environmental source |
|---|---|---|---|
| ICU A | Non-MDR *Serratia marcescens,* AST near identical | Sputum × 2 | Hand wash sink drain, patient bedside drawer, IV pump |
| | MR *S Staphylococcus epidermidis*, AST not identical | Blood × 1 | Nursing station vital stats monitor mouse |
| | MDR *Klebsiella pneumonia,* AST near identical | Blood × 6 | Bed sink drain |
| | *Pseudomonas aeruginosa* AST identical | Urine × 1 | Staff bathroom drain, sluice drains |
| ICU B | MDR A*cinetobacter baumannii* and *Acinetobacter* spp. AST identical | Tracheal aspirate × 5, peritoneal aspirate × 1, pleural aspirate × 1, bronchial aspirate × 1, blood × 2, urine × 2, catheter tip × 3 | Patient bedside drawer, admission book, telephone handset, medication prep surface, bedpan wash sink and drains |

| | Organism | Clinical source | Environmental source |
|---|---|---|---|
| | MDR *Acinetobacter baumannii* AST identical Sensitive to Gentamycin | Tracheal aspirate × 1, urine × 2, catheter tip × 1, wound swab × 1 | Bedpan wash sink, sluice room drain |
| | Non-MDR *Serratia marcescens* AST identical | Tracheal aspirates × 3 | Telephone handset, patient bedside drawer, hand wash sink |
| | MDR *Klebsiella pneumonia* AST near-identical | Sputum × 1 | Patient bedside drawer |

**Conclusions:** The AMR profiles of clinical isolates implicated in hospital-acquired infections matched those of environmental isolates in some, but not all, instances. This indicated that other reservoirs of AMR organisms might be present in the environment, such as colonised but asymptomatic patients or healthcare workers.

**References**
1. Grand Challenges Africa AMR Innovation Seed Grant

**Topic:** Infections and prevention

## 001203

### Prediction of the volume response through the increase in the time velocity integral after a change in the positive pressure at the end of expiration (PEEP Study Test)

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001203

**Introduction:** Determining the patient's ability to respond to volume expansion is essential during the management of hemodynamically unstable patients in the Intensive Care Unit (ICU), trying to avoid fluid overload that causes an increase in mortality. The increase in positive end-expiratory pressure (PEEP) decreases stroke volume (SV) and is explained by the decrease in venous return as a result of an increase in pleural pressure and with this could induce a response to fluids.
**Objectives:** To evaluate whether the increase in time velocity integral (TVI) following a change in positive end-expiratory pressure (PEEP) predicts the volume response.
**Methods:** This is a prospective, longitudinal, comparative, analytical study. Patients who were admitted to the ICU with mechanical ventilation were included. The volume responsiveness was measured by measuring the baseline ITV and after passive leg raising (PLR), presenting an increase of 10%. The PEEP test consisted of increasing the PEEP level to the baseline level by 5 cmH2O for one minute, obtaining an ITV measurement, subsequently decreasing it back to the baseline PEEP with its respective ITV measurement. During the test, the patient had continuous monitoring.
**Results:** A total of 54 patients were registered with 70.4% ($n=38$) women and 29.6% men ($n=38$) (Table 1). It was demonstrated that there is a significant statistical difference ($p=0.001$) after performing PLR and 55.6% ($n=30$) were defined as responders and 44.4% ($n=24$) as non-responders with an average ITV of 21.68 ± 3.5 ($p=003$) and 19 ± 2.5 ($p=0.002$), respectively. After decreasing the PEEP delta to 5 cmH2O, the average ITV for responders was 21.6 ± 3.6 ($p=0.000$) and for non-responders 18.4 ± 2.5 ($p=0.000$) (Figure 1). The average PEEP at the beginning of the study was 6 cmH2O with no difference observed between responders and non-responders ($p=0.369$). The area under the curve of the PEEP test for detecting volume responsiveness was 0.801 (95% CI: 0.85 to 0.91) ($p=0.001$) (Figure 2).

| Variable | Total population ($n=54$ | Responder ($n=30$) | Non-responder ($n=24$) |
|---|---|---|---|
| Gravity scales | | | |
| APACHE | 17.35 ± 6.7 | 18 ± 7.4 | 15.74 ± 5.6 |
| SOFA | 9.5 ± 3.28 | 9.46 ± 3.2 | 9.65 ± 3.44 |
| Time velocity integral (TVI) | | | |
| TVI baseline | 19.0 ± 2.9 | 18.7 ± 3.2 | 19.3 ± 2.7 |
| TVI after PLR | 20.4 ± 3.3 | 21. 68 ± 3.5 | 19 ± 2.5 |
| TVI Δ 5 cmH2O | 17.3 ± 3.2 | 17.1 ± 3.5 | 17.7 ± 2.7 |
| TVI baseline 2 | 20.5 ± 3.6 | 22 ± 3.6 | 18.54 ± 2.5 |
| Causes of shock (%) | | | |
| Hypovolemic | 9 (16.7%) | 9 (16.7%) | 0% |
| Abdominal | 14 (25.9%) | 9 (16.7%) | 9.3% (5) |
| Soft tissue | 4 (7.4%) | 2 (3.7%) | 2 (3.7%) |
| Pulmonary | 25 (46.3%) | 10 (18.5%) | 15 (27.8%) |
| Pulmonary and abdominal | 2 (3.7%) | 0% | 2 (3.7%) |

**Conclusions:** The response to volume can be detected using changes in mechanical ventilation; both the tidal volume change and the PEEP test using the left ventricular outflow tract velocity time integral (LVOT VTI) as a surrogate for stroke volume.

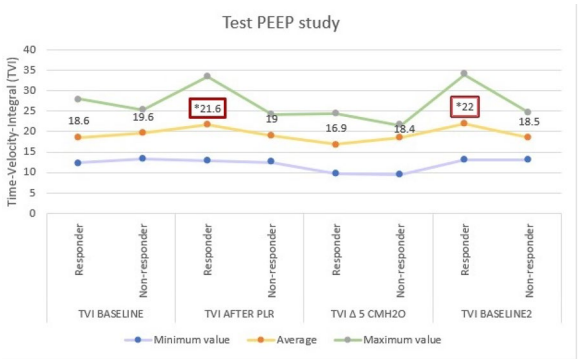


**Fig. (abstract 001203)** Changes in TVI with passive leg raising (PLR), PEEP-test and volume expansion in volume responsive and volume unresponsive patients. *$p<0.05$

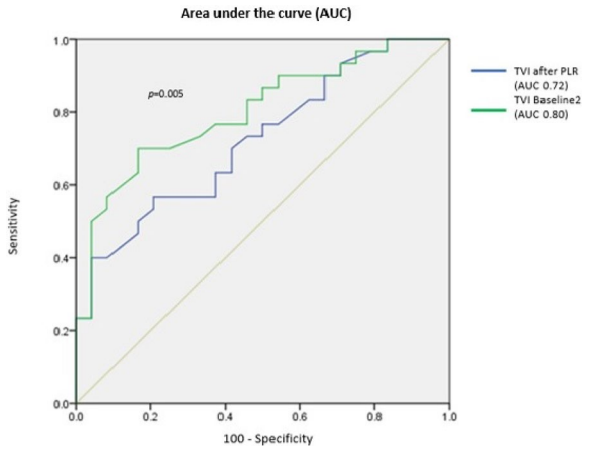


**Fig. (abstract 001203)** Area under the receiver-operating characteristic curves expressing the ability to detect volume responsiveness with TVI and pressure during a PEEP-test ($p = < 0.0001$)

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**Topic:** Cardiovascular issues in ICU

## 001204

## A scoping review of approaches to alarm fatigue reduction in intensive care and telemetry units

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**Introduction:** Alarm fatigue is a widely recognised patient safety risk that occurs when health professionals are exposed to excessive alarms, causing sensory overload and desensitising nurses' responsiveness to critical alarms (Schmid et al., 2011). Those affected by alarm fatigue may postpone or dismiss critical alarms (Sendelbach & Funk, 2013), leading to unintended consequences for both patients and care providers. There is a general agreement that implementing alarm management strategies can contribute to reducing alarm fatigue (Paine et al. 2015), yet the description of what sort of strategies can reduce alarm fatigue and how these strategies contribute to alleviating alarm fatigue in hospital settings remains unclear.
**Objectives:** This review aims to 1) synthesise the strategies employed to reduce alarm fatigue, including excessive false and non-actionable alarms which are major factors causing alarm fatigue among nurses, and 2) understand how these strategies contribute to alleviating alarm fatigue in ICU and telemetry settings.
**Methods:** This scoping review was conducted according to the Guidance for conducting systematic scoping reviews (Peters et al. 2015). The PubMed, CINAHL and ProQuest databases were searched for manuscripts published between 2013 and 2023. The search strategy followed the most recent Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews (PRISMA-ScR) guidelines (Tricco et al. 2018).
**Results:** This review included twenty-seven articles focused on alarm management strategies for the reduction of alarm fatigue in healthcare settings. We found a lack of studies that sought to decrease alarm fatigue directly; instead, the predominant focus was on reducing alarm quantity, with the anticipated effect of reducing alarm fatigue. Alarm management strategies include reducing unnecessary telemetry use, reducing invalid alarms, reducing valid but nonactionable alarms, enhancing the signals of actionable alarms for improved responsiveness and implementing a care bundle. These interventions addressed various types of problems potentially contributing to alarm fatigue. These interventions were implemented by various members of the healthcare team. Studies aimed at bundled interventions were associated with greater alarm fatigue reduction benefits in healthcare settings than those targeting a single intervention alone.
**Conclusions:** Although efforts have been made to reduce alarm fatigue, no single approach has been found universally beneficial, acknowledging diverse types of alarms contributing to alarm fatigue. These interventions were implemented by various members of the healthcare team, underscoring the multifaceted and collaborative nature of the strategies employed. The recognition of the multifaceted nature of problematic alarms suggests that a series of different interventions, rather than a singular approach, that together form a framework have a greater potential for alarm fatigue reduction in healthcare settings.

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6. This work was supported by the Newcastle upon Tyne Hospitals NHS Foundation Trust.

**Topic:** Nursing care and physiotherapy

## 001205

### The climate impact of an intensive care unit in Sweden, a life cycle assessment

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**Introduction:** Climate change is already impacting human health and is perceived as one of the greatest health issues for the twenty-first century. The health sector's climate footprint is equivalent to 4.4% of the global net emissions of greenhouse gases (HCWH, Arup, 2019). Intensive care is a particularly resource demanding sector of health care but little is known about its climate footprint (Bein T, Koch S, Schulz C. 2021).
**Objectives:** The objective of this study was to estimate the total climate impact of a Swedish ICU and to identify modifiable hotspots.
**Methods:** A process-based life cycle assessment was conducted to estimate the climate impact per bed-day at the Helsingborg hospital ICU in southern Sweden using ReCiPe 2016 method. The analysis included single-use items, reusable items and textiles, pharmaceuticals, fluids, medical air and oxygen, and energy consumption for electronic equipment, lighting, and heat-ventilation-air condition (HVAC). Results are reported as median and 95% reference intervals [2.5th–97.5th percentiles] emissions of carbon dioxide equivalents (CO2eq).
**Results:** The climate impact of one bed-day at the ICU was 32 kg CO2eq [30–35]. About 60% of the total impact came from the production and waste management of single-use items, followed by the unit's energy consumption representing 25% of the total impact (Fig. 1, panel A). Of the single-use items, aprons, gloves and woven gauzes were the top three contributors and contributed by 14%, 12% and 11% of the total climate impact from single-use items (Fig, panel B). The sensitivity analysis showed that changing from a Swedish, mainly renewable energy mix, to an average European or a fossil intensive energy mix increased the climate impact to 77 kg CO2eq [73–83] and 150 kg CO2eq [116–197], respectively.
**Conclusions:** The opportunity to reduce the climate impact from Swedish intensive care mainly lies in the reduced use of single-use items. However, for countries which are dependent on fossil intensive energy sources, the main opportunity to reduce intensive care's climate impact is through the transition to green energy.

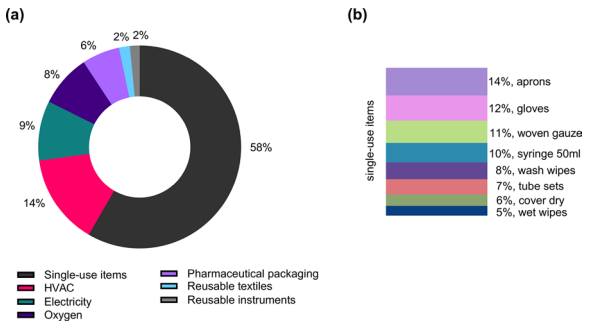


**Fig. 1 (abstract 001205)** (A) Contribution analysis showing the climate impact from different activities at the ICU. HVAC = heat, ventilation, and air conditioning. (B) Contribution analysis showing the single-use items which contributes by ≥ 5% of the single-use items total climate impact

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3. Linn Hemberg received funding from Lund University Agenda 2030 Graduate School.
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**Topic:** Health Services Research and Outcome

## 001206

### Early outcome prediction in cardiac arrest survivors using galectin-3, neuron-specific enolase and their combination

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001206

**Introduction:** Early and precise prognosis determination in cardiac arrest survivors remains challenging despite multimodal approach. Currently, the only guidelines-recommended biomarker for early prognostication is neuron-specific enolase (NSE).
**Objectives:** The aim of our study was to compare prognostic values of Galectin-3 (Gal) with NSE at different timepoints after cardiac arrest and with combination of both biomarkers.
**Methods:** Eligible subjects for this prospective study were out-of-hospital cardiac arrest survivors. All patients were treated with targeted temperature management (33 °C for 24 h) using an endovascular device. Blood samples for the measurements of NSE and Gal levels were drawn at 24 h (D1), 48 h (D2), 72 h (D3), and 96 h (D4) after hospital admission. Thirty-day neurological outcomes according to the Modified Rankin Scale (mRS) were evaluated as clinical endpoints, and poor outcome was defined as mRS 4–6. Prognostic values of NSE and Gal for the prediction of poor outcomes were determined using ROC analysis.
**Results:** A total of 83 cardiac arrest survivors (mean age 65 years) were enrolled in the present study. The area under the ROC curve (AUC) for NSE was 0.779, $P < 0.001$ at D1, 0.936, $P < 0.001$ at D2, 0.968, $P < 0.001$ at D3, and 0.990, $P < 0.001$ at D4. The AUC for Gal was 0.711, $P < 0.001$ at D1, 0.528, $P = 0.689$ at D2, 0.575, $P = 342$ at D3, and 0.541, $P = 0.679$ at D4. The comparison of ROC curves revealed similar AUC at D1 ($P = 0.269$) and significantly lower AUC for Gal in comparison to NSE at D2-4. Multiple logistic regression revealed that combination of both biomarkers at D1 may predict poor prognosis with a 69% specificity and 84% sensitivity (AUC 0.801; $P < 0.001$) and poor outcome with 100% specificity at D1 can be predicted with a sensitivity of 32.4% (Figure 1).
**Conclusions:** Our results indicate significant predictive value off Gal at 24 h after cardiac arrest. The combination of NSE and Gal may improve prognosis prediction with high predictive value already the first day after collapse.

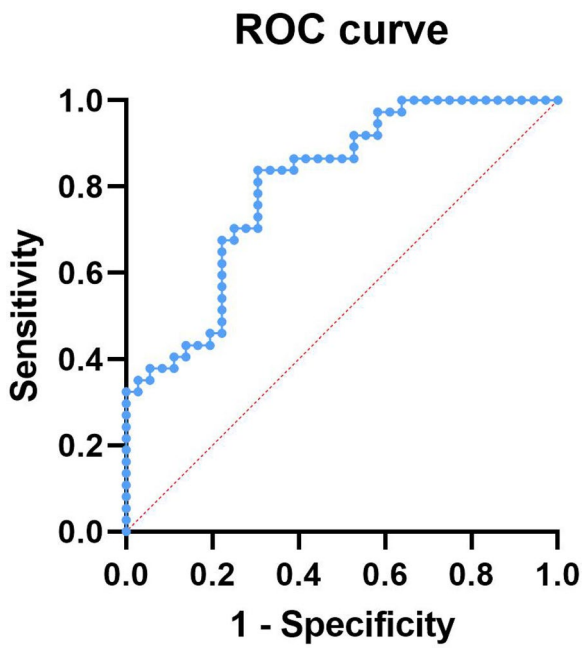


**Fig. 1 (abstract 001206)** ROC curve for the combination of Gal and NSE at D1

**References**

1. This study was supported by the Ministry of Health, Czech Republic–Conceptual Development of Research Organization, Motol University Hospital, Prague Czech Republic 00064203
2. This study was supported by the Ministry of Health, Czech Republic—Conceptual Development of Research Organization, Motol University Hospital, Prague, Czech Republic, 00064203
3. This study was supported by the Charles University Research Program "Cooperatio Cardiovascular Sciences"

**Topic:** Cardiac arrest

## 001207

### Usefulness of ΔPocc as a predictor of success within the weaning protocol in patients with acute respiratory distress syndrome

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**Introduction:** Acute respiratory distress syndrome is one of the most common pathologies in critical care. Once this pathology has been resolved, the integration of various tests during the mechanical ventilation withdrawal protocol allows predicting the successful weaning of the patient. The evaluation of respiratory effort with tools such as ΔPocc will allow us to have more tools to predict a safer weaning from mechanical ventilation.

**Objectives:** To determine the usefulness of ΔPocc within the weaning protocol of patients with acute respiratory distress syndrome (ARDS) in the Intensive Care Unit of a tertiary hospital in Mexico City.

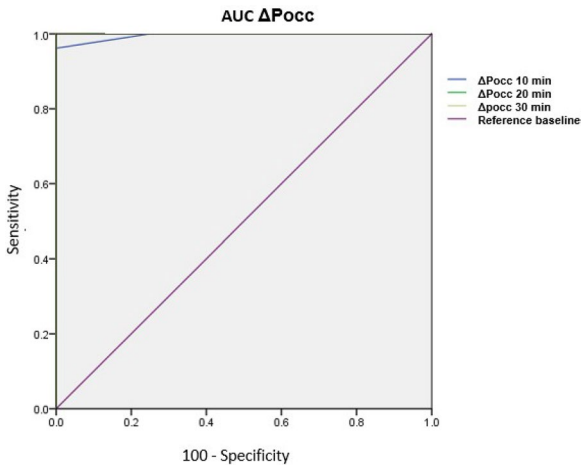
**Methods:** A prospective, analytical, longitudinal and observational study was carried out. The measurement of ΔPocc was obtained in 30 patients in the mechanical ventilation weaning protocol who had ARDS. The measurement was carried out 10, 20 and 30 min after starting the spontaneous ventilation test, in CPAP/Pressure Support (CPAP/PS) mode with FiO2 < 40%, PS 5 cmH2O, PEEP 5 cmH2O for 30 min. AUC were estimated to determine the sensitivity and specificity of ΔPocc in these time intervals.

**Results:** The characteristics of the population are listed in Table 1. It was found that a ΔPocc between −9 and −14 predicts, with a sensitivity of 96% and specificity of 100%, success in extubation, with good correlation at any time of the measurement during the spontaneous ventilation test (Graphic 1).

**Table 1 (abstract 001207)** Characteristics of the population

| | | |
|---|---|---|
| Age | 46 years (± 18 years) | |
| Length of days | 10 days | |
| Days of mechanical ventilation | 9 days | |
| SOFA | 9 points | |
| Weaning | Successful 26 patients<br>Fail 4 patients | |
| | Diaphragmatic dysfunction | 1 patient |
| | Secretions | 3 patients |

**Conclusions:** The ΔPocc is a good predictor to ensure successful weaning and is complementary to other tests to be evaluated during weaning from mechanical ventilation, allowing the evaluation of respiratory effort to be integrated into said protocol.




**Graphic 1 (abstract 001207)** AUC ΔPocc at 10, 20 and 30 min after the spontaneous ventilation test

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6. Special thankfulness to Hospital Juárez de México

**Topic:** Acute respiratory failure and mechanical ventilation

## 001208

## Lactate levels improve SAPS-3 performance in septic shock

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**Introduction:** Septic shock, the most severe form of sepsis, carries high morbidity and mortality. No gold standard for diagnosing sepsis and septic shock exists, which significantly challenges clinical practice. Scoring systems in intensive care units, such as SAPS-3, vary in performance by patient population and complicate distinguishing patients likely to benefit from treatment. Elevated lactate levels (> 2 mmol/L), indicative of septic shock, correlate with shock severity and mortality. However, it remains unclear how lactate measurements—at various stages of the illness—can enhance or refine risk assessment provided by SAPS-3.
**Objectives:** The aim of this study was to investigate the effect of different lactate parameters on the performance of SAPS-3 in patients with septic shock. The primary endpoint was ICU mortality. Furthermore, the assessment of the contemporary mortality of septic shock as well as ideal cutoff values for lactate and SAPS-3 were secondary aims of this study.
**Methods:** Consecutive patients admitted to the participating ICUs of the University Hospital Vienna between January 2017 and December 2019 were screened for septic shock and included if they met the Sepsis-3 criteria within the first 24 ± 4 h of ICU admission. Simple logistic regression was used to test SAPS-3 and lactate as prognostic markers and cutoffs were identified using Youden's index. Multiple logistic regression models were then used to determine the effects of lactate on SAPS-3. ROC curves were plotted and the AUROCs of these models were then compared with that of SAPS-3 alone using DeLong test.
**Results:** The mortality rate of septic shock in this population was 62.12%. Non-survivors had significantly higher SAPS-3 ($p = 0.001$) as well as first lactate, last lactate and peak lactate levels than survivors ($p < 0.001$). The 24-h lactate clearance was lower in non-survivors than in survivors, but the difference did not reach statistical significance (-11% vs. 17%, $p = 0.1$). SAPS-3 and all three measured absolute lactate levels were significant predictors of ICU mortality. Adding each of the three lactate measurements to the SAPS-3 score improved the AUROC in the multiple logistic regression analysis, indicating enhanced predictive accuracy compared to using SAPS-3 alone. However, it was the incorporation of the last lactate value specifically that achieved a statistically significant enhancement, with the AUROC increasing from 70.3% to 80.0% ($p = 0.033$), as shown in the Figure below.

**Table (abstract 001208)** SAPS-3 and lactate

| Characteristic | N | total [1] | ICU mortality | | *p*-value [2] |
|---|---|---|---|---|---|
| | | | Non-survivor, *N* = 41 [1] | Survivor, *N* = 25 [1] | |
| SAPS-3 | 66 | 81 (± 16), [52,122] | 86 (± 15), [59, 122] | 73 (± 14), [52, 108] | **0.001** |
| First lactate (mmol/L) | 66 | 5.8 (± 5.1), [0.9, 22.0] | 7.4 (± 5.9), [1.7, 22.0] | 3.3 (± 1.7), 2.9 [0.9, 6.8] | **< 0.001** |
| Last lactate (mmol/L) | 58 | 4.3 (± 4.3), [0.9, 18.0] | 5.8 (± 4.9), [1.2,18.0] | 2.4 (± 2.2), [0.9, 9.6] | **< 0.001** |
| Peak lactate (mmol/L) | 58 | 6.1 (± 4.3), [2.1, 22.0] | 7.6 (± 4.8), [2.4, 22.0] | 4.3 (± 2.3), [2.1, 9.7] | **< 0.001** |
| 24-h lactate clearance (%) | 58 | 1 (± 74) | -11 (± 78) | 17 (± 68) | 0.10 |

[1] mean (± SD), [min., max.]
[2] First, last and peak lactate were transformed by log to perform t-test

**Conclusions:** Our analysis revealed an improved predictive capacity of SAPS-3 when combined with lactate levels for patients in septic shock, compared to the use of SAPS-3 in isolation. Notably, lactate measurements taken after 24 h significantly enhanced the accuracy of outcome predictions.

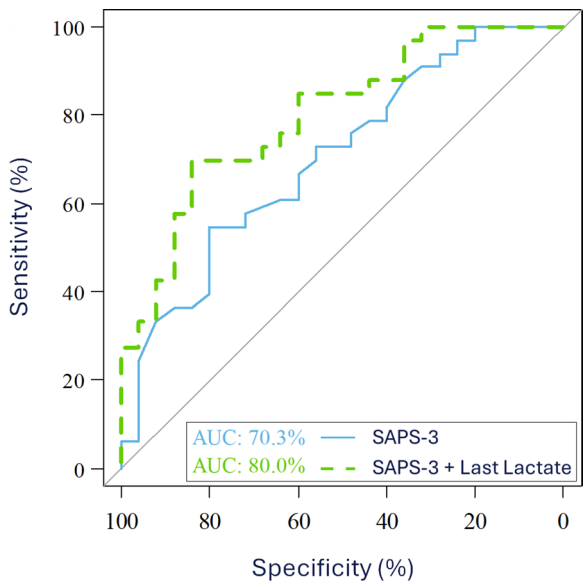


**Fig. (abstract 001208)** SAPS-3 ± last lactate (ROC curve), $N = 58$. Blue curve—SAPS-3. Green curve—SAPS-3 + last lactate

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**Topic:** Sepsis

## 001209

### Patients treated with therapeutic plasma exchange (TPE) in critical care: a single centre study of alterations in haemostatic and biochemical parameters during treatment

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001209

**Introduction:** Therapeutic plasma exchange (TPE) is a treatment used in the Intensive Care Unit (ICU) for a variety of disease states in an attempt to remove harmful molecules from the body. It is well established that during treatment, TPE alters the haemostatic balance through the removal of non-target components such as platelets and coagulation proteins, as well as by the use of circuit anticoagulant and haemodiluting replacement fluids.1 We performed a retrospective analysis of patients undergoing TPE in our ICU with the aim of evaluating the effect of TPE on standard laboratory parameters.
**Objectives:** To observe the indications, practices and outcome of TPE in a tertiary care ICU and its effect on the haemostatic and biochemical parameters of patients undergoing treatment.
**Methods:** We conducted a single-centre retrospective analysis of all patients ($N=26$) who underwent TPE between February 2023 and January 2024. Data relating to demographics, diagnosis, number of sessions and type of replacement fluid were collected. We analysed differences in admission international normalized ratio (INR), platelet count (109/L), serum-adjusted calcium (mmol/L) and albumin levels (g/L) with those measured during treatment.
**Results:** A total of 26 patients were evaluated. There were 11 males and 15 females who had a mean age of $56.9 \pm 21$ years. 129 TPE sessions were recorded. Indications for treatment are shown in Figure 1. Mean length of stay was $11.5 \pm 9.5$ days. All patients received 5% human albumin solution as their replacement fluid and all circuits were anticoagulated with heparin. During TPE treatment, compared to admission bloods, we found a significant change in the mean level of several parameters. Mean platelet counts were significantly reduced during TPE (158 vs 280, $p<0.0001$), which represents an average reduction from admission of $43\% \pm 19.4$. Mean albumin levels were also reduced (27 vs 36, $p<0.0001$), as were serum calcium levels (2.1 vs 2.4, $p<0.0001$). There was a significant difference in admission INR to the highest level during treatment with an average increase of $26\% \pm 20$. Of note, we found no correlation with number of TPE sessions and severity of abnormal results. No major bleeding complications were reported.
**Conclusions:** As with previous studies, in this cohort, we demonstrated that TPE treatment alters haemostatic markers, electrolyte and albumin levels. In particular, we found a marked universal reduction in platelet counts during treatment. This is likely to be due to the inadvertent removal of platelets due to the mechanical processing of blood in the extracorporeal circuit itself1. Unlike previous studies, we found no correlation with measured coagulopathy and the number of TPE sessions or type of fluid replacement used2. Despite the observed changes in biochemical parameters TPE-associated bleeding complications are low. Prospective studies are needed to determine the multiple factors causing these blood abnormalities and to evaluate the impact of these on patient outcomes.

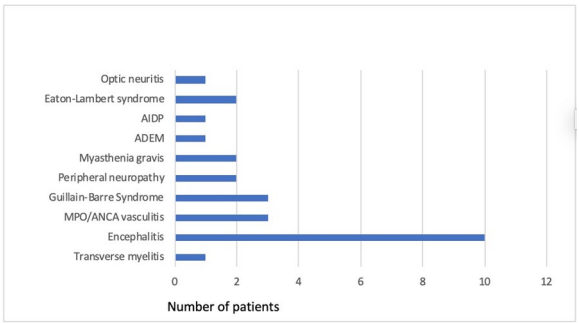


**Fig. 1 (abstract 001209)** Indications for TPE treatment on our ICU. Acute disseminated encephalomyelitis (ADEM). Acute inflammatory demyelinating polyneuropathy (AIDP) .

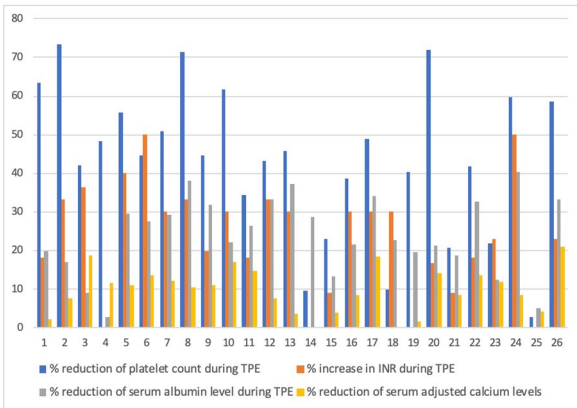


**Fig. 2 (abstract 001209)** Graph to show the percentage (%) reduction of platelet count, serum albumin and serum-adjusted calcium levels, and % increase in INR during TPE treatment from admission baseline bloods

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**Topic:** Haematologic-oncologic issues in the ICU

## 001210

### Influence of the development of hematological complications in the immediate postoperative period of cytoreductive surgery and hyperthermic intraperitoneal chemotherapy

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001210

**Introduction:** Cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) are therapies employed in patients with peritoneal carcinomatosis associated with digestive cancers, ovarian cancers, and primary peritoneal malignancies. While effective, they carry significant risks, including considerable morbidity and mortality. Hematological toxicity is a poorly defined complication, given limited research on the subject, and reported outcomes exhibit wide variability, with incidences ranging from 2 to 38% (1,2,3). Determining the frequency of its occurrence and understanding its impact throughout the postoperative period may be crucial for implementing preventive strategies within post-surgery recovery protocols.
**Objectives:** Assessing the influence of hematological complications in patients admitted to the ICU following the postoperative period of cytoreductive surgery and HIPEC.

**Methods: Design**
Prospective observational study conducted in a Spanish Intensive Care Unit (ICU) focusing on patients admitted following cytoreductive surgery and HIPEC from January 2013 to December 2023.

**Study variables**
The recorded data included age, sex, cancer type, severity upon ICU admission (APACHE II and SOFA scores), daily complete blood count and coagulation times, hemorrhagic complications, ICU mortality, and length of stay.
We defined leukopenia as $<4000/\mu l$, thrombocytopenia as $<150{,}000/\mu l$, anemia as hemoglobin $\leq 10$ g/dl, coagulopathy as INR $\geq 1.3$ and/or APTT $>37$ s, and hypofibrinogenemia as $<200$ mg/dl.
**Analysis**
Qualitative variables were described using counts and percentages, while quantitative variables with a normal distribution were presented as mean $\pm$ standard deviation. For quantitative variables with a non-normal distribution, median (interquartile range) was utilized for description.
**Results:** 123 patients were admitted to the ICU during the selected period, of which 61% of the total were men. The mean age was $59.5 \pm 10.5$ years, with an average APACHE score of 8.5 (6.0–12.0) and a Charlson index of 6. Of the sample, 15.4% (19) had gynecological cancer and 84.6% (104) had digestive cancer.
112 (91%) patients experienced some form of hematological complication: 12 (9.7%) had leukopenia, 59 (47.6%) had thrombocytopenia, 71 (57.3%) had prolonged coagulation times, 76 (61.3%) had anemia, and 12 (9.7%) had hypofibrinogenemia.
Only 11 (15%) patients had hemorrhagic complications: 45% had bleeding related to surgical drains, 45% had hematuria, and 10% had gastrointestinal bleeding. All of these were managed conservatively.
Only 17 (19%) patients required blood transfusions, and 1 (<1%) required platelet transfusion.
The average length of stay in the ICU was 5 (4–5) days. ICU mortality was 0.8%, but it was not associated with hemorrhage.
**Conclusions:** In our research, we observed that 91% of patients undergoing CRS and HIPEC experienced hematological complications during the immediate postoperative period. The majority of these complications were not severe and resolved spontaneously, without a significant impact on mortality or length of hospital stay.

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**Topic:** Haematologic-oncologic issues in the ICU

## 001212

### Cerebral hemodynamic behavior measured by ultrasound before and after prone position

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001212

**Introduction:** Transcranial Doppler ultrasound is used for evaluation and monitoring in neurocritical patients in most intensive care units. Currently, it has important applications to determine cerebral vasomotor reactivity, monitoring flow velocities in real time, in addition to being a diagnostic complement in the daily monitoring of neurocritical patients. Today it is known to be a bedside tool that provides real-time information on cerebral hemodynamics.
**Objectives:** To evaluate the cerebral hemodynamic behavior measured by ultrasound after changing position in prone position in patients with ARDS.
**Methods:** An observational, analytical, prospective study was carried out, in the intensive care unit hospital in Mexico, over a period of nine months. Patients with a diagnosis of ARDS who required a prone position were included. Ultrasonographic measurements of the middle cerebral artery (MCA) were performed; systolic velocity (SV), diastolic velocity (DV), mean velocity (MV), pulsatility index (PI), intracranial pressure (ICP), resistive indices (IR) and cerebral perfusion pressure (CPP) by Bellner formula, before of the prone position, during the prone position, and one hour afterward.
**Results:** Measurements were obtained from 26 patients diagnosed with ARDS who required a prone position. The Kolmogorov–Smirnov test was applied, showing normality of the sample. The admission diagnoses were 3 neurocritical patients plus ARDS (11.5%) and 23 had ARDS alone (88.5%). Using the ANOVA test of repeated means, statistical significance was evident during the measurements carried out before and during prone, but with stability after the first hour of prone, remaining within physiological ranges. An increase in the flows of the left and right MCA of the SV, RV and MV was evident after performing the prone position ($p<0.001$), as well as an increase in IP, IR and CPP ($p<0.005$), however, remained stable towards the first hour of the maneuver. In the case of ICP, a decrease in it was evident at the time of the prone position, of up to 1.1 mmHg ($p<0.005$). (Table 1).

**Table 1 (abstract 001212)** Measurement of cerebral flows in the MCA ($n = 26$)

| Variable | Before-prono Media (SD) | Prono Media (SD) | Prono + 1 h Media (SD) | *p*-value |
|---|---|---|---|---|
| MCA right | | | | |
| • SV | 78.15 (2.62) | 80.92 (2.42) | 82.11 (2.27) | < 0.001 |
| • DV | 36.4 (2.62) | 39.65 (2.38) | 40.73 (2.21) | < 0.001 |
| • MV | 50.33 (2.38) | 53.41 (2.24) | 54.52 (2.06) | < 0.001 |
| • IP | 0.88 (0.069) | 0.81 (0.051) | 0.78 (0.047) | < 0.005 |
| • ICP | 8.40 (0.756) | 7.5 (0.560) | 7.3 (0.517) | < 0.005 |
| • IR | 0.539 (0.026) | 0.515 (0.021) | 0.507 (0.019) | < 0.005 |
| • CPP | 68.2 (1.68) | 68.3 (1.14) | 70.6 (1.08) | < 0.005 |
| MCA left | | | | |
| • SV | 78.30 (2.78) | 81.65 (2.51) | 80.57 (2.24) | < 0.001 |
| • DV | 38.19 (2.42) | 39.65 (2.38) | 40.73 (2.21) | < 0.001 |
| • MV | 51.56 (2.39) | 54.73 (2.31) | 54.52 (2.06) | < 0.001 |
| • IP | 0.82 (0.061) | 0.77 (0.048) | 0.73 (0.039) | < 0.001 |
| • ICP | 7.76 (0.661) | 7.25 (0.524) | 6.81 (0.431) | < 0.005 |
| • RI | 0.518 (0.024) | 0.501 (0.020) | 0.487 (0.017) | < 0.005 |
| • CPP | 68.8 (1.66) | 68.7 (1.13) | 71.14 (1.01) | < 0.005 |

SV: systolic volume, DV: diastolic volume, MV: media velocity, IP: pulsatility index, ICP: intracranial pressure, RI: resistive index, CPP: cerebral perfusion pressure

**Conclusions:** The prone position in patients with ARDS, regardless of its origin, presented changes in cerebral hemodynamics, although these changes were not outside physiological ranges. Furthermore, in terms of ICP, showed that after the prone position, there is a decrease in it, so we could consider it as something beneficial for patients with ARDS.

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5. Special thankfulness to Hospital Juarez de Mexico


**Topic:** Neurointensive care

## 001215

### Endotoxin hemoadsorption in septic shock with severe multiorgan dysfunction and extreme endotoxin activity


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**Introduction:** There is a lack or solid data about the endotoxin hemoadsorption (ET-HA) in patients with septic shock (SS) and severe multiorgan dysfunction (MODS) with extreme endotoxin activity (EAA, EAA $\geq$ 0.9).

**Objectives:** To analyze the efficacy of ET-HA in reducing EAA in patients with SS and MODS with extreme EAA.

**Methods:** This is a single-center, observational and retrospective study (January 2018 to December 2023). Inclusion criteria: patients with septic shock (Sepsis 2) and multiorgan dysfunction with EAA $\geq$ 0.9 who were treated with ET-HA. We evaluated the endotoxin activity with the Endotoxin Activity Assay (Spectral Medical Inc, Canada). EAA was measured at the first 24 h of evolution of septic shock, before the ET-HA (EAApreET-HA) and also in the following 18-20 h (EEApostET-HA). Hemodynamic, organ dysfunction and inflammatory parameters were recorded. ET-HA (Toraymyxin™) was performed in the first 24 h of septic shock evolution. In patients in whom the EAA control was less than 0.6, the second session of HA-ET was not performed. The data have been expressed a "n" (%) if they are categorical and as median (interquartile range) or mean (standard deviation) if they are quantitative. The study was approved by the Clinical Research Ethics Committee (PR(AG)336/2016).

**Results:**

During the described period, 33 HA-ETs were performed in patients with septic shock, MODS and EAA $\geq$ 0.6. In 10 patients, the EAA was $\geq$ 0.9: 60% men, mean age 57 (13) years, SOFA 11 (2) points, APACHE II 32 (9) points, lactate 12 (3.9) mmol/L. In half of the patients, the focus of infection was respiratory and in the other half abdominal. Table 1 summarizes other characteristics of the included patients. The EAApreET-HA was 1.17(0.37) and EAApostET-HA 0.34 (0.28). A second session of HA-ET was necessary in only 3 patients. Hospital mortality and ICU mortality were 60%.

**Conclusions:** In our series, HA-ET in patients with SS, MODS and extreme EAA has been associated with an improvement in EAA levels.

**Table 1 (abstract 001215)** Characteristics of the study population

| | | n=10 |
|---|---|---|
| Age (years), m (SD) | | 57.4 (13.20) |
| Gender (female), n (%) | | 40 (40) |
| SOFA, m (SD) | | 11.9 (2.99) |
| APACHE II, m (SD) | | 23.6 (9.05) |
| Noradrenaline, n (%) | | 10 (100) |
| Vasopressin, n (%) | | 8 (80) |
| Dobutamine, n (%) | | 7 (70) |
| ECMO, n (%) | | 3( 30) |
| Mechanical Ventilation (days), m (SD) | | 17.5 (35-34) |
| RRT, n (%) | | 9 (90) |
| Infection source ,% | Respiratory | 5 (50) |
| | Abdominal | 5 (50) |
| Leukocyte count (6x10e9/L), m (SD) | | 3.2 (3.8) |
| Lactate (mmol/L), m (SD) | | 5.67 (3.93) |
| CRP (mg/dL), m ( SD) | | 13.83 (11.53) |
| PCT (ng/mL), m (SD) | | 73.98 (50.48) |
| IL-6 (pg/mL), m (SD) | | 141531 (113149) |
| EAApreET-HA, m (SD) | | 1.17 (0.37) |
| EEApostET-HA, m (SD) | | 0.34 (0.28) |
| ET-HA sessions, m (SD) | | 1.3 (0.48) |

**Topic:** Sepsis

## 001217

### Impact of the development of electrolyte and renal complications in the immediate postoperative period of cytoreduction surgery and hyperthermic intraperitoneal chemotherapy

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**Introduction:** The combination of hyperthermic intraperitoneal chemotherapy (HIPEC) with cytoreductive surgery (CRS) represents the primary treatment for selected patients with peritoneal malignancies. However, HIPEC carries a moderate to high morbidity and mortality, including the possibility of developing postoperative acute kidney injury, with a prevalence that varies widely between 1 and 48% (1,2,3). Identifying the frequency of this complication and understanding its impact throughout the postoperative period is essential to implement preventive strategies within surgical recovery protocols.
**Objectives:** To determine the influence of electrolyte and renal complications in patients admitted to the ICU after postoperative cytoreduction and HIPEC surgery.
Methods. Design
Prospective observational study in a Spanish polyvalent ICU of patients admitted after cytoreduction and HIPEC from January 2013 to December 2023.
Data recorded were age, sex, type of cancer, severity at ICU admission (APACHE II and SOFA scores), complete biochemistry panel, need for CRRT, ICU mortality and length of stay.
We defined ARF as an increase in serum creatinine (Cr) of $\geq$0.3 mg/dl within 48 h after surgery. Electrolyte disturbances were defined as all electrolyte disturbances outside the laboratory range. Polyuria was defined as urine output greater than 3 L/day.
Analysis
Qualitative variables are described as number and percentages, quantitative variables with normal distribution as mean $\pm$ S.D., quantitative variables with non-normal distribution as median (interquartile range).
**Results:** 123 patients were accepted in the ICU during the chosen period, of which 61% of the total were male, the mean age was 59.5 $\pm$ 10.5 years and the mean APACHE was 8.5 (6.0–12.0) and a Charlson index of 6. Of the sample, 15.4% (19) were cancer of gynaecological origin and 84.6% (104) were of digestive origin. 119 (96%) patients had some type of ionic alterations, all asymptomatic: hyponatraemia 28 (22.8%), hypernatraemia 4 (3.2%), hypokalaemia 51 (41.1%), hyperkalaemia 3 (2.4%), hypomagnesaemia 31 (25.0%), hypermagnesaemia 10 (10.0%), hypophosphataemia 29 (23.4%), hypocalcaemia 107 (86.3%) and hypercalcaemia 1 (0.8%).
Only 6 presented ARF (4.9%) and only 1 (0.8%) required CRRT.
Polyuria was present in 106 (85.4%).
Mean ICU stay was 5 (4–5) days.
ICU mortality was 0.8% but was not related to electrolyte disturbances or acute renal failure.
**Conclusions:** In our study, we observed that patients undergoing CRS and HIPEC very commonly experienced some type of ionic complication (96%) with a low frequency of renal failure (4.9%) during the immediate postoperative period. Most of these complications were not severe and resolved spontaneously, with no significant impact on mortality or length of hospital stay.

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**Topic:** Acute Kidney Injury and haemofiltration

## 001218

### What if it was possible to have organ donors in withdrawal of life support therapy in Portugal?—results from pilot study

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**Introduction:** Organ transplantation saves thousands of lives around the world and it is one of the greatest medical advances of the twentieth century. These organs can be harvested from brain dead donors (DBD) or circulatory death donors (DCD), originally known as non-heart-beating donation. Controlled cardiac arrest donation after withdrawal of life support therapy—Maastricht classification type III donors—is expanding and has been demonstrated as an important source of viable organs, but in Portugal this is not yet legally approved. Therefore, despite the excellent results and improvements implemented in recent years in Portuguese organ donation, there are limitations when compared to other European countries such as Spain.
**Objectives:** The aim of this study was to estimate the number of patients that could have been possible organ donors in the intensive care unit of a tertiary hospital, if Maastricht III category was approved in Portugal.
**Methods:** We used the clinical records of patients admitted to the intensive care unit of a tertiary hospital in Portugal between January 1st and December 31st of 2023. Patients with death associated with limitation of life support therapy, due to critical and irreversible illness and without unexpected cardiac arrest or hemodynamic instability, were selected. Finally, all patients who presented a contraindication to organ donation were excluded (for example, chronic or acute pathology compromising the donation, uncontrolled infection or hematological dyscrasia/vascular disease making cannulation impossible).
**Results:** Of the 699 patients admitted to the intensive care unit of a tertiary hospital between January 1st and December 31st of 2023, a total of 36 were considered possible organ donors in Maastricht category III. The median age was 66.0 years [P25 56.3 years and P75 77.0) and 52.8% ($n = 19$) were female. The main diagnosis at hospital admission was non-traumatic intracerebral hemorrhage in 13 (36.1%), ischemic stroke in 8 (22.2%), traumatic brain injury in 8 (22.2%), post-anoxic encephalopathy in 5 (13 0.9%), spinal cord trauma in 1 (2.8%) and meningo-encephalitis in 1 (2.8%) patient.
**Conclusions:** Although not all potential donors progress to effective donation and transplantation, the approval of donation in controlled circulatory arrest in Portugal could increase the number of organs (especially kidney and liver) and consequently reduce the amount of patients waiting for transplantation.
In the future, we expect to increase research in this area and predict the benefits of including Maastricht III category for organ donation in the norms and laws of our country. We also aim to improve protocols and discuss related ethical issues, as well as health literacy of the Portuguese population.

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**Topic:** Brain death, organ donation and transplantation

## 001219

## Acute renal failure and electrolyte disorders in the immediate postoperative period of cytoreductive surgery and hyperthermic intraperitoneal chemotherapy (HIPEC) with cisplatin

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**Introduction:** Cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) are treatments employed to manage peritoneal carcinomatosis in patients with digestive, ovarian, and primary peritoneal cancer. The most commonly used treatment regimens include cisplatin and/or mitomycin. Given the known adverse effects of cisplatin in systemic therapies, it is likely to contribute to the development of acute kidney injury and electrolyte imbalances in the postoperative period (1,2,3). On the other hand, other chemotherapy agents such as mitomycin often exhibit a more favorable safety profile regarding renal complications and electrolyte imbalances (3,4). Identifying the frequency of these complications, associated factors, and understanding their impact throughout the postoperative period could be essential for implementing preventive strategies within post-surgical recovery protocols.
**Objectives:** To evaluate whether the use of cisplatin in HIPEC therapies was associated with a higher incidence of renal and electrolyte complications in the immediate postoperative period compared to other therapies such as mitomycin.

**Methods: design**
This is a prospective observational study in a Spanish polyvalent ICU of patients admitted after undergoing cytoreduction and HIPEC from January 2013 to December 2024.

The recorded data included age, sex, type of cancer, severity upon admission to the ICU (APACHE II and SOFA scores), complete biochemistry panel, need for RRT, ICU mortality, and length of stay.
We defined AKI as an increase in serum creatinine (Cr) of $\geq 0.3$ mg/dl in the 48 h following surgery. Electrolyte abnormalities were defined as any values outside the laboratory range.
Analysis
Quantitative variables are described with mean and standard deviation or with median and interquartile range using the Mann–Whitney U test for analysis. For categorical variables, percentages were calculated and compared using Fisher's exact test. In all cases, values of $p < 0.05$ were considered statistically significant.
**Results:** A total of 123 patients were included, of whom 115 had electrolyte abnormalities. 31 (49.2%) were males. The mean age was $59.32 \pm 10.54$ years. 104 (84.6%) had digestive cancer and 19 (15.4%) had gynecological cancer. The mean APACHE II and SOFA scores upon admission to the ICU were 8.5 (6–12) and 2 (1–3), respectively, with a Charlson index of 6, without statistically significant differences. It was observed that patients treated with cisplatin had a significantly higher positive fluid balance compared to those treated with mitomycin, with a statistically significant difference.
There were no differences in the need for mechanical ventilation upon admission, the use of amines, and the need for blood products.
The mean ICU length of stay was 5 (4–5) days.
ICU mortality was 0.8%, but it was not related to electrolyte abnormalities or the presence of renal failure.
**Conclusions:** In our research, we observed that the use of cisplatin in patients undergoing CRS and HIPEC was not associated with a higher incidence of renal complications compared to those treated with mitomycin. Ionic disturbances were common in both groups, with hypokalemia and hypocalcemia being the most prevalent. The use of cisplatin

was statistically significantly associated with hypomagnesemia found in this group of patients.

**Table 1 (abstract 001219)** .

| Renal complications | All (123) | Cisplatin (53) | Mitomycin (70) | P |
|---|---|---|---|---|
| Need of RRT | 0 | 0 | 0 | |
| Hematuria | 9 (7.4%) | 3 (5.8%) | 6 (8.6%) | 0.731 |
| FRA AKIN | 6 (4.9%) | 3 (5.7%) | 3 (4.3%) | 1.000 |

**Table 2 (abstract 001219)** .

| Electrolytes abnormalities | All | Cisplatin | Mitomycin | P |
|---|---|---|---|---|
| | 115 (95.8%) | 49 (94.2%) | 66 (97.1%) | 0.651 |
| Hyponatremia | 27 (22.1%) | 10 (18.9%) | 17 (24.6%) | 0.633 |
| Hypernatremia | 4 (3.3%) | 1 (1.9%) | 3 (4.3%) | 0.156 |
| Hypokalemia | 50 (40.7%) | 31 (58.5%) | 19 (27.1%) | 0.000 |
| Hyperkalemia | 3 (2.4%) | 0 (0.0%) | 3 (4.3%) | 0.258 |
| Hypomagnesemia | 31 (25.2%) | 19 (35.8%) | 12 (17.1%) | 0.018 |
| Hypermagnesemia | 10 (8.1%) | 3 (5.7%) | 7 (10.0%) | 0.513 |
| Hyperphosphatemia | 19 (15.4%) | 11 (20.8%) | 8 (11.4%) | 0.156 |
| Hypocalcemia | 106 (86.2%) | 44 (83.0%) | 62 (88.6%) | 0.377 |
| Hypercalcemia | 1 (0.8%) | 1 (1.9%) | 0 (0.0%) | 0.431 |

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**Topic:** Perioperative care

## 001221

### Post-operative severity scores and outcome in an onco-surgical intensive care unit—a retrospective pilot study


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**Introduction:** Post-operative complications and clinical outcome are important quality indicators of surgical intensive care unit (ICU). With improvement in surgical and anaesthesia services, post-operative (PO) complication rate has been shown to come down significantly. Anticipating PO complications can be challenging as most of the predictive scores (ASA, P-POSSUM) are known to overestimate morbidity and mortality. APACHE 4 and APS are scoring systems validated in medical ICU patients to predict prognosis depending on its value in first 24 h. Therefore, this study hypothesized that PO APACHE 4 and APS scores on first 48 h can be predictive of PO outcome in terms of ICU stay and mortality.
**Objectives:** Aim of this retrospective study was to evaluate PO severity scores as predictive tools for PO outcome. The objective of the study is to evaluate association of PO APACHE 4 and APS score (Day 1 and Day 2) with PO mortality and ICU stay.
**Methods:** This is a retrospective observational single-center study conducted in 11 bedded onco-surgical ICU of a tertiary care cancer center. We had collected data from January 2023 to June 2023, of all post-surgical patients, admitted to ICU either for organ support (mechanical ventilation or vasopressor support) or for close observation. Patients requiring 3 or more days of ICU stays were included in the study protocol. APACHE 4 and APS were calculated for all these patients on post operative day 1 and day 2 and depending on that value, predicted mortality and ICU stay were calculated. Predicted mortality and ICU stay were then compared with actual mortality and ICU stay for all these patients.
**Results:** During this 6-month period, 117 patients were included in the study. Distribution of patients according to months have been shown in Figure 1. For PO Day 1, mean (Std) APACHE 4 score of our patients was 47 (13) and mean (Std) APS score was 29 (12). For PO Day 2, mean (Std) APACHE 4 score was 44 (11) and mean (Std) APS score was 26 (8). Anticipated ICU stay according to PO Day 1 severity score (4.0 days) is more representative of actual ICU stay (4.26 days) compared to that of PO Day 2 (3.0 days). On the other hand, predicted mortality as per PO Day 2 score (5 deaths) is more representative of actual mortality (5 deaths). PO Day 1 score overpredicts mortality (8 deaths). Figure 2 depicts the month wise distribution of (a) mean APACHE 4 score, (b) mean APS score and (c) estimated and actual length of ICU stay. Subgroup analysis of patients with prolong ICU stay had shown that surgical complications had happened mostly on day 3 and beyond.
**Conclusions:** Severity scores (APACHE 4 and APS) on PO Day 1 can be representative of PO ICU stay, whereas severity scores on PO Day 2 can corroborate with PO mortality. Larger sample size is needed to assess statistical test of significance. Severity scores (APACHE 4 and APS) on PO Day 3 can be more contributory to pick up surgical complications.


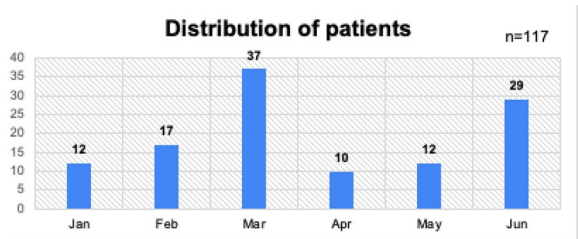


**Fig. 1 (abstract 001221)** Distribution of patients according to months within study period ($n = 117$)

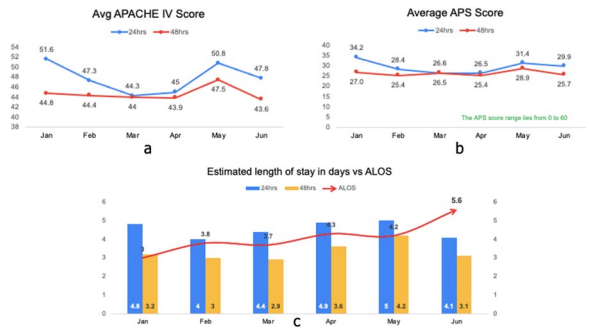


**Fig. 2 (abstract 001221)** Distribution of (a) mean APACHE 4 score, (b) APS score and (c) estimated and actual length of ICU stay according to months within study period ($n = 117$)

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**Topic:** Perioperative care

## 001224

### Influence of increased creatinine clearance on prophylactic anticoagulation with enoxaparin in critically ill patients

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**Introduction:** Venous thromboembolism prophylaxis is increasingly performed in the ICU. Enoxaparin, a low-molecular weight heparin, is frequently used for this purpose. Enoxaparin follows first-order kinetics and is eliminated primarily by the kidneys. Increased renal clearance is frequently observed in critically ill patients; consequently, standard dosing of enoxaparin can lead to treatment failure.
**Objectives:** To determine the influence of increased creatinine clearance on anti-Xa activity levels in critically ill patients.
**Methods:** Prospective and observational study at a tertiary university hospital, between October 2022 and March 2024. Critically ill adult patients who received a prophylaxis dose of 40 mg/day of enoxaparin were included. Anti-Xa activity was measured at day four (D4) and day seven (D7) after starting prophylaxis. Prophylactic levels were considered between 0.2 and 0.5 IU/mL. Increased creatinine clearance was defined as 8-h measured urinary creatinine clearance (CLCR8h) above 150 ml/min. Patients were divided into two groups according to this cutoff. Patients with CLCR8h < 60 mL/min were excluded.
**Results:** Sixty-four patients were included. On D4, 25% of patients had increased creatinine clearance (group 1) showing a median CLCR of 173 mL/min and on D7, 21% had increased creatinine clearance and a median CLCR of 192 mL/min. Group 1 was younger (46 vs. 64 y; $p < 0.05$); however, both groups showed similar SOFA and severity scores. Within groups, anti-Xa activity was 0.21 vs. 0.27 ($p = 0.247$) and 0.27 vs. 0.33 ($p = 0.114$) in D4 and D7, respectively. When considering all the measurements in the two time-point (D4 and D7, $n = 93$), no correlation was found between Anti-Xa activity and CLCR8h. The rate of target attainment was 62.5% vs. 77.1%, at D4 and 100% vs. 91.3% at D7, respectively, for group 1 and 2, not statistically significant.
**Conclusions:** In ICU setting, increased renal function above 150 mL/min seems to make more difficult reaching the target for anti-Xa activity. In patients exhibiting this condition, the anti-Xa activity should be monitored, in order to minimize the risk of therapeutic (prophylactic) failure.

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**Topic:** Acute Kidney Injury and haemofiltration

## 001227

### Efficacy of testosterone transdermal gel in restoring normal serum testosterone values in non-burned critically ill patients—TESTICU-1

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**Introduction:** Patients admitted in ICU present hypercatabolism, proteolysis and muscle loss during their ICU stay. Those patients may also present testosterone deficiency. Testosterone is one of the anabolic hormones of the organism. Several studies have demonstrated the benefit of Testosterone's administration in severe burns patients to reduce the proteolysis and improve their rehabilitation. The administration of Testosterone Skin Gel (AndroGel®) has not been studied in ICU until nowadays. Pharmacokinetics data are also missing.
**Objectives:** The purpose of this pilot study called TestICUs-1 is to evaluate the pharmacokinetics and tolerance of the 14-day administration of 101.25 mg of testosterone for men and 25.25 mg for women.
**Methods:** This is an open, monocentric, randomized controlled study achieved in the medical intensive care of Clermont Ferrand University Hospital. Patients admitted for shock and intubated for at least two days were included. Patients with PSA > 4 ng/mL were excluded. The primary outcome was the rate of patients with serum testosterone concentration within norms at days 4, 7, 10 and 14

(Testosterone > 280 ng/mL for male and > 12 ng/dL for female). TestICUs-1 trial was approved by the French ethical community (N°18044-RIPH1, CPP: "comité de protection des personnes", Ile de France, France).
**Results:** Finally, 30 patients were included (14 in the placebo group and 16 in the interventional group). Median age was 66.1 y.o.; 19 (63.3%) patients were males; SAPS II was 63.5 and hospital mortality rate was 53.3% ($N = 16$). On inclusion, testosterone concentration was 43 ng/dL [13.5; 66] with similar concentrations in both groups (45 [15; 68] in placebo and 40 [12; 64] in interventional); at days 4, 7 and 10, testosterone concentrations were higher in the interventional group (Day 4: placebo: 22 [13.5; 40.5] versus intervention: 68 [46; 86]; $p < 0.01$). At day 4, only 4/25 (16%) of the patients get their Testosterone in normal range with no significant difference between placebo and intervention (Placebo: 1/12 (8.3%) versus 3/13 (23.1%), $p = 0.32$). Similar results were obtained at days 7, 10 and 14. Only female presented testosterone in normal range after intervention but not male. Occurrence of adverse events were similar in both the groups.
**Conclusions:** During ICU stay, all the patients presented hypotestosteronemia. After supplementation, concentrations of testosterone increased compared to placebo but became in normal range only for the female. Androgel with those dosage can be administered safely and its impact on functional outcome should be assessed.

**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001229

### Ultrasound assessment of abdominal muscle weakness to identify patients at high risk for mechanical ventilation weaning failure

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**Introduction:** Assessing readiness for extubation is challenging in critically ill patients. Effective coughing is essential but hard to quantify. Ultrasound can help predict high-risk mechanical ventilation liberation failure by assessing abdominal muscle activation during coughing in ventilated patients.
**Objectives:** This study aims to 1) evaluate the effectiveness of using abdominal muscle ultrasound measurements to predict the success of weaning and 2) investigate the relationship between abdominal muscle weakness (ABSAW) and critical illness-associated diaphragm (DD) and limb (ICUAW) weakness and their impact on weaning outcomes.
**Methods:** The study included critically ill intubated or tracheostomized patients mechanically ventilated for over 48 h. The clinical examinations were conducted during the first spontaneous breathing trial (SBT, Pressure support 6 and PEEP 6). As previously described (1), the occurrence of ABSAW was assessed by ultrasound using the combined abdominal muscles thickening fraction during cough (TFabs) of three muscles: rectus abdominis (RA), transversus abdominis (TrA), and internal oblique (IO). ABSAW was defined as TFabs = TFcough, RA + TFcough, TrA + TFcough, IO, less than 127%. DD was defined as a diaphragm thickening fraction (TFdi) lower than 20% (2). ICUAW was defined as usual: a Medical Research Council Scale score (MRCs) score < 48 or a simplified peroneal nerve test (PENT) of less than 5.26 mV in uncooperative patients (3; 4). SBT failure was reintubation or reconnection to ventilator within 48 h. Liberation failure is defined as dependency on a ventilator for more than 7 days following the first SBT. Other data collected included admission diagnosis, clinical data, and outcome.
**Results:** 37 patients were recruited; 21 patients (57%) had a successful SBT, and 17 (46%) failed liberation at 7 days. Consistent with the literature, most patients presented with some degree of weakness, with ABSAW diagnosed in 30 (81%), ICUAW in 27 (73%), and DD in 20 (54%), Table 1. ABSAW patients had higher liberation failure probability (OR 6.86, CI 1.00–137.99, $p$ 00.091) but not SBT failure (OR 0.17, CI 0.01–1.14, p 0.116), Figure 1; liberation failure was only marginally significant. TFabs were unrelated to ICUAW (OR 0.49, CI 0.09–2.01, p 0.350) or DD (OR 0.01, CI -0.9–0.92, $p$ 0.987). ICUAW is related to successful SBT ($p = 0.003$) and liberation failure ($p = 0.007$). ICUAW and DD increase the probability of reintubation-reconnection (OR 10.18, CI 1.51–204.78) but not DD alone. Patients with ABSAW have a higher risk of liberation failure when both ICUAW and DD are present (OR 7.67, CI 0.77–76.3, $p$ 0.082).
**Conclusions:** These preliminary results indicate that ABSAW is associated with a higher reintubation-reconnection rate within 7 days. Small sample sizes and weak patients may have caused the lack of statistical significance. We are increasing the sample size to confirm the TFabs predictive validity for weaning failure.

**Table 1 (abstract 001229)** Population characteristics depended on ABSAW

| | N | NO ABSAW (N=7) | ABSAW N=30) | |
|---|---|---|---|---|
| AGE | 37 | 57.0 **59.0** 73.0 | 58.0 **64.0** 71.0 | P=0.70[3] |
| BMI | 37 | 19.9 **27.8** 30.6 | 24.4 **29.4** 33.6 | P=0.20[3] |
| SAPS II | 37 | 21.5 **24.0** 40.3 | 23.0 **30.0** 34.3 | P=0.73[3] |
| VFD_28 | 37 | 14.0 **21.0** 23.7 | 0.0 **19.5** 23.1 | P=0.58[3] |
| MV_DURATION | 37 | 4.3 **7.0** 14.0 | 4.9 **8.5** 19.2 | P=0.73[3] |
| NO ICUAW (%; N) | 37 | 0.3 2/7 | 0.3 8/30 | P=0.92[2] |
| OUTCOME (%; N) | 37 | | | P=0.50[2] |
| ALIVE | | 0.9 6/7 | 0.6 19/30 | |
| DEAD IN ICU | | 0.1 1/7 | 0.3 9/30 | |
| DEAD IN HOSPITAL | | 0.0 0/7 | 0.1 2/30 | |
| DIAGNOSIS | 37 | | | P=0.42[2] |
| POLYTRAUMA | | 0.0 0/7 | 0.0 1/30 | |
| HYPOXIC RESPIRATORY FAILURE | | 0.3 2/7 | 0.1 2/30 | |
| SEPTIC SHOCK | | 0.0 0/7 | 0.1 3/30 | |
| HEMORRHAGIC STROKE | | 0.0 0/7 | 0.1 2/30 | |
| ARDS COVID | | 0.7 5/7 | 0.7 22/30 | |
| COMORBIDITIES | 37 | | | P=0.43[2] |
| NO COMORBIDITY | | 0.3 2/7 | 0.2 6/30 | |
| ONE | | 0.4 3/7 | 0.3 9/30 | |
| TWO | | 0.3 2/7 | 0.2 6/30 | |
| 3+ | | 0.0 0/7 | 0.3 9/30 | |
| SBT FAILURE | 37 | 0.9 6/7 | 0.5 15/30 | P=0.09[2] |
| NO DIAPHRAGM DYSFUNCTION | 37 | 0.4 3/7 | 0.5 14/30 | P=0.86[2] |
| LIBERATION FAILURE | 37 | 0.1 1/7 | 0.5 16/30 | P=0.06[2] |

ABSAW, abdominal muscles acquired weakness; BMI, body mass index; SAPS II, Simplified Acute Physiology Score -2; VFD 28, ventilator-free days at 28 days; MV duration, mechanical ventilation duration; ICUAW, intensive care unit-acquired weakness; ICU: intensive care unit; ARDS: acute respiratory distress syndrome; SBT, spontaneous breathing trial; DD: diaphragm dysfunction. N is the number of non-missing values. Test statistic: 1. Kruskal–Wallis. 2. Pearson. 3. Wilcoxon.

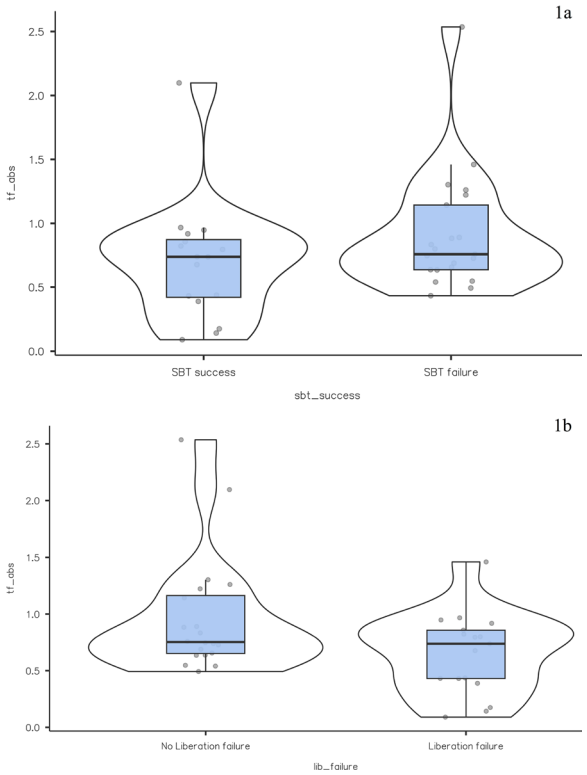


**Fig. 1 (abstract 001229)** The distribution of TFabs is depicted in relation to the occurrence of liberation failure and the success of SBT. tf_abs, abdominal muscles thickening fraction during cough (TFabs = TFcough, RA + TFcough, TrA + TFcough, IO); SBT, spontaneous breathing trial

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5. None

**Topic:** Acute respiratory failure and mechanical ventilation

## 001230

### Results of a TAVI programme from an intensive care view in a second de level hospital

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**Introduction:** Endovascular treatments, like transaortic valve implantation (TAVI), on high-risk cardiovascular patients has improved their survival and quality of life and decreased the morbidity compared to classical surgery. However, is not free of complications, specially due to a high median age and comorbidities. One of the most frequent is the electrocardiographic (EKG) alterations, some of which may require from permanent pacemaker (PM) therapy.
**Objectives:** First, to analyse the percentage of permanent PM in patients who received transaortic valve implantation (TAVI). Second, to identify possible risk factors (RF) associated with this complication.
**Methods:** This is a retrospective observational 36-month study (years 2021 to 2023) who received TAVI in our University Second Level Hospital in Granada (without Cardiac Surgery). The admission and procedure was supported by intensive care physicians in our cardiologic intensive care unit (cICU).
Variables studied: demographic, previous comorbidities, EKG pre- and post-implantation, incidence of permanent PM and mortality rate. We performed a Student T test for continuous variables and a CHI2 test for the categorical variables.
**Results:** We registered 105 TAVI implants, all of them due to severe aortic stenosis. 12 patients (11.4%) had a previous PM. 3 patients (2.85%) died in the operating room. 90 patients entered in our study, in all of them a transitory pacemaker (tPM) was implanted for the procedure via right internal jugular vein.

- 3 patients died during hospital income (3.33%) and 3 during the one-year follow-up (3.33%).
- In 28 (31.11%) patients, a permanent PM was performed before hospital discharge.
- Previous RBBB is related to PM implant (CI 95% 1,545–27,664)
- After surgery, tPM stimulation is related with PM implant (CHI2 40*, not possible CI).

| | Non-PM | PM | *p* | Test |
|---|---|---|---|---|
| Age | 82.64 ± 4.13 | 83.5 ± 3.5 | 0.078 | Student T |
| Cr | 1.15 ± 0.63 | 1.26 ± 0.55 | 0.67 | Student T |
| LVEF < 50% (yes/no) | 83.3% (15)/79.2% (57) | 16.7% (3)/18.2% (15) | 0.693 | X2 |
| IHD (yes/no) | 80.4% (45)/79.4% (27) | 19.6% (11)/20.6% (7) | 0.913 | X2 |

**Conclusions:** The rate for PM implant in our TAVI programme was 31%. In our study, RBBB is the only variable that has been related to permanent PM implant. 12 h after TAVI, transitory pacemaker stimulation due to symptomatic bradycardia is related with the need of dPM.

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**Topic:** Perioperative care

## 001231

### Comparison of ECG-synchronized pulsatile and standard continuous flow ECMO in porcine model of acute myocardial infarction complicated by ventricular septal defect and cardiogenic shock

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**Introduction:** Optimal strategy for mechanical circulatory support in acute myocardial infarction (AMI) complicated by ventricular septal defect (VSD) and cardiogenic shock has not been determined. The standard extracorporeal membrane oxygenation (ECMO) increases systemic flow but may have negative effect on left ventricle (LV). The novel ECG-synchronized pulsatile ECMO offers full hemodynamic support and preserves LV function.
**Objectives:** The aim of our study was to compare hemodynamic effects of ECG-synchronized pulsatile and standard continuous ECMO flow in AMI complicated by VSD and cardiogenic shock.
**Methods:** Under general anesthesia and mechanical ventilation in pigs (sus scrofa domestica), AMI was induced by ligation of left anterior descending. VSD was simulated by insertion of 25F cannulas into the left and right ventricles via partial sternotomy, and their extracorporeal connection by 3/8 tubes generating left-to-right shunt. The hemodynamic effect of synchronized pulsatile (P) and standard continuous (C) ECMO flow (2 and 3 L/min) was evaluated by the measurement of left ventricular end-diastolic pressure (LVEDP), mean arterial pressure (MAP), carotid flow (CAR) as a surrogate of total circulatory output, and VSD flow. Data are presented as mean (SD), and $P<0.05$ was considered statistically significant.
**Results:** Eleven animals were used, one died after induction of AMI, and ten pigs completed all study procedures. Baseline LVEDP was 14.0 (2.1) mmHg, MAP 50.0 (11.9) mmHg, CAR 286.2 (27.5) mL/min, and VSD flow 1086.0 (401.6) mL/min (Figure 1). LVEDP was significantly lower with P in comparison to C at 2 L/min (diff −0.8 [1.1] mmHg, $P=0.046$) and at 3 L/min (−0.4 [0.4] mmHg, $P=0.010$) (Figure 1). MAP was significantly higher with P in comparison to C at 2 L/min (+3.5 [2.4] mmHg, $P=0.001$) and at 3 L/min (+3.0 [4.1] mmHg, $P=0.046$) (Figure 1). CAR was significantly higher with P in comparison to C at 2 L/min (+19.7 [8.3] mL/min, $P<0.001$) and at 3 L/min (+22.4 [12.0] mL/min, $P<0.001$) (Figure 1). VSD flow was significantly reduced with P in comparison to C at 2 L/min (−119.4 [79.6] mL/min, $P=0.001$) and at 3 L/min (−87.9 [71.7] mL/min, $P=0.004$) (Figure 1).
**Conclusions:** In the porcine model of AMI complicated by VSD and cardiogenic shock, ECG-synchronized pulsatile ECMO significantly increased systemic arterial blood pressure and carotid artery flow together with the protective effect on LV filling pressure and VSD shunt in comparison to standard continuous flow ECMO.

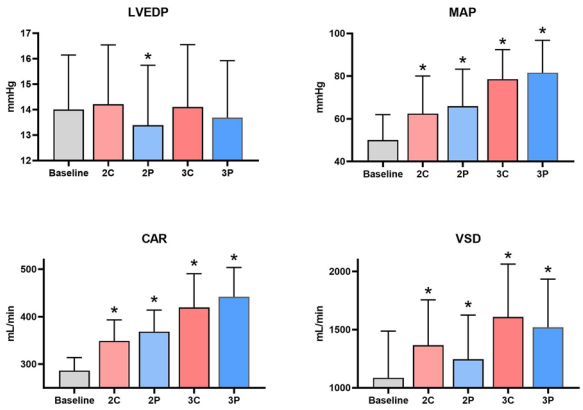


**Fig. 1 (abstract 001231)** Hemodynamic effect of ECG-synchronized pulsatile (P) and standard continuous (C) ECMO flow (2 and 3 L/min) in acute myocardial infarction complicated by ventricular septal defect and cardiogenic shock. LVEDP, left-ventricular end-diastolic pressure; MAP, mean arterial pressure; CAR, carotid artery flow; VSD, ventricular septal defect flow. * $P<0.05$ vs. Baseline

**References**

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**Topic:** Cardiovascular issues in ICU

## 001232

### Incidence of thrombosis and bleeding events during perioperative extracorporeal membrane oxygenation for severe COPD patients undergoing lung volume reduction surgery

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**Introduction:** Lung volume reduction surgery (LVRS) is a beneficial treatment option for COPD patients with severe emphysema, however, with an increased risk of perioperative mortality [1]. Veno-venous extracorporeal membrane oxygenation (vv-ECMO) holds promise in facilitating lung-protective ventilation and rapid recovery of spontaneous breathing postoperatively. The thrombosis and bleeding risk linked with vv-ECMO remains notably high, correlating with a significantly increased mortality rate [2]. Currently, data concerning the thrombosis and bleeding risk during perioperative vv-ECMO for LVRS are limited.
**Objectives:** The primary aim of this study was to examine the incidence of thromboses and bleeding events in patients with advanced emphysema undergoing vv-ECMO as part of lung reduction surgery. We investigated the influence of therapeutic anticoagulation during vv-ECMO initiation compared to the standard of care on the incidence of thrombosis and bleeding events and the occurrence of the individual events between the patients with high-flow and low-flow vv-ECMO.
**Methods:** This retrospective analysis included 30 patients (≥ 18 years) who underwent LVRS with elective perioperative vv-ECMO at Charité—Universitätsmedizin Berlin between July 2019 and February 2023. All patients were admitted to the ICU preoperatively, vv-ECMO (high-flow or low-flow ECMO) was applied on the following day, and lung volume reduction was performed surgically.
One group of patients received therapeutic anticoagulation, i.e., a heparin bolus was administered immediately after vv-ECMO cannulation, adjusted to the initial partial thromboplastin time (PTT) to reach the target PTT range of 60 s. Therapeutic anticoagulation was afterwards continued with heparin perfusion until vv-ECMO removal. The observation period for the occurrence of thrombosis or bleeding events started from ECMO initiation until the end of the ICU stay.
Fisher's exact test was applied to categorical data. The significance level was set at < 0.05. The statistical analysis was performed in Python version 3.6.15.
**Results:** Data from 30 patients were analysed. The median age was 67 [IQR 61–71] years, with 63% being male. Twelve patients received low-flow vv-ECMO, while 18 received high-flow vv-ECMO. The median Charlson Comorbidity Index was 4 [IQR 3–6], and the body mass index was 22.8 [19.6–25.8] kg/m$^2$, respectively. The median duration on vv-ECMO was 26.2 [22.7–50.3] hours.
A total of ten thrombotic events (33%) and five (17%) bleeding events occurred. Four patients (13%) received a heparin bolus immediately after vv-ECMO cannulation. No significant difference in the incidence of bleeding and thrombosis was observed between the group that received therapeutic anticoagulation for vv-ECMO initiation and the group that did not (see Table 1). In addition, no significant difference was observed in either the low-flow or high-flow ECMO groups regarding thrombotic events or bleeding events.
**Conclusions:** One-third of all the patients with severe COPD who underwent perioperative vv-ECMO for LVRS experienced a thrombotic event. There was no difference in thrombotic events or bleeding events depending on an initial heparin bolus or the ECMO flow rate.

**Table 1 (abstract 001232)** Occurrence of bleeding and thrombotic events during perioperative VV -ECMO in patients with lung volume reduction

| Variable | Thrombosis | No Thrombosis | p-value | Bleeding event | No bleeding event | p-value |
|---|---|---|---|---|---|---|
| **Primary analyses** | | | | | | |
| Initial Heparin bolus | 0 (0%) | 4 (100%) | 0.3 | 1 (25%) | 3 (75%) | 0.5 |
| No initial heparin bolus | 10 (38%) | 16 (62%) | | 4 (15%) | 22 (85%) | |
| **Secondary analyses** | | | | | | |
| High-Flow ECMO | 7 (39%) | 11 (61%) | 0.7 | 3 (17%) | 15 (83%) | 1.0 |
| Low-Flow ECMO | 3 (25%) | 9 (75%) | | 2 (17%) | 10 (83%) | |

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001233

### Choosing a ventilation technique in minimally invasive heart valve surgery

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**Introduction:** Minimally invasive cardiac surgery via right-sided minithoracotomy has advantages over the traditional median sternotomy. However, at the same time, surgeons might have some difficulties in ensuring visualization of the surgical field.
**Objectives:** To choose the optimal ventilation technique during heart valve surgery performed via the right-sided minithoracotomy.
**Methods:** Eighty adult patients were included in non-randomized, retro- and prospective study. All patients underwent heart valve surgery via right-sided minithoracotomy. Peripheral cardiopulmonary bypass with cannulation of the right femoral artery and right femoral vein was carried out. During the surgery besides standard parameters, we monitored invasive blood pressure, central venous pressure, cerebral oximetry, arterial and venous blood gas analysis. Retrospective group included 40 patients with mean age of 52.3 (± 12.4) years, who underwent protective low tidal volume mechanical ventilation in VCV mode with TV 4–6 ml/kg of ideal body weight. Prospective group also included 40 patients with mean age 51.8 (± 13.9) years. They received high-frequency jet injection (HFV) ventilation with MV 10–18 l/min and f 100–120 per min. In the postoperative period, we evaluated the duration of ventilatory support in ICU, length of ICU and hospital stay, incidence of postoperative pulmonary complications.
**Results:** During the surgery, PaO2 was significantly higher in the HFV group compared to the protective ventilator group: 307 (220–352) vs. 106 (90–127.5) $p < 0.0001$ before CPB and 252 (± 98.6) vs. 147 (109.5–183.5), $p < 0.0001$ after CPB. PaO2 to FiO2 ratio (P/F) was also significantly higher during the same stages of the surgery in the HFV group compared to the protective ventilator group: 623 (450–714) vs. 226.9 (± 77.1) $p < 0.0001$, 506.3 (199.5) vs. 260 (200.5–358), $p < 0.0001$, respectively. In addition, we found out significant differences between groups in PaCO2 levels, 47.5 (38–54) vs. 42 (38.3–44), $p = 0.0162$ and 48 (39–54) vs. 39.8 (± 5.1) $p = 0.0005$, respectively. Visualization of the operative field was better in the HFV group compared to the protective ventilation group and was rated as good in 80% of cases. There were no significant differences between the groups in the number of postoperative pulmonary complications, as well as the duration of postoperative ventilatory support and length of ICU stay.
**Conclusions:** Use of high-frequency jet injection ventilation during heart valve surgery via right-sided minithoracotomy allows to ensure adequate oxygenation and avoid hypoxemia. Meanwhile, it does not have a negative impact on visualization of operative field and does not lead to the increase of postoperative complications.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001234

### "Safety and feasibility of phrenic nerve transcutaneous electrical stimulation in sedated critically ill patients under controlled mechanical ventilation"

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**Introduction:** Diaphragmatic weakness is present in up to 60–80% of the critically ill patients and prolonged invasive mechanical ventilation (MV) is considered one of the main causes. It appears early after initiation of invasive MV and the degree of diaphragmatic weakness is related to the duration of MV and the use of mandatory modalities. To date, there are few treatment strategies to counterbalance diaphragmatic weakness, and these are rarely applied in sedated patients on continuous mandatory ventilation. Phrenic nerve transcutaneous electrical stimulation is considered a potential strategy to improve diaphragmatic strength in these patients, but there is currently a lack of evidence on this subject.
**Objectives:** The main objective of this study is to evaluate the safety of transcutaneous electrical phrenic nerve stimulation in sedated critically ill patients on invasive MV ventilation with continuous mandatory modes. The secondary objective is to assess the feasibility of this intervention in this type of patients.
**Methods:** Case series study in critically ill patients. After 12 h of invasive MV, critically ill sedated (RASS −4 to −5) adult patients received unilateral transcutaneous electrical phrenic nerve stimulation in the anterior cervical region. We used a Compex® Rehab Chattanooga Theta 4 Channel electrostimulation device with a motor point electrode to deliver up to 30 min per day of symmetrical bidirectional rectangular pulses. Electrostimulation parameters were as follows: frequency 8–10 Hz, pulse time 300 µs and intensity 0.5–12 mA. Safety was assessed by the measurement of alterations in hemodynamic (> 20% variation in heart rate and/or mean arterial pressure and occurrence of cardiac arrhythmias) and respiratory (5% decrease in oxygen pulse oximetry saturation) parameters. Feasibility was evaluated through the measurement of asynchrony index (not feasible if > 10%) and phrenic nerve stimulation success rate.
**Results:** A total of 28 patients (ages 65 ± 14) were stimulated and 67 sessions were performed (2.39 mean sessions per patient), with a diaphragmatic stimulation success rate of 73.1% (49 sessions). The mean time to locate the phrenic nerve was 6 min (interquartile range 13). The mean frequency and intensity achieved during electrostimulation were 8.04 ± 0.84 Hz and 2.24 ± 0.99 mA, respectively. One patient (1.5%) presented a mean arterial pressure variation of 20%, but no other safety events occurred among the other patients. There were no significant changes in asynchrony index (0% VS. 0%, $P < 0.001$).
**Conclusions:** This case series study in sedated critically ill patients on invasive MV suggest that transcutaneous electrical phrenic nerve stimulation is safe and feasible in this population of patients.

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5. This study has not had financial support.

**Topic:** Nursing care and physiotherapy

## 001235

### Haematological complications in hyperthermic intraperitoneal chemotherapy with cisplatin

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**Introduction:** Cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) are treatments for peritoneal carcinomatosis in patients with digestive, ovarian, and primary peritoneal cancer. Often, regimens based on cisplatin and/or mitomycin are used. Hematologic toxicity secondary to these treatments is a poorly established complication due to the scarcity of studies, with results varying considerably, with percentages ranging from 2 to 38% (1,2,3). Cisplatin is a known antineoplastic agent for its myelosuppressive effect in systemic treatments, although its use in intrabdominal therapies may decrease the risk of toxicity by crossing in limited amounts into the systemic circulation (1,4). Identifying the frequency of these complications, associated factors, and understanding their impact during the postoperative period could be essential for implementing preventive strategies within post-surgical recovery protocols.
**Objectives:** Analyze whether there are differences in hematologic complications among patients admitted to the Intensive Care Unit (ICU) after undergoing cytoreduction and HIPEC, distinguishing between those treated with cisplatin-based hyperthermic intraperitoneal chemotherapy (HIPEC) and those who received mitomycin-based HIPEC.
**Methods: Design:** This is a prospective observational study in a Spanish polyvalent ICU of patients admitted after undergoing cytoreduction and HIPEC from January 2013 to December 2024. Recorded data included age, sex, cancer type, severity at ICU admission (APACHE II and SOFA scores), type of chemotherapy used, daily blood count and coagulation times, hemorrhagic complications, ICU mortality, and length of stay. We defined leukopenia as < 4000/µl, thrombocytopenia as < 150,000/µl, anemia as hemoglobin ≤ 10 g/dl, coagulopathy as INR ≥ 1.3 and/or APTT > 37 s, and hypofibrinogenemia as < 200 mg/dl.
**Analysis:** Quantitative variables are described with mean and standard deviation or with median and interquartile range using the U-Mann–Whitney test for analysis. For categorical variables, percentages were calculated and compared using Fisher's exact test. In all cases, $p < 0.05$ was considered statistically significant.
**Results:** A total of 123 patients were included, of whom 111 had haematologic alterations. 31 (49.2%) were males. The mean age was 59.32 ± 10.54 years. 104 (84.6%) had digestive cancer and 19 (15.4%) gynecological cancer. The mean APACHE II and SOFA scores at ICU admission were 8.5 (6–12) and 2 (1–3), respectively, with a Charlson index of 6, without statistically significant differences. It was observed that patients treated with cisplatin had a significantly higher positive fluid balance compared to those treated with mitomycin, with a statistically significant difference. There were no differences in the need for mechanical ventilation at admission, use of amines, and need for blood products. The mean ICU stay was 5 (4–5) days. ICU mortality was 0.8%, but it was not related to hematologic alterations or the presence of bleeding.

| **Haematologic alterations and intraoperative bleeding** | **All** **111 (90.2%)** | **Cisplatin** **48 (90.6%)** | **Mitomycin** **63 (90.0%)** | ***P*** **0.917** |
|---|---|---|---|---|
| Leukopenia | 12 (9.8%) | 6 (11.3%) | 6 (8.6%) | 0.611 |
| Anemia | 75 (61.0%) | 40 (75.5%) | 35 (50.0%) | **0.004** |
| Thrombocytopenia | 59 (48.0%) | 30 (56.6%) | 29 (41.4%) | 0.095 |

| Haematologic alterations and intraoperative bleeding | All 111 (90.2%) | Cisplatin 48 (90.6%) | Mitomycin 63 (90.0%) | *P* 0.917 |
|---|---|---|---|---|
| Coagulopathy | 70 (56.9%) | 29 (54.7%) | 41 (58.6%) | 0.669 |
| Hypofibrinogenemia | 12 (9.8%) | 6 (11.3%) | 6 (8.6%) | 0.611 |
| Bleeding | 14 (11.4%) | 3 (5.7%) | 11 (15.7%) | 0.082 |

**Conclusions:** In our sample, a statistically significant association was observed between the use of cisplatin compared to mitomycin in HIPEC therapies and the incidence of anemia in patients undergoing CRS and HIPEC.

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**Topic:** Transfusion and haemostasis disorders

## 001237

### Unconventional application of electrical impedance tomography in patients with significant thoracic deformities due to trauma


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**Introduction:** ARDS develops in 17% of the cases with isolated pulmonary contusion and in up to 78% of the cases with additional injury [1]. The risk is higher (82%) if the contusions exceed 20% of the lung volume [2]. The heterogeneity of the injured lung parenchyma results in inadequate gas flow distribution. It is crucial to optimize the respiratory monitoring in order to improve the protective mechanical ventilation [3]. The electrical impedance tomography (EIT) is used to evaluate lung mechanics [4] and support mechanical ventilation [5]. The informational value of the method is significantly reduced due to the lack of guidelines for reconstruction of personalized and reliable EIT images with sufficient spatial resolution.

**Objectives:** To increase the informational value of the EIT images taken at an unconventional level of interest.

**Methods:** A previously developed method for defining a level of interest, placement of EIT electrodes and personalized reconstruction of the EIT images [6], is applied in patients with thoracic trauma and monitored with EIT monitor PulmoVista 500 and Draeger EIT Data Analysis Tool 6.3. Anonymized raw data from the EIT monitor are used. To increase the informational value of the method, the number of the fem mesh elements is increased. A pixel size of 5 × 5 mm is accepted optimal—providing sufficient spatial resolution without significant increase in the computational time. The result is proportional 2D color-coded diagram representing the body composition based on water/gas content. The spatial conformity of the standard and personalized EIT images is analyzed.

**Results:** The application of the original method (Fig. 1) resulted in significant spatial conformity between the CT scan and the personalized EIT image taken at the corresponding thoracic level (Fig. 2). Due to the thoracic deformation, standard and personalized EIT images differ significantly. The altered chest and lung mechanics are not correctly represented on the standard EIT image, where a standardized contour of the "patient's" thorax and a blend present unreliable image with low spatial resolution that gives a very simplified idea of what and where it happens. Although the chest deformation suggests impaired ventilation in the ventral region of the right lung, on the standard EIT image (Fig. 3) the ventilation in this area is visualized better than in the dorsal region. The personalized reconstruction of the EIT image provides significant overlapping conformity, resulting in increased informational value concerning the spatial resolution of the images. The color coding of impedance distribution improves structural recognition and spatial evaluation of gas flow distribution, reflecting patient's anatomic characteristics.

**Conclusions:** The selected pixel size and the personalized reconstruction of the EIT images significantly optimize lung ventilation monitoring and increase the informational value of the EIT applied in patients with thoracic wall deformities due to trauma.

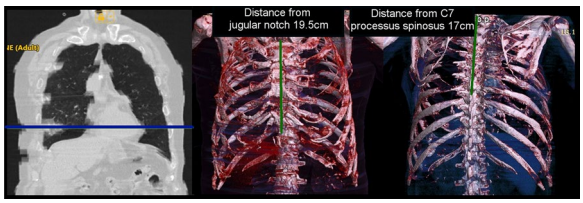


**Fig. 1 (abstract 001237)** Selection of level of interest and belt positioning

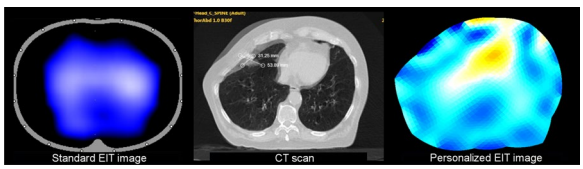


**Fig. 2 (abstract 001237)** A comparison of a standard EIT image, a CT scan and a personalized EIT image

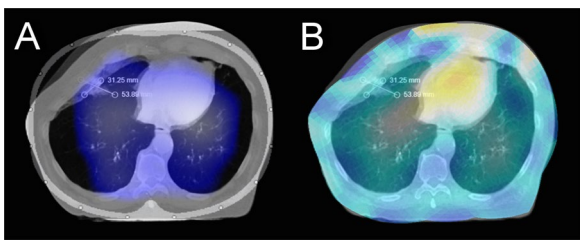


**Fig. 3 (abstract 001237)** A comparison of the spatial conformity between A (standard EIT image/CT scan) and B (personalized EIT image/CT scan)

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**Topic:** Imaging in intensive care

## 001238

### Mediastinitis in critical care: a six years' short story

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**Introduction:** Mediastinitis (MD) is a rare but severe and rapidly progressive infection of the mediastinum with different aetiologies. If not promptly treated is associated with high morbidity and mortality.
**Objectives:** To characterize a cohort of critically ill patients with MD.
**Methods:** This is a retrospective single-centre study of 38 patients with MD admitted to the ICU between 2018 and 2023 in a tertiary hospital in Portugal. Patient demographics, risk factors, causative pathogens, organ support, antimicrobial and surgical treatment and mortality were analysed. SPSS 27 as used for statistical analysis.
**Results:** In our series of 38 adults, 57.9% were female, with a median age of 62 y and 13.2% had cancer as comorbidity.
Median SAPS II and SOFA score on ICU admission were 31.00% and 3.0, respectively.
Descending necrotizing MD, 47.4%, was the most frequent aetiology followed by oesophageal perforation in 39.5% and post-surgical sternal wound infection in 10.5%.
Causative microorganisms were documented in 25 cases (65.8%) and 56.0% of them were polymicrobial. Gram-positive bacteria were the most frequent pathogens (80.0%) followed by Gram negative (40.0%) and anaerobes (32.0%). Fungi were present in 24.0% of all microbiologically documented MD and secondary bacteraemia was present in 20.0% of them.
Empirical combination of antimicrobials was used in 86.8% of the patients (an antifungal was included in 34.2% of them) and it was considered appropriate in 88.0% of all microbiologically documented cases. Empirical treatment was changed in 65.8% of the patients: 28.9% as stepdown therapy, 13.2% due to superinfection, 10.5% due to toxicity and in 7.9% due to inadequacy. Mean duration of antimicrobial treatment was 30.5 days and source control surgery was performed in 30 patients (78.9%). Invasive mechanical ventilation and vasopressors were used, respectively, in 73.4% and 68.4% of the cases. Tracheostomy was performed in 9 patients (23.7%). Median ICU length of stay (LOS) was 16 days. ICU, 28 days and hospital mortality were 10.5%, 13.2% and 21.1% respectively.
In univariate analysis, male gender ($p = 0.003$) and cancer as comorbidity ($p = 0.004$) were the only variables associated with hospital mortality. No independent risk factors for hospital mortality were found.
**Conclusions:** Although not very frequent, MD is associated with a heavy antimicrobials' consumption, need of multiple surgical interventions for source control and high use of ICU resources. Despite low mortality, it is associated with prolonged ICU LOS.

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**Topic:** Sepsis

## 001239

### Linear power and mortality in acute respiratory distress syndrome secondary to COVID-19

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**Introduction:** Acute respiratory distress syndrome secondary to COVID-19 (C-ARDS) overcrowded the intensive care units (ICU) in the world with a high mortality rate. Mechanical ventilation (MV) remains the most important aspect of managing patients with ARDS; however, as it is a new pathology, the evidence of ventilatory variables associated with mortality is not entirely clear. In 2021, a new variable was described, which is superior to other ventilatory markers in ARDS due other pathologies, however, its possible usefulness in patients with C-ARDS has not been described.
**Objectives:** To assess linear power as a mortality risk marker in patients with C-ARDS in ICU.
**Methods:** After approval by the local research and ethics committees (HGL-CIS-2022/038), a retrospective cross-sectional analytical study was carried out in the intensive care unit of the Leon General Hospital in the period July 2021 to February 2022; all records of patients of both genres over 18 years old with a diagnosis of ARDS according to the Berlin definition with IMV and a positive test for COVID-19 (PCR or antigen) were included. Pregnant patients, MV in spontaneous modes or non-conventional modes, with known chronic disease (COPD, pulmonary fibrosis, interstitial diseases, etc.).
The present study adhered to ethical standards on health research, the Helsinki declaration and the Strobe declaration. It was a sampling of consecutive cases, and a total sample size of 80 patients was calculated, expecting a linear power difference between those who died and those who survived of at least 20%, a confidence of 95% and a power of 80%.
The study was divided into two groups: patients who died and patients who were discharged from ICU. To the entire population, linear power at admission to the ICU was calculated with the following formula:
Linear Power = (4 × driving pressure) + respiratory rate.
**Results:** We included 60 patients who met all selection criteria for this study during this specified period. 58.3% of the patients were of the male gender, with an average (± SD) of 52 years (± 14.3 years) and an average BMI of 30 kg/m$^2$ (± 5.3 kg/m2); in 83.3%, the ventilatory mode was control volume with a median interquantile range (IQR) of 5.1 ml/kg (4.5–5.9 ml/kg), PEEP of 8 cmH2O (7.75–10 cmH2O), FiO2 of 0.9 (0.6–1) and 90% of the patients were in prone position; the ventilatory monitoring variables, ΔP 15 cmH2O (12.7–17 cmH2O), MP of 20.8 J/min (17–24.3 J/min) and linear power of 82 (72–93.7); finally, mortality was 43.3% (Table 1).

In the study, it was divided into 26 patients in the death group and 34 patients in the group who was discharged from ICU. When comparing both groups, only gender ($p=0.043$) and weight (84.7 vs 79 kg, $p=0.04$) had a difference in demographic variables; in ventilatory variables, PEEP (10 vs 8 cmH2O, $p=0.017$), MP (23 vs. 18 J/min, $p=0.035$) and ΔP (16 vs 14 cmH2O, $p=0.021$) were higher in patients who died, and 53% of the death group had a ΔP upper than 15 cmH2O ($p=0.056$, RM 2.8 IC at 95% 0.96–8.13) and 67% a MP greater than 17 J/min ($P=0.006$, RM 3.22 95% IC 1.5–13) (Table 1).

The linear power in the death group was 89.5 (77–103.2), and in the discharge group, it was 78 (71.25–88, $p=0.031$); in the ROC curve analysis, the linear power had an AUC of 0.663 (0.525–0.802, $p=0.031$, Figure 1) with mortality. When divided into quartiles, the second quartile was the one that presented the best prognostic capacity (sensitivity of 73% and specificity of 60%, Table 2) and increased the probability of risk (OR 3.5, 95% CI 1.13–12.3,) of die; Likewise, those with a linear power greater than 80 had lower survival compared to the group less than 80 (log rank test, $p=0.043$, Figure 2).

In the multivariable regression analysis, male gender (OR 4.63, 1.16–14.23) and linear power (OR 4.4, 95% CI 1.15–17.3) were the risk factors associated with mortality.

**Conclusions:** Linear power greater than 80 is a possible mortality risk variable in C-ARDS patients with IMV in ICU.

**Table 1 (abstract 001239)** General data of the population and comparison between the death group and the intensive care discharge group

| | N=60 | Death n=26 | Discharge n=34 | p |
|---|---|---|---|---|
| Male, n (%) | 35 (58.3) | 19 (73.1) | 16 (47.1) | **0.043** |
| Female, n (%) | 25 (41.6) | 7 (27) | 18 (53) | **0.043** |
| Age, years | 52 (± 14.3) | 54.5 (± 11.3) | 50.6 (±16.3) | 0.305 |
| Weight, Kg | 80 (±15.2) | 84.9 (±16.23) | 77 (±13.5) | **0.045** |
| BMI, Kg/m2 | 30 (±5.3) | 29 (26-33) | 30 (26-34) | 0.952 |
| Prone position, n (%) | 54 (90) | 26 (100) | 28 (84) | **0.025** |
| Tidal volume, ml/kg* | 5.1 (4.5-5.9) | 5.05 (4.3-5.7) | 5.2 (4.74-6) | 0.483 |
| PEEP, cmH2O | 8 (7.75-10) | 10 (8-10.75) | 8 (7-10) | **0.017** |
| Respiratory rate, fr/min | 26 (22.8-28) | 26 (23.5-28) | 26 (22.5-28) | 0.712 |
| FIO2, decimals* | 0.9 (0.6-1) | 0.95 (0.81-1) | 0.85 (0.5-1) | 0.137 |
| Plateau pressure, cmH2O | 23.5 (21-26) | 25 (22-27.8) | 23 (20-25) | 0.069 |
| Static compliance, cmH2O | 27(22-37) | 28.8 (22.8-37) | 26.6 (22-36) | 0.737 |
| Driving pressure, cmH2O | 15 (12.7-17) | 16 (14-19) | 14 (12-16) | **0.021** |
| Mechanical power, J/min | 20 (17-24) | 23 (19-25) | 18 (14-23) | **0.035** |
| Linear Power | 82 (72-93.7) | 89.5 (77-103.2) | 78 (71.25-88) | **0.031** |
| Pao2, mmhg | 75 (66-91) | 74.5 (66.25-86) | 76 (67.25-91) | 0.676 |
| Paco2, mmhg | 50 (42-67.7) | 59 (42.25-79.25) | 48 (42.1-61) | 0.192 |

It is described as mean (±SD), median (q1-q3), number (n), percentage (%), BMI (body mass index), PEEP (positive end-expiratory pressure), FiO2 (inspired fraction of oxygen in units), PaO2 (blood pressure of oxygen), PaCO2 (blood pressure of carbon dioxide), millimeters of mercury (mmhg).

**Table 2 (abstract 001239)** Division of linear power into quartiles

| Quartil Linear power | | OR (IC al 95%) | Sensitivity | Specificity |
|---|---|---|---|---|
| First quartile (1Q) | 73 | 4.1 (0.8-21) | 92% | 26% |
| Secondquartile (2Q) | 80 | 3.5 (1.13-14) | 75% | 60% |
| Thirdquartile (3Q) | 94 | 3.1 (1.06-10) | 46% | 79% |

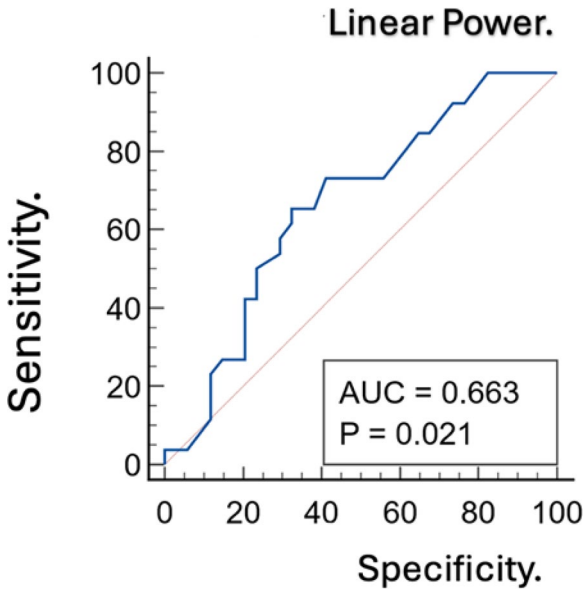


**Fig. 1 (abstract 001239)** ROC curve with area under the linear power curve of 0.663 (IC al 95% de 0.530–0.780, $p=.021$)

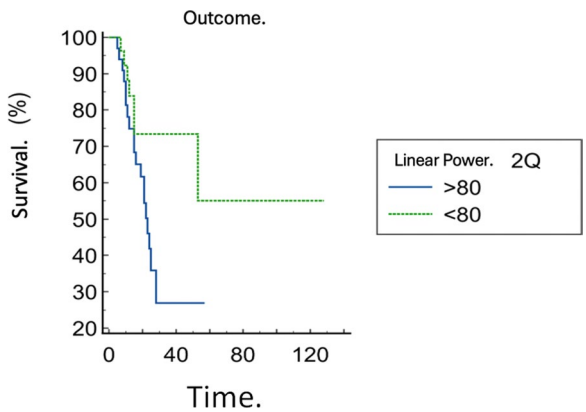


**Fig. 2 (abstract 001239)** Kaplan Meier survival curve, with a comparison of the curves by Log-rank test (x2 4.083, $p=0.043$)

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001242

### Neurological alteration after endovascular procedure

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**Introduction:** Contrast encephalopathy is a rare and potentially serious entity that affects patients undergoing angiographic procedures with iodinated contrast. It involves an alteration of the blood–brain barrier and different clinical symptoms of the nervous central system.
**Objectives:** To describe the characteristics and evolution of patients with a clinical profile compatible with contrast encephalopathy after a cerebral aneurysm embolization.
**Methods:** This is a retrospective descriptive study of patients admitted to our Intensive Care Unit (ICU) in 2023, with a diagnosis of contrast encephalopathy after a cerebral angiographic procedure. We evaluate the clinical setting, radiological alterations, treatment, and evolution of those patients.
**Results:** Four female patients aged between 45 to 65 years were admitted to our ICU requiring a cerebral angiography, and in three cases, the diagnosis was a cerebral aneurysm. Low osmolarity iodinated contrast (300 mg/ml) was used in angiography. Three of the patients were smokers, and none had impaired renal function. After the procedure hemiparesis was observed in two patients, seizures in another two, dysarthria in one case, blindness and diabetes insipidus were associated with one of the above. Two brain MRI were performed that ruled out acute ischemic lesions and intracranial bleeding, and two brain CT angiograms described hemispheric cerebral edema with asymmetry in vascularization in one patient. Three patients received treatment with corticosteroids. Within 72 h, all four patients showed clinical improvement.
**Conclusions:** Cases of contrast-induced encephalopathy are rare after the use of endovascular iodinated contrast agents. The literature has included this complication associated with cardiac catheterizations for years and currently cases after cerebral angiograms are published more frequently. Patients who have received high doses of contrast directly into cranial vessels are at greater risk. The physiology is still unknown, but the literature describes osmotic damage to the blood–brain barrier due to direct toxicity of the contrast on the brain tissue in combination with the effects of its osmolarity. Despite the use of hypoosmolar contrasts, these alterations may exist. Patients with no clinical history nor previous brain pathology may suffer from this pathology. The neurological alteration ranges from visual impairment, language impairment and motor alteration to seizures and coma. Imaging tests performed when clinical worsening occurs usually describes few alterations, although cerebral edema is common. A clinical-radiological improvement is described in the first days in most patients, but sometimes the affection is more serious and persists over time. Treatment with corticosteroids continues to be a therapeutical option. We must think about this entity that appears more often than

we suspect, after a clinical deterioration of those patients who underwent procedures with iodinated contrast, always ruling out other complications, to apply a treatment for promptly recovery.

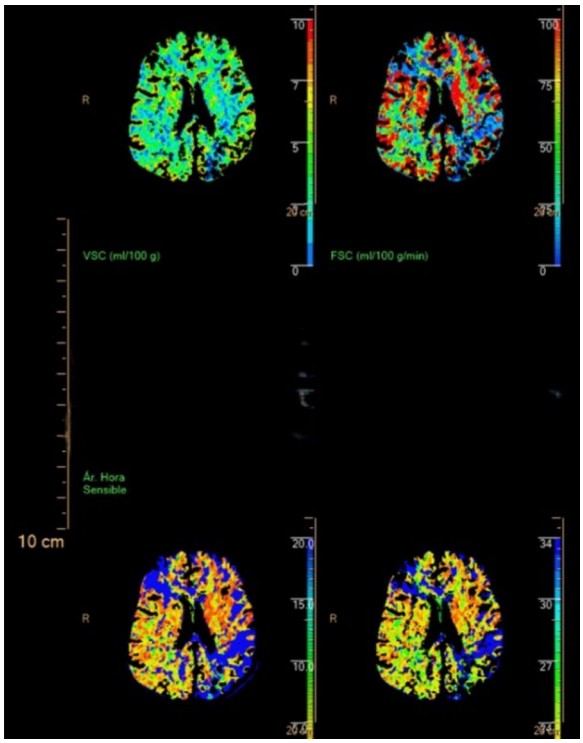


**Fig. (abstract 001242)** Asymmetry in perfusion maps with increase in time and slight decrease in flow in the territory of the right MCA

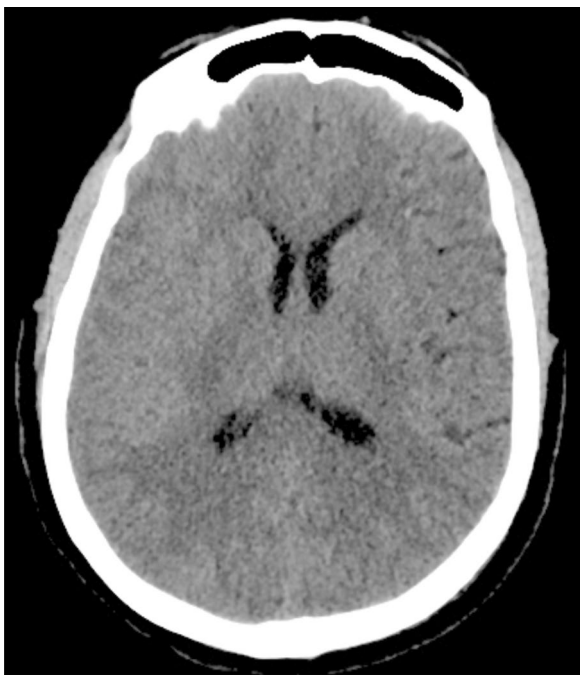

**Fig. (abstract 001242)** Effacement of right cerebral sulci compatible with cerebral edema

**Topic:** Neurointensive care

**001244**

## Use of isoflurane as treatment for super-refractory status epilepticus

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**Introduction:** Status epilepticus (SE) has been defined as the clinical condition that results from the failure of mechanisms that control the onset or termination of seizures, causing an abnormally prolonged epileptic state. This form of epilepsy presents considerable incidence in general population (40/100.000) and associated high hospital mortality (9–52%) and morbidity, with long-term severe neurological impairment (severe neurological status in 39% of survivors at 90 days). According to this, quick control of SE is crucial, being benzodiazepines and antiepileptic drugs the first- and second-line recommended treatments. When we fail to control status epilepticus, we refer to it as refractory status epilepticus (RSE). This condition obligates physicians to start sedation. If, although deep sedation, RSE is not controlled, we define it as super-refractory status epilepticus (SRSE). This other form of epilepsy is a maximum severity disease with high ratios of neuronal morbidity and mortality. Conventional sedative drugs usually fail to subdue SRSE, therefore, considering alternative drugs such as isoflurane may be an option.
**Objectives:** To assess the efficacy and safety of inhaled isoflurane in the ICU for the management of super-refractory status epilepticus (SRSE).
**Methods:** This is a retrospective review of 6 cases of SRSE treated with inhaled isoflurane in the ICU (using the AnaConDa-S device) due to the ineffectiveness of conventional sedative and anticonvulsant drugs. Control of seizures was considered as absence of clinical and/or electroencephalographic seizures after the initiation of isoflurane, with no recurrence after withdrawal of the drug. In addition, variables such as mortality, functional outcome at ICU discharge, and occurrence of complications attributable to isoflurane were assessed. Because of previous reports of alterations in the T2 pattern of nuclear magnetic resonance (NMR) imaging, we studied the occurrence of these lesions in our patients.
**Results:** Control of SRSE was achieved in 4 of 6 patients following initiation of isoflurane treatment. 4 of the 6 patients died from serious concurrent pathologies, with SRSE controlled in 3 of the 4 deceased patients. 2 of the deaths were attributed to uncontrolled SRSE (mortality of SRSE in different series varies between 20 and 50%). The 2 surviving patients with controlled SRSE were discharged from the ICU at their baseline functional status. All cases required vasopressors during isoflurane treatment at a dosage similar to that required during the use of other sedatives. 1 patient developed ventilator-associated pneumonia 48 h after starting isoflurane, with no clear causal relationship established. No other adverse effects were observed. MRI studies were conducted in 5 of 6 patients, with only 3 of them performed after the use of isoflurane. None of the 3 cases showed new lesions attributable to the drug.
**Conclusions:** Isoflurane seems to be an effective rescue treatment for controlling SRSE. Patients showed hemodynamic alterations requiring vasopressors without other apparent complications related to isoflurane use. These data suggest that isoflurane could be considered as a safe and effective alternative in the management of SRSE.

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**Topic:** Neurointensive care

## 001245

### Practice of ultrasound-guided central venous catheter check: a survey from the Winfocus Research Study Group. Preliminary results

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001245

**Introduction:** Recent evidence has confirmed the usefulness and reliability of ultrasound (US) localization of the central vein catheter (CVC) tip, potentially altering clinical practice behavior in recent years. However, no previous study has investigated common clinical practice behavior. Thus, the World Interactive Network Focused On Critical UltraSound (WINFOCUS) launched an international worldwide audit of CVC confirmation practices among its members.
**Objectives:** This survey aims to delineate global practices regarding CVC placement confirmation, with a particular emphasis on the utilization of US. The findings from this survey will also guide the design and implementation of a multinational prospective observational study investigating the use and outcomes associated with CVC placement.
**Methods:** Between April 4th and September 9th, 2023, a web-based cross-sectional survey was distributed through the WINFOCUS World Ultrasound Network across five continents. The survey was individually emailed to members of the WINFOCUS mailing list using the SurveyMonkey online platform. A cover letter attached to the email briefly explained the study and provided a link to the online survey. Two reminders were subsequently sent to encourage participation. Descriptive statistics were utilized to summarize the data. Results for continuous variables were expressed as median ± IQR (Interquartile Range). Qualitative items were compared using a Chi-square test, with a p-value < 0.05 considered statistically significant. Data analysis was performed using SPSS version 27.0.
**Results:** One thousand, two hundred and forty-six forms were submitted to the online data platform. All data were included in the final analysis. The survey reached 1246 practitioners, and of these, 1227 (98.5%) agreed to participate and responded to the survey. The continents of respondents were: Europe (33.5%), Asia (28.3%), South America (25.6%), Africa (5.8%), North America (5.3%), and Oceania (1.5%). A 92.2% of respondents reported inserting CVCs, mainly physicians (95.4%), specializing in critical care medicine (27%), anesthesiology (22%), and emergency medicine (14.3%). Over half had > 6 years of practice (51.8%) and placed > 200 central lines, often under US guidance (70%). To confirm CVC placement, CXR was "always" used (52%), followed by US wire visualization (45%). Other methods included saline/fluid injection (23%), blood tracking (22%), intravascular ECG (8%), blood gas analysis (6%), and ultrasound contrast injection (4%). Among those using US, methods included contrast medium injection with TTE/TEE (8.2%), TTE apical view (7.3%), TTE bicaval subcostal view (6.4%), and TEE (2.6%). 9% used no contrast, 34% used saline, and 57% used air-blood-saline or contrast mixtures. Obstacles to using US included institutional guidelines (33.9%), medico-legal concerns (13.8%), and lack of US skills (8.8%).
**Conclusions:** Although current scientific evidence supports the use of ultrasound (US) for confirming the position of CVCs, many physicians still do not fully utilize US and incorrectly regard chest X-ray (CXR) as the standard for checking tip position. We believe that US should be the primary method for confirming catheter malposition, with CXR reserved for specific situations where US is not feasible. To enhance patient safety, optimize hospital resources, and minimize radiation exposure, we advocate for a de-implementation strategy to discourage the systematic use of CXR for checking CVC positioning.

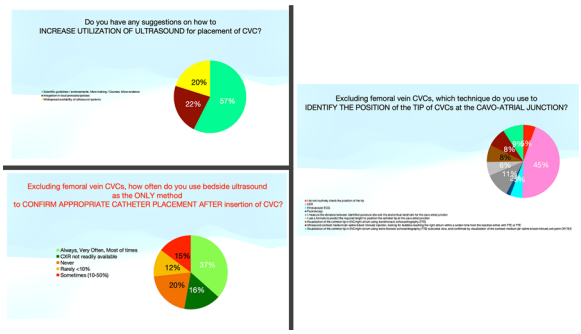


**Fig. 1 (abstract 001245)** Practices regarding CVC placement confirmation

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4. None

**Topic:** Perioperative care

## 001246

### Baclofen poisoning: effects and ICU outcomes

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**Introduction:** The recommendation for using baclofen in alcohol withdrawal makes this drug more accessible and provides an opportunity for voluntary intoxication by the patient or its surrounding.
**Objectives:** Describe the epidemiological, clinical and prognostic characteristics of acute intoxications with baclofen admitted to the intensive care unit.
**Methods:** This was a retrospective descriptive study conducted in a toxicology Intensive Care Unit over a period of 4 years (2020–2023). We included patients admitted to the ICU for baclofen intoxication. Patients with polydrug intoxication were excluded.
**Results:** Forty-one patients were included. The average age was 28 ± 13 years. Ten patients (25%) were children. The gender ratio was 0.46. The mean IGS II and APACHE II scores were 28 ± 11 and 10 ± 4, respectively. Twelve patients (30%) had psychiatric history. All cases were suicidal acts. Intoxication was associated with alcohol consumption in 5 patients with an average blood alcohol level of 1.7 g/L. The average time to consultation was 6 ± 3 h. The average presumed ingested dose was 420 ± 320 mg. Fourteen patients (34%) experienced agitation episodes. Six patients (14.6%) had tonic–clonic seizures. The mean GCS score at admission was 8 ± 4. Toxic coma was the main reason for mechanical ventilation, required in 34 patients (83%). High presumed ingested dose was associated with a risk of requiring orotracheal intubation (170 ± 70 vs. 320 ± 66, $p = 0.005$). Eighteen patients developed aspiration pneumonia. Three patients had ventilator-acquired pneumonia during ICU stay. The average duration of mechanical ventilation was 48 ± 32 h. Electrocardiographic abnormalities included atrioventricular block ($n = 4$, 10%) and prolonged QT interval ($n = 3$, 7%). The average hospitalization duration was 3.5 ± 2 days. All patients survived.
**Conclusions:** Signs of baclofen intoxication are mainly neurological. The prognosis is favorable when management is adequate.

**Topic:** Poisoning/Toxicology/Pharmacology

## 001247

### Can we optimize blood pressure targets by monitoring cerebral autoregulation before revascularization in endovascular therapy for acute ischemic stroke?

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001247

**Introduction:** Typically, 1.9 million neurons are lost each minute in which ischemic stroke is untreated (1). Endovascular therapy (EVT) significantly improves outcomes in acute ischemic stroke (AIS) (2). Loss of cerebral autoregulation makes AIS patients vulnerable to variations in blood pressure. However, the ideal blood pressure for individual patients before and after revascularization remains unclear (3,4). Before revascularization, blood pressure targets guided by the cerebral autoregulation status holds the potential to save penumbra.
**Objectives:** To investigate the feasibility of determining optimal blood pressure from cerebral autoregulation status before revascularization during EVT.
**Methods:** In this prospective observational study, we have completed the data collection from 25 AIS patients undergoing EVT under general anesthesia. Mean arterial blood pressure (MAP) and regional brain tissue oxygenation using near-infrared spectroscopy (NIRS; INVOS with rSO2) as a surrogate measure of cerebral blood flow were continuously recorded. Changes in rSO2 in response to variations in MAP were recorded and averaged over 10 s periods. The ICM + software package (ICM + ®, Cambridge Enterprise, University of Cambridge, UK) was used for time-correlation analysis to calculate tissue oxygenation derived autoregulatory index (TOx) which can be used to identify the MAP-range at which the autoregulation function was best preserved3. Figure 1 shows the parabolic curve of MAP fitted to TOx in which the nadir of the curve corresponds to the optimal MAP (based on autoregulatory function) for each individual patient. The calculated optimal MAP was compared to the patient's initial blood pressure levels upon presentation.
**Results:** So far, a subset of 6 patients have been analyzed. In 5 out of the 6 patients, a tissue oxygenation derived autoregulatory index could be calculated despite short registration times before revascularization was achieved (15 min on average). In these patients, the range of optimal blood pressure was 100–115 mmHg which correlated ($r = 0.9$) to the spontaneous achieved pre-procedural levels ranging from 85 to 117 mmHg.
**Conclusions:** Calculating cerebral autoregulation indices before revascularization in AIS patients appears feasible despite the short data registration period. Optimal blood pressure levels correlated closely with pre-procedural levels, emphasizing the importance of meticulous blood pressure control during EVT patient management. Analyses of the full data set awaits.

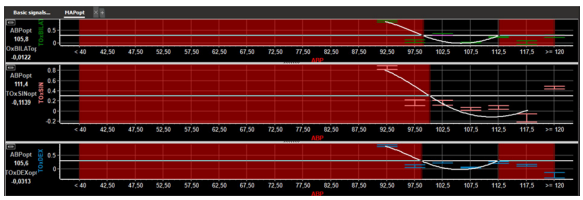

**Fig. 1 (abstract 001247)** .

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**Topic:** Neurointensive care

## 001248

### Clinicians insights on do not resuscitate and care escalation decisions: understanding the barriers and improving practices

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**Introduction:** In the UK, the ReSPECT (Recommended Summary Plan for Emergency Care and Treatment) form is used to document whether a patient is for resuscitation in the event of cardiorespiratory arrest, and what levels of escalation are appropriate should they become critically unwell [1]. This includes stating that a patient is for resuscitation and for escalation to treatment on ICU. Usually, these forms are easily completed, but decisions about resuscitation and escalation of treatment are often made out of hours and at a late stage during a patient's hospital journey. This can cause delays in management, increase workload for out of hours teams, tension between intensive care and medical staff, and harm to patients.

**Objectives:** To understand clinicians' knowledge of ReSPECT forms, escalation decisions, and when they are using these. We wanted to see if there are barriers to use and what these are. We can then use these results to guide the development of educational events and resources to improve clinicians' use of ReSPECT forms and decision-making surrounding escalation of treatment, which should improve patient care.
**Methods:** We created a survey using Google Forms, which was circulated to consultants and registrars working across two hospital sites. It was distributed to medical, surgical, and emergency department doctors via e-mail and WhatsApp groups. Information was collected anonymously.
**Results:** We received 33 responses. Most respondents were medical consultants. 78.8% said they felt comfortable making resuscitation and escalation decisions 80–100% of the time. It was felt that the most appropriate time to make these decisions was on admission or at the request of a patient or family. Only 24.2% of respondents said they would complete a form if the patient was for resuscitation and full escalation of treatment. The most common reasons for not making these decisions were time constraints and fear of offending the patient or relatives. However, 93.8% felt legally and professionally supported to make these decisions. Although 75.8% of respondents felt they receive sufficient training on these issues, 57.6% were interested in attending refresher courses.

**Conclusions:** Our survey shows that senior medical clinicians across our two hospitals feel able to make resuscitation and escalation of treatment decisions. Documentation around these issues appears to only occur if a patient is not suitable for resuscitation and has limitations to their treatment options. These conversations and decisions are time consuming and this impacts on the ability of busy clinicians to perform these tasks. Despite feeling supported to make these decisions, a significant number of clinicians felt a refresher course would be beneficial. We are looking to develop an educational event aimed at discussing these topics and to develop inter-speciality associations. Having prompts on our electronic patient system would remind clinicians to discuss these topics, as well as incorporating it as part of the ward round checklist.

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2. Not Applicable

**Topic:** Ethics and end of life care

## 001249

### Setting up of a structured and multidisciplinary patient handover protocol in an ICU of adult

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**Introduction:** Patient handover is the main activity which take place in the ICU and is based on and effective communication between healthcare professionals and it means a high risk activity of which adverse events derive.
**Objectives:** To implement a protocol in our ICU for carrying out a multidisciplinary and standardized structured patient handover focused in the handover of diary objectives from each patient.
To get the achievement of the quality indicators proposed by European Society of Intensive Care Unit (ESICM) and the Spanish Society of Intensive Care Unit (SEMICYUC).
**Methods:** A Medical patient handover with "Organs and System" structured information was established followed by a multidisciplinary round with nurses, nursing auxiliaries and porters using a checklist. The protocol was established during 6 months like a monitoring period. At the end of this period, ESICM quality indicators were calculated, adverse events were analyzed, and a survey was filled by the healthcare professionals.
**Results:** Quality process indicator "Standardized Handover procedure for discharging patients" obtained was 85% (ESICM consensus 100%, SEMICYUC standard 90%). Quality indicator "Presence of routine multidisciplinary clinical ward rounds" obtained was 70% (ESICM consensus 100%, SEMICYUC standard 80%). About the survey filled by Healthcare professional, 8 physicians were asked, 87% considered the protocol was useful, 75% considered it was easy to carry out and as difficulties they found lack of coordination between the time of the patient handover, the time for bathing patients and the time of the multidisciplinary round. 20 nurses were surveyed, 90% considered the protocol was useful, 80% considered it was easy to carry out and as difficulties they found lack of coordination between the time of the patient handover, the time for bathing patients and the multidisciplinary round resulting in a delay in the daily tasks. Finally, 15 nursing auxiliaries were surveyed, 86.67% considered the protocol was useful, 86.67% considered it was easy to carry out and they found the same difficulties as nursery. About adverse events, no adverse events derived from patient handover were found, and there were no differences between the number of events out of the monitoring period.
**Conclusions:** To implement a protocol in an ICU, carrying out a multidisciplinary and standardized structured patient handover is possible, which decreases adverse events derived from patient handover.
- A longer period of establishment is necessary for getting the standard of quality indicators.
- Checklist use makes easier the transmission of the information about patient diary objectives.

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**Topic:** Health Services Research and Outcome

## 001250

### Relationship between perceived stress, perceived social support and family satisfaction among relatives of adult critical patients: a cross-sectional study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001250

**Introduction:** Admission to the intensive care unit (ICU) is a difficult and stressful situation for patients and relatives. Several stressors for ICU relatives are described such as uncertainty, communication issues, changes in roles and responsibilities, and decision-making difficulties (1). The stressful ICU environment can affect the way relatives evaluate their satisfaction with the quality of ICU care (2,3). In this scenario, perceived social support may serve as a stress buffer for ICU relatives (4,5). However, evidence of the influence of perceived stress and perceived social support on family satisfaction is limited.
**Objectives:** To explore the relationship between perceived stress, social support, and family satisfaction in relatives of ICU patients.
**Methods:** A correlational cross-sectional study was conducted in a private health clinic in the central region of Chile. Relatives of ICU patients with > 48 h of stay were eligible and completed the perceived

stress scale (PSS), the Medical Outcomes Study Social Support Survey (MOS-SSS), and the Family Satisfaction with Care in the Intensive Care Unit-24 (FS ICU-24). Sociodemographic and patient clinical data were also collected. Data were analyzed using descriptive statistics and Spearman rho correlations to explore potential associations between the PSS, MOS-SSS, and FS ICU-24 (overall satisfaction, satisfaction with patient and family care, satisfaction with communication, and satisfaction with decision-making). The study was approved by two Ethics Committees (ID: 220922006 and 061404-23).

**Results:** A convenience sample of 50 relatives were enrolled with 70% being female and a mean age of 50.1 years (*SD* = 15.5). Mean scores for perceived stress, perceived social support, and family satisfaction levels were 19.3 (*SD* = 7.9), 92 (SD = 17.7), and 75.6 (*SD* = 15.), respectively. Concerning FS ICU-24 dimensions, the mean scores were 75.8 (*SD* = 15.1) for satisfaction with patient and family care, 76.3 (*SD* = 20.53) for satisfaction with communication, and 73 (*SD* = 25.2) for satisfaction with decision-making. Then, perceived stress was negatively associated with overall satisfaction ($r = -0.384$, $p = 0.006$), satisfaction with patient and family care ($r = -0.359$, $p = 0.011$), satisfaction with communication ($r = -0334$, $p = 0.018$), and satisfaction with decision-making ($r = -0.338$, $p = 0.041$). Perceived social support was not statistically associated with perceived stress and family satisfaction.

**Conclusions:** Findings from this study increase knowledge regarding the negative impact of perceived stress on family satisfaction. Further studies are required to explore the possible influence of perceived social support on the relatives' ICU experience. Knowing the factors that influence family satisfaction may assist healthcare providers in improving family-centered care in the ICU.

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**Topic:** Nursing care and physiotherapy

## 001251

### Correlation between gastric residual volume using ultrasound and manual aspiration for gastric reserve volume estimation in patients with enteral feeding intolerance

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**Introduction:** Enteral feeding intolerance continues to be a limiting factor in many patients in intensive care unit (UCI), which has generated the search for strategies that allow early detection, as well as the standardization of the evaluation of gastric functions with an examination of the abdomen at the patient's bedside. Traditionally, measurement of gastric residual volume by manual aspiration has been used as a method to monitor enteral feeding intolerance. In the search to improve safety and minimize complications in critically ill patients, determination of gastric residual volume by ultrasound could be a tool that allows the early diagnosis of enteral intolerance due to its high sensitivity and specificity to detect or rule out a full stomach in clinical scenarios in which the presence of gastric contents is uncertain. In addition to being highly reproducible, it can determine its correlation with gastric residual volume by manual aspiration, and it could also improve early detection in our unit and implement routine monitoring and treatment strategies that will benefit the patients.

**Objectives:** To correlate gastric residual volume measured by ultrasound and manual aspiration for gastric reserve volume estimation in patients with enteral feeding intolerance.

**Methods:** This is a descriptive, longitudinal, prospective study in patients admitted to the adult UCI of a tertiary hospital in Mexico City and in whom enteral feeding intolerance was documented their stay. We measured gastric residual volume using ultrasound and compared this measurement with manual aspiration for gastric reserve volume estimation.

**Results:**

We included 23 participants, and 59 measurements of gastric residual volume were performed using ultrasound and then compared with manual aspiration for gastric reserve volume. Parametric tests of normality were carried out with Kolmogorov–Smirnov with normal distribution. Of the 23 participants, 52% men, 47% women, and all participants were fed with a nasogastric tube. The mean age of the included participants was 48 years, mean BMI 28.4 kg/m2. The admission etiology was pneumonia 56.5% (N13), followed by cerebral vascular disease 26.1% (N6). The main comorbidities were obesity 34% (N8), systemic arterial hypertension 34% (N8), and diabetes 21.79% (N5).

A total of 59 measurements were made, estimating an average of 636 ml for gastric volume in 24 h using USG in contrast to an average of 634 ml for gastric volume obtained by manual aspiration, without identifying alterations in intra-abdominal pressure. Even in patients with greater residual, an average of 7.76 mmHg was found. Using the Pearson test, it was determined that there is a directly proportional correlation with a correlation coefficient of 0.97, and a significant $p < 0.01$.

The main clinical data associated with enteral intolerance were diarrhea in 26.08% (N6) of the participants, followed by vomiting and abdominal pain in 4.34% (N1) of the participants.

| | N (59) | Media (DE) | IC 95% |
|---|---|---|---|
| GRV USG 1* | 23 | 288 (13.08) | (260–317) |
| GRV USG 2* | 23 | 248 (13.11) | (219–277) |
| GRV USG 3* | 13 | 193 (19.47) | (151–235) |
| GRV USG 24 h * | 59 | 636 (168.70) | (563–638) |
| GRV 1* | 23 | 294 (13.97) | (263–324) |
| GRV 2* | 23 | 252 (19.57) | (210–295) |
| GRV 3* | 13 | 186 (20.00) | (143–230) |
| GRV 24 h* | 59 | 634 (176.93) | (557–710) |

* $p < 0.0001$, GRV USG (gastric residual volume by ultrasound), GRV (gastric residual volume by manual aspiration

**Conclusions:** The measurement of gastric residual volume by ultrasound is a reliable method to detect enteral intolerance early, with a high correlation and statistical significance. This represents benefits for the critically ill patient, since ultrasound at the point of care presents a strategy of cutting-edge, non-invasive that can be performed at the patient's bedside.

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001254

### Predictive performance of an antibiotic model informed precision dosing program in critically ill adults with infection

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**Introduction:** Critically ill patients in the intensive care unit (ICU) often face serious infections and poor outcomes (1, 2). Their altered pharmacokinetics (PK) make antibiotic dosing challenging (3, 4). Achieving therapeutic antibiotic exposures may be improved with the use of model-informed precision dosing (MIPD) programs. This approach further individualises dosing and is a key advantage over a traditional therapeutic drug monitoring approach, in that, it can be performed prior to steady state, allowing for earlier dosing adjustment to attain target exposures (5). External evaluation of MIDP programs is essential to assess how well they perform in real-world clinical scenarios.
**Objectives:** To quantify and compare both a priori and a posteriori predictive performance of an antibiotic MIPD program in a heterogenous cohort of critically ill adults with infection.
**Methods:** The MIDP program, ID-ODS TM, was used to predict a priori and a posteriori concentrations for piperacillin, meropenem, cefepime, flucloxacillin and vancomycin using clinical and demographic data derived from a previous study in critically ill adults (GUIDE trial). Predicted concentrations were compared to observed concentrations using pre-specified acceptance criteria. Furthermore, the impact of predictions on theoretical dosing recommendations to achieve predefined drug exposures was assessed.

**Results:** One hundred and six patients were included in the external evaluation (see Table 1). The a priori predictive performance in 81 patients administered beta-lactams did not meet any pre-specified acceptance criteria. However, all beta-lactams met accuracy acceptance criteria for the a posteriori approach, although only cefepime demonstrated accep Table precision and F20 and F30 acceptance. In 25 patients administered vancomycin, a priori predictive performance met all acceptance criteria for accuracy and precision (see Tables 2 and 3). When assessing a priori theoretical dosing recommendation concordance, approximately 1 in 3 predictions led to an unnecessary dosing action. Concordance was similar with an a posteriori approach; however, overprediction was observed in 20% of meropenem predictions.
**Conclusions:** In a heterogenous adult ICU population, the a priori predictive performance of vancomycin was shown to be accep Table. Conversely, the a priori predictive performance for the beta-lactams was not acceptable. Although predictive performance improved with the a posteriori approach for beta-lactams, only cefepime met acceptance criteria.

**Table 1 (abstract 001254)** Patient demographics and clinical characteristics

| *Characteristic* | *Piperacillin/tazobactam (n = 36)* | *Meropenem (n = 18)* | *Cefepime (n = 12)* | *Flucloxacillin (n = 15)* | *Vancomycin (n = 25)* | *Combined (n = 106)* |
|---|---|---|---|---|---|---|
| Age (Years) | 66.5 (56.5 – 74.5) | 64.3 ± 12.8 | 67.8 ± 13.1 | 62.3 ± 13.5 | 51 (42.5 -63.5) | 61.8 ± 13.7 |
| Height (cm) | 170.5 ± 10.2 | 168.9 ± 10.3 | 170.3 ± 11 | 172 ± 8.6 | 175 (166.5 -178) | 170.8 ± 9.7 |
| Weight (kg) | 95.5 (72.5 – 107.8) | 94.9 ± 31.6 | 91 (71-100) | 87.1 (70-98) | 82 (67 -110.8) | 90 (71.9-108) |
| BSA ($m^2$) | 2.09 ± 0.34 | 2.08 ± 0.37 | 2.06 (1.82-2.24) | 2.05 (1.83-2.12) | 2.01 (1.79 -2.33) | 2.08 ± 0.34 |
| BMI ($kg/m^2$) | 29.9 (25.7 – 36.2) | 32.28 (24.9 - 39.1) | 29.64 ± 6.43 | 30.12 (23.03 - 37.11) | 27.7 (23.3 -38.9) | 29.7 (24.5 – 36.9) |
| Male | 21 (58.3) | 10 (55.5) | 7 (58.3) | 12 (80) | 16 (64) | 66 (62.3) |
| APACHE II score | 21 (17 -25.5) | 19.7 ± 6.1 | 19 ± 6.4 | 19.6 ± 5.9 | 21 (15 -26.5) | 21 (15.75 - 24.25) |
| SOFA score | 6.0 ± 2.8 | 6.6 ± 3.7 | 4.9 ± 2.9 | 5.9 ± 2.4 | 6.0 ± 2.8 | 5.9 ± 2.9 |
| Pressors administered on day of first TDM sample | 23 (64) | 14 (77.8) | 7 (58.3) | 11 (73.3) | 21 (84) | 76 (72) |
| Drains in-situ on day of first TDM sample | 18 (50) | 11 (61.1) | 5 (41.7) | 2 (13.3) | 7 (28) | 43 (41) |
| CRRT on day of first TDM sample | 8 (22) | 5 (27.7) | 2 (16.7) | 2 (13.3) | 6 (24) | 23 (22) |
| eGFR on day 1 of antibiotic therapy | 47 (27.9 -70.7) | 76.7 (43.2 - 101.6) | 81.8 ± 42.6 | 58.4 ± 27.3 | 71.7 (43.9 – 101.8) | 56.5 (36.6 – 87.3) |
| **Source of infection** | | | | | | |
| Respiratory | 16 (44) | 6 (33) | 7 (58.3) | 3 (20) | 11 (44) | 43 (41) |
| Abdominal sepsis | 10 (28) | 5 (28) | 4 (33.3) | 1 (6.7) | 1 (4) | 21 (20) |
| Skin and soft tissue | 3 (8) | 2 (11) | 0 (0) | 7 (46.7) | 4 (16) | 16 (15) |
| Urinary sepsis | 2 (6) | 4 (22) | 1 (8.3) | 0 (0) | 2 (8) | 9 (8) |
| Other | 5 (14) | 1 (6) | 0 (0) | 4 (26.7) | 7 (28) | 17 (16) |

BSA, body surface area; BMI, body mass index; APACHE, acute physiology and chronic health evaluation; SOFA, sequential organ failure assessment; TDM, therapeutic drug monitoring; CRRT, continuous renal replace therapy; eGFR, estimated glomerular filtration rate; values presented as mean ± SD, median (IQR) or n (%). A Shapiro–Wilks test for normality was performed

**Table 2 (abstract 001254)** A priori and a posteriori accuracy and precision

| Characteristic | Accuracy * | CI 95% low | CI 95% high | Acceptance (MDPE ≤ 20%) | Precision ¥ | CI 95% low | CI 95% high | Acceptance (MDAPE ≤ 30%) |
|---|---|---|---|---|---|---|---|---|
| Pooled beta-lactam *a priori (n = 81)* | -35.25 | -60.68 | -23.64 | No | 58.29 | 38.05 | 66.55 | No |
| Pooled beta-lactam *a posteriori (n = 39)* | -3.581 | -30.79 | 17.17 | Yes | 45.34 | 17.17 | 71.68 | No |
| Piperacillin *a priori (n = 36)* | -38.31 | -75.16 | -0.74 | No | 63.82 | 38.05 | 78.92 | No |
| Piperacillin *a posteriori (n = 18)* | -3.10 | -67.86 | 45.66 | Yes | 57.62 | 17.17 | 98.02 | No |
| Meropenem *a priori (n = 18)* | -55.42 | -70.11 | -10.24 | No | 55.94 | 22.86 | 70.11 | No |
| Meropenem *a posteriori (n = 15)* | 8.52 | -13.14 | 70.22 | Yes | 30.79 | 8.519 | 70.22 | No |
| Flucloxacillin *a priori (n = 15)* | -34.64 | -82.09 | 33.86 | No | 69.51 | 33.86 | 82.39 | No |
| Cefepime *a priori (n = 12)* | -30.79 | -48.43 | - 1.50 | No | 31.71 | 20.53 | 48.43 | No |
| Cefepime *a posteriori* (n = 6) | -26.99 | -86.69 | 12.48 | Yes | 28.43 | 0.023 | 86.69 | Yes |
| Vancomycin *a priori (n = 25)* | -9.33 | -19.00 | 5.79 | Yes | 22.78 | 13.08 | 30.27 | Yes |
| Vancomycin $AUC_{0\text{-}24}$ *a priori (n = 22)* | -10.63 | -17.24 | -1.96 | Yes | 15.54 | 10.63 | 27.62 | Yes |

CI, confidence interval; * according to median prediction error (MDPE); ¥ according to median absolute prediction error (MDAPE); n, number; AUC, area under the curve

**Table 3 (abstract 001254)** $F_{20}$ and $F_{30}$ acceptance criteria

| Characteristics | $F_{20}$ ¥, n (%) | Acceptance ($F_{20} \geq 35\%$) | $F_{30}$*, n (%) | Acceptance ($F_{30} \geq 50\%$) |
|---|---|---|---|---|
| Pooled beta-lactam *a priori (n = 81)* | 13 (16) | No | 23 (28) | No |
| Pooled beta-lactam *a posteriori (n = 39)* | 13 (33.3) | No | 15 (38.4) | No |
| Piperacillin *a priori (n = 36)* | 6 (16.7) | No | 9 (25) | No |
| Piperacillin *a posteriori (n = 18)* | 5 (27.7) | No | 5 (27.7) | No |
| Meropenem *a priori (n = 18)* | 3 (16.7) | No | 7 (38.9) | No |
| Meropenem *a posteriori (n = 15)* | 5 (33.3) | Yes | 7 (46.7) | No |
| Flucloxacillin *a priori (n = 15)* | 2 (13.3) | No | 2 (13.3) | No |
| Cefepime *a priori (n = 12)* | 2 (16.7) | No | 5 (41.7) | No |
| Cefepime *a posteriori (n = 6)* | 3 (50) | Yes | 5 (50) | Yes |
| Vancomycin *a priori (n = 25)* | 12 (48) | Yes | 17 (68) | Yes |
| Vancomycin $AUC_{0\text{-}24}$ *a priori (n = 22)* | 14 (66.7) | Yes | 16 (76.2) | Yes |

¥ calculated as predictive error percentage with ± 20% (measure of precision and accuracy); * calculated as predictive error percentage with ± 30% (measure of precision and accuracy); n, number; AUC, area under the curve


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**Topic:** Infections and prevention

## 001255

### Association of degrees chemosis with fluid balance in critically patients


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**Introduction:** The intensive care unit can be a dangerous environment for the eyes (1). Ophthalmological complications are frequently encountered in ICU patients; ocular care is often overlooked as management focuses on organ failures (1,2). The most common eye problems are keratopathy (3.6%–60%), chemosis (9%–80%), and microbial keratitis (2,3). Currently, there are still patients with fluid overload in a significant percentage (4), and it has been proposed that chemosis could result in an objective sign for early identification.

**Objectives:** Evaluate the association of the degrees of chemosis with the daily accumulated fluid balance and determine if the Godet's sign is related to the degree of chemosis.

**Methods:** This is a trial analytical, observational, correlational, prospective, and longitudinal study. This study included adult patients over 18 years of age, who were admitted to the ICU. The filling out of nursing sheets was used as a tool, where daily fluid balances, uresis and other variables per hour are specified; finally, they were collected in a database in the period from July 1, 2022, to July 1, 2023. According to Will Jaffe et al. 2018, where they found an incidence of 80% of accumulated positive balance with mortality after 72 h with a p 0.05, the G*Power statistical program was used to know the sample size, using a size of the effect of 0.7, alpha error of 0.05 and statistical power of 0.80. Since it was an association study, the formula of events per variable was used, 10 x (number of variables/frequency of the outcome), resulting in a total of 218 patients, who met the outcome; 15% losses were calculated. Adding in the end, a total of 251 patients meet the outcome.

**Results:** The degree of chemosis was evaluated with the accumulated fluid balance, relating the milliliters of the balance to the degree of chemosis and the relationship with Godet´s sign, finding that patients who present chemosis (grade 2 and 3) have a risk of up to 2.3 times of having a balance of 8000 ml, but up to 3.7 times of having it more than 8000 ml, as well as 2.5 times of having Godet's sign+++ and 4.4 times of having Godet's++++, representing a strong association. A second adjusted multivariate analysis (aOR) was performed, again finding significance of the variables, with age being an adjusted OR 2.1 (95% CI 3.04–7.51, p 0.011), fluid balance < 8000 ml adjusted OR 3.3 (95% CI) 2.1–7.02, p 0.004), > 8001 obtained an adjusted OR of 5.6 (95% CI 1.98–4.21, p 0.010), Godet's sign 6 mm (+++) obtained an adjusted OR of 4.3 (95% CI 5.17–9.34, p 0.009), Godet 8 mm (++++) obtained adjusted OR of 6.1 (95% CI 8.11–12.4, p 0.025).

**Table 1 (abstract 001255)** Chemosis severity

| | |
|---|---|
| **Grade 0** | **Absent** |
| Grade 1 | Conjunctival edema without formation of depressions or "dellen" a |
| Grade 2 | Conjunctival edema with formation of depressions or "dellen" |
| Grade 3 | Conjunctival edema with prolapse through the eyelid aperture |

The adverse effects associated with fluid overload in critically ill patients are one of the major problems in ICU and have gained great relevance both in research and in obtaining practical ways to identify it; ultrasound-based protocols have recently been suggested (5,6). Trying to find an answer to the question: Where is the liquid? Is in the intravascular space or in the interstitial space? Our study addressed this question from a clinical point of view and demonstrated that patients with grade II chemosis had accumulated balances of at least 8000 ml and patients with grade III chemosis exceeded this. Currently, there is no study in critically ill patients that compares the relationship between chemosis and fluid balances, the result is innovative since it proposes to return to the clinical bases: jugular engorgement, Godet's sign and chemosis. Considering that it is also an easily reproducible method—available to everyone—that has not cost, no learning curve is required for its evaluation.

**Conclusions:** Patient inspection is the pillar of examination, but in the face of overwhelming technological change, it has been delegated by new generations. With this study, it becomes evident that returning to good foundations is essential in our practice, that there is no doubt that detecting chemosis will be of great help to limit the administration of fluids and/or decide strategies to eliminate excess cumulative.

**Table 2 (abstract 001255) .**

| Table 2 | Chemosis Grade II n=58 | Chemosis Grade III n=193 |
|---|---|---|
| Age, median (IQR), years | 47.5 (18.8) | 42 (29.5-65) |
| SOFA, mean (±SD) | 13 (2.4) | 13.1 (2.0) |
| SAPS, mean (±SD) | 29 (2.4) | 31 (3.2) |
| Chronic disease, n (%) | | |
| T2D | 8 (13.7) | 15 (7.7) |
| T2D/SAH | 7 (12) | 25 (12.8) |
| SAH | 8 (13.7) | 28 (14.5) |
| Days of onset of chemosis, mean (±SD) | 3.7 (0.9) | 3.5 (1) |
| Fluid balances at the beginning of chemosis, median (IQR), ml | 7500 (6300-8510) | 8288 (6900-9942) |
| Godet´s sign, mean (±SD), mm | 6.8 (.47) | 8 (.23) |
| RRT, n (%) | 1 (1.7) | 11 |
| Mortality, n (%) | 14 (24.1) | 40 (20.7) |

IQR (interquartile range), ± SD (± standard deviation), M (male), F (female), SAH (systemic arterial hypertension), T2D (type 2 diabetes), RA (rheumatoid arthritis), RRT (renal replacement therapy), BMI (body mass index)

**Table 3 (abstract 001255) .**

| | Multivariate analysis | | | Multivariate (Adjusted) | | |
|---|---|---|---|---|---|---|
| | OR | CI 95% | p | aOR | CI 95% | p |
| Age | 1.6 | 2.34-8.29 | **.006** | 2.1 | 3.04-7.51 | **.011** |
| Fluid balance | | | | | | |
| <8000 ml | | | | | | |
| >8001 ml | 2.3 | 1.07-5.12 | **.032** | 3.3 | 2.1-7.02 | **.004** |
| | 3.7 | 1.7-8.09 | **.009** | 5.6 | 1.98-4.21 | **.010** |
| Godet´s sign | | | | | | |
| +++ (6 mm) | 2.5 | 4.67-5.78 | **.016** | 4.3 | 5.17-9.34 | **.009** |
| ++++ (8 mm) | 4.4 | 3.23-7.09 | **.020** | 6.1 | 8.11-12.4 | **.025** |

OR (odd ratio), CI 95% (confidence interval)

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**Topic:** Acute Kidney Injury and haemofiltration

## 001256

### Gastrointestinal dysfunction in mechanically ventilated patients: evaluation with two specific scores


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**Introduction:** Gastrointestinal (GI) disorders in critically ill patients are common and associated with poor prognosis. The acute gastrointestinal injury (AGI) score was recently designed to assess increasing levels of GI dysfunction. Due to the likely subjectivity in assessing GI symptoms and the lack of uniform definitions/specific biomarkers, the Gastrointestinal Dysfunction Score (GIDS) was developed, aiming to make it more objective and reproducible. However, its validity and reproducibility have not been definitively confirmed. Moreover, higher levels of GI dysfunction also entail greater feeding intolerance (FI), leading to an inability to reach caloric and protein goals.

**Objectives:** To evaluate the progression of gastrointestinal (GI) dysfunction using the AGI and GIDS in relation to hospital mortality in patients on mechanical ventilation (MV). A secondary objective was to evaluate the prognostic variables associated with hospital mortality including both scores and FI.

**Methods:** This is a secondary analysis of a prospective cohort study carried out in 10 ICUs of the public sector in Argentina. Eight hundred patients > 18 years requiring MV and in whom the need for enteral nutrition (EN) for at least 4 days was estimated were included. In each patient enrolled in the study, signs and symptoms of GI, as defined by the ESICM Working Group on Abdominal Problems, were recorded daily. Subsequently, the AGImax and GIDSmax were calculated based on the maximum recorded values.

FI was defined as an average of < 20 kcal/kg received due to GI symptoms, and cumulative caloric debt was calculated within the first week. Both scores were assessed using Kaplan–Meier curves and hospital mortality. Cox regression models were constructed to evaluate independent predictors of mortality. A $p$ value $\leq 0.05$ was considered significant for all comparisons.

**Results:** Characteristics of the 800 patients included: age 45 ± 19; male sex 529 (63); Charlson 0 [0–1]; medical diagnosis 438 (55%); APACHE II 17 ± 6; SOFA 7 [4–9]; shock 426 (52%); ARDS 306 (38%); MV days 11 [7–16]; ICU days 14 [9–40]; hospital mortality 318 (40%). The classification into increasing grades according to AGI/GIDS is shown in Figure 1. In general, increasing grades of AGI/GIDS were associated with greater severity and hospital mortality. In Figure 2, we observe Kaplan–Meier curves for hospital mortality for both scores. Grouping AGI 0–1 vs 2–4

and GIDS 0–1 vs 2–4, we obtained for Hospital mortality OR 11 (CI95% 7.6–11) and 10 (CI95% 7–15), for FI OR 20 (CI95% 13–30) for both scores and for caloric debt mean difference −4405 (CI95% −4026, −4783) and −4293 (CI95% −3912, −4675), respectively. Figure 3 illustrates Cox models considering AGI 2–4 for one model and GIDS 2–4 for the other model as prognostic variables of interest. The two models also incorporated the same variables (age, APACHE II, SOFA, Charlson, medical admission). The AGI model included FI as the nutritional variable, and the GIDS model included caloric debt.

**Conclusions:** Both scores exhibited strong prognostic capability for hospital mortality in severely critically ill mechanically ventilated patients.

There were no major differences when classifying the same cohort with both scores, although the GIDS score placed more patients in grade 2 and differentiated mortality between grades 3 and 4.

With both scores, a substantial difference in mortality, feeding intolerance, and caloric debt was noted when comparing grades 0 and 1 versus 2, 3 and 4.

The adequate prognostic capability, along with other independent mortality factors, highlights the importance of incorporating these scores in selected populations.

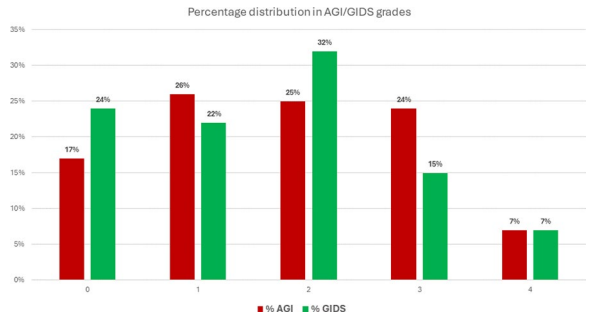


**Fig. 1 (abstract 001256)** Percentage distribution in AGI and GIDS grades

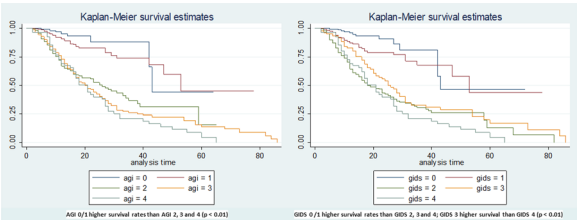


**Fig. 2 (abstract 001256)** Hospital survival curves according to increasing grades of AGI and GIDS

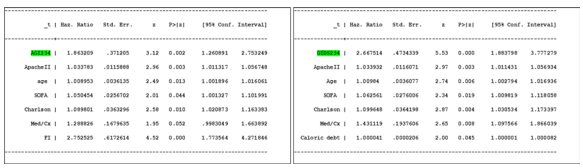

**Fig. 3 (abstract 001256)** Cox models with independent factors for hospital mortality incorporating the AGI score or the GIDS score

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001257

## Indications and complications of transesophageal echocardiography in critical care

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**Introduction:** Transesophageal echocardiogram identifies shock and the underlying cause. Provides detailed information and more precise visualization.

**Objectives:** Determine the main indications for TEE in the intensive care unit.

**Methods:** This is a descriptive, prospective study of a sample of 22 patients. The TEE was performed by a critical care resident with prior training of 8.5 h per month.

**Results:** The main indications for TEE were identified: hemodynamic monitoring 52.63%, search for thrombi in the left atrium 26.31%, infective endocarditis 15.78%, VV ECMO cannulation 5.26%; the hemodynamic diagnoses are in Table 1. There were no complications during tube placement. In the field of intensive cardiovascular therapy, the use of TEE generates a modification in treatment and support in decision making, making it an increasingly indispensable instrument. The limitation of the study is due to the sample size.

**Table 1 (abstract 001257)** .

| Characteristics | *n* = 22 |
|---|---|
| Age, median (IQR), years | 53.5 (36–59) |
| TEE indications, *n* (%) | |
| Hemodynamic monitoring | 13 (59.09) |
| OI thrombus search | 5 (22.72) |
| Infectious endocarditis | 3 (13.63) |
| ECMO VV cannulation | 1 (4.54) |
| Diagnoses, *n* (%) | |
| Hypovolemic shock | 1 (4.54) |
| Septic shock | 6 (27.27) |
| Mitral endocarditis | 1 (4.54) |
| Tricuspid endocarditis | 1 (4.54) |
| Ischemic stroke | 4 (18.18) |
| Subdural hematoma | 1 (4.54) |
| Heart failure | 2 (9.09) |
| Acute respiratory distress syndrome | 3 (13.63) |
| Liver hematoma | 1 (4.54) |
| Dermatomyositis DMA5 | 1 (4.54) |
| Systemic lupus | 1 (4.54) |

| Characteristics | *n* = 22 |
|---|---|
| SOFA, median (SD) | 11.1 (4.3) |
| APACHE II, median (SD) | 17 (7) |
| SAPS III, median (SD) | 57.3 (16.2) |
| Time, median (SD) | 11.8 min (2.4) |
| Distributive shock | 2 (9.09) |
| Left ventricular systolic dysfunction | 4 (18.18) |
| Right ventricular dysfunction | 2 (9.09) |
| Left ventricular hypertrophy | 3 (13.63) |
| Aortic insufficiency | 2 (9.09) |
| Mitral regurgitation | 4 (18.18) |
| Left atrium thrombus | 1 (4.54) |
| Normal | 4 (18.18) |
| Medium esophagus 4 chamber, *n* (%) | 22 (100) |
| Transgastric, *n* (%) | 22 (100) |
| Medium esophagus Bicava, *n* (%) | 21 (95.45) |
| Medium esophagus LVOT, *n* (%) | 20 (90.90) |
| Treatment modification, *n* (%) | 11 (57.89) |
| Mortality, *n* (%) | 5 (22.72) |

**Conclusions:** Transesophageal echocardiography is another tool that provides very important information in the monitoring of critically ill patients, without presenting complications during its performance.

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**Topic:** Imaging in intensive care

## 001261

### Association of serum creatinine trajectories with one-year mortality after valvular heart surgery: a retrospective cohort study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001261

**Introduction:** Acute renal dysfunction is defined by the maximum increase in serum creatinine (sCr) without considering the pattern of change in sCr. We aimed to identify longitudinal patterns (trajectories) of postoperative sCr concentrations and investigate their association with long-term outcomes in patients undergoing valvular heart surgery.
**Methods:** In this retrospective review of 3,436 patients who underwent valvular heart surgery, we applied trajectory projection cluster analysis to identify the trajectories of sCr changes from baseline during the seven postoperative days. Primary and secondary endpoints were to investigate the associations of sCr trajectories with mortality using Kaplan–Meier curves and Cox proportional hazards regression analysis, and a composite of major adverse kidney events (MAKEs) at one year after surgery, respectively.
**Results:** Four clusters were identified: Clusters 1 and 2, a minimal change in sCr (90.1% of patients); Cluster 3, a significant and persistent increase in sCr (4.1% of patients); and Cluster 4, a significant but transient increase in sCr (5.8% of patients). The one-year postoperative mortality rate was higher in Cluster 3 (18.4%) and Cluster 4 (11.6%) than in Cluster 1 + 2 (2.7%). The Kaplan–Meier survival curve demonstrated significant differences in mortality rates among the clusters (log-rank test, $P < 0.001$). In the multivariable Cox analysis, the sCr trajectory cluster was an independent prognostic factor for mortality. Cluster 3 had a higher prevalence of MAKEs (37.6%) compared with Cluster 1 + 2 (6.8%, $P < 0.001$) and Cluster 4 (24.1%, $P = 0.045$). The cluster was an independent prognostic factor for MAKEs.
**Conclusions:** The sCr trajectory clusters exhibited significantly different risks of mortality and MAKEs at one year after surgery. Through these sCr trajectories, we confirmed that both the extent of sCr increase and its sustainability during the first seven postoperative days were closely associated with the long-term prognosis after valvular heart surgery.

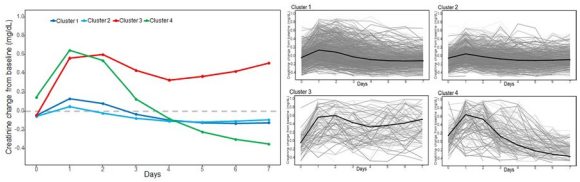


**Fig. (abstract 001261)** Serum creatinine trajectory clusters based on changes for the seven postoperative days

**Topic:** Perioperative care

## 001262

### The deletion of Cmtm3 attenuates sepsis-induced ALI through neutrophil modulation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001262

**Introduction:** Sepsis is a condition characterized by multi-organ dysfunction caused by the host's dysregulated response to infection (1). Sepsis-induced acute lung injury (ALI) is one of the most common critical illnesses in the intensive care unit, with an extremely high incidence and mortality rate (2). Significant strides have been made in the basic and clinical research of sepsis-induced ALI in recent years. However, clinical management largely remains dependent on supportive care, including anti-infection measures and mechanical ventilation, with a noticeable absence of targeted treatment (3). Thus, exploring the underlying mechanisms of sepsis-induced ALI and identifying potential therapeutic targets is of paramount importance.
Immunological imbalance plays a crucial role in the early stages of sepsis, where neutrophils are implicated in anti-infection activities, inflammatory responses, immune regulation, and tissue damage (4). Their levels and functional states are intimately associated with the progression and prognosis of the disease. In the context of sepsis-induced ALI, neutrophils contribute to defense against infection and microbial clearance but also have the potential to cause or exacerbate inflammation and damage to lung tissue (5). Consequently, research into the regulation of neutrophils and therapeutic strategies is vitally important for improving the outcomes of patients with sepsis-induced ALI.
CKLF-like MARVEL transmembrane domain containing (CMTM)3 belongs to the CMTM superfamily and exhibits widespread expression across the immune system (6). Previous studies have reported that CMTM3 stabilizes the expression of epidermal growth factor receptor (EGFR), VE-Cadherin, and B-cell receptor (BCR) on the cell membrane, thus playing an integral role in the immune response and tumorigenesis (7–9). Our preliminary findings indicate that CMTM3 expression is

upregulated in patients with sepsis-induced ALI. However, the role of CMTM3 in the pathogenesis of sepsis has not yet been reported.

**Objectives:** The objective of this study is to investigate the function and mechanisms of CMTM3 in sepsis-induced ALI and to evaluate the potential role of CMTM3 as a therapeutic target for this condition.

**Methods:** Our study employed bioinformatic analysis and real-time quantitative polymerase chain reaction (RT-QPCR) to determine the expression levels of CMTM3 in cases of sepsis-induced ALI. We generated systemic Cmtm3 gene knockout (KO) mice and established a sepsis model using the cecal ligation and puncture (CLP) method to conduct in vivo experiments. The extent of lung tissue damage was assessed using histological microscopy and RT-QPCR method. Neutrophil infiltration was evaluated through immunohistochemistry (IHC). Lastly, single-cell RNA sequencing (scRNA-seq) of lung tissue from mice was utilized to analyze the specific impact of Cmtm3 deletion on neutrophil populations.

**Results:** We found that CMTM3 is overexpressed in sepsis-induced ALI patients. The knockout of Cmtm3 improved the survival rates and attenuated lung tissue damage in septic mice. Mechanistic analysis indicated that the absence of Cmtm3 reduced neutrophil infiltration in the lung tissue of septic mice. The scRNA-seq analysis revealed significant heterogeneity within the neutrophil populations in lung tissue. They were categorized into three subclusters. Subcluster 1 demonstrated high expression of chemotactic factors. Subcluster 2 was characterized by neutrophil infiltration and activation. Subcluster 3 was distinguished by cell apoptosis and immune regulation. During sepsis, there was a predominant increase in Subcluster 2, whereas Cmtm3 deletion resulted in a reduction of Subcluster 2 and an increase in Subcluster 1 and Subcluster 3.

**Conclusions:** We found that CMTM3 is upregulated in sepsis-induced ALI and may exacerbate lung injury by affecting neutrophil function. The deletion of Cmtm3 shows potential therapeutic value in mitigating ALI in sepsis.

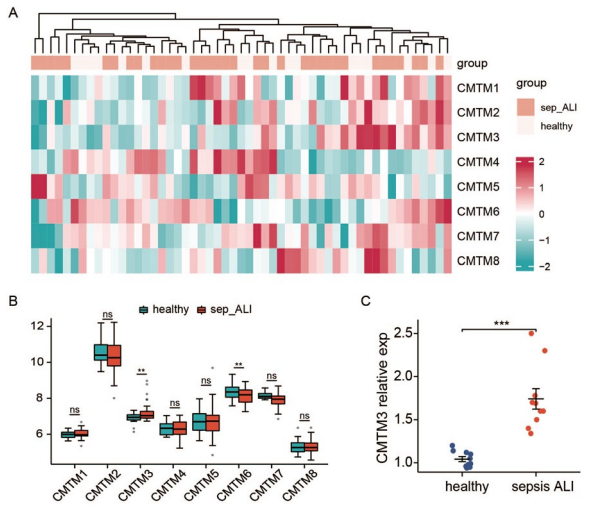


**Fig. 1 (abstract 001262)** The expression of CMTM3 is upregulated in sepsis-induced ALI. (A) Expression heatmap of CMTM1-8 in sepsis-induced ALI and healthy individuals in public datasets. (B) Comparison of CMTM1-8 expression differences between sepsis ALI and healthy groups. (C) Expression of CMTM3 in sepsis-induced ALI patients and healthy controls using PCR test

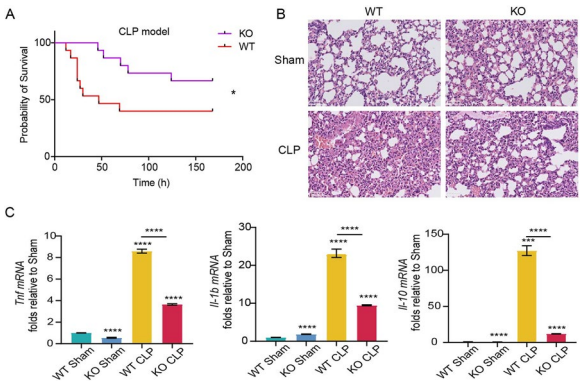


**Fig. 2 (abstract 001262)** Cmtm3 deletion attenuates ALI in septic mice. (A) Survival rate of WT and KO mice 7 days after CLP surgery. (B) HE stains of lung 24 h after Sham or CLP. (C) mRNA expression of Tnf, Il1b and Il10 in lung 24 h after Sham or CLP

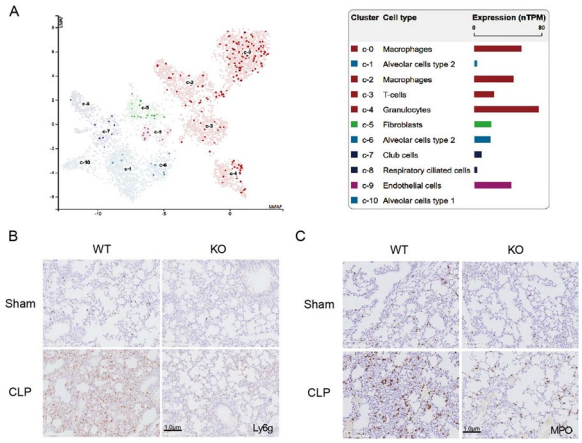


**Fig. 3 (abstract 001262)** Cmtm3 deletion attenuates neutrophil infiltration in lung tissue of septic mice. (A) The expression of CMTM3 in major cell types of lung tissue. (B) IHC stains of Ly6g in lung 24 h after Sham or CLP. (C) IHC stains of MPO in lung 24 h after Sham or CLP

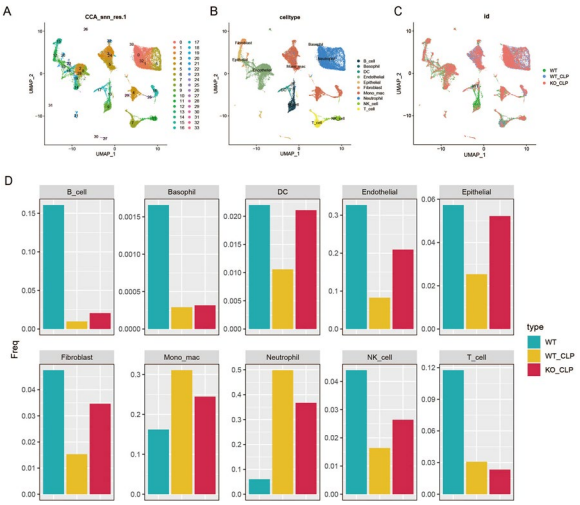


**Fig. 4 (abstract 001262)** Using scRNA-seq identifies mice lung cell populations. (A–C) UMAP plot of lung cells. (D) The proportion of lung cell populations in each group

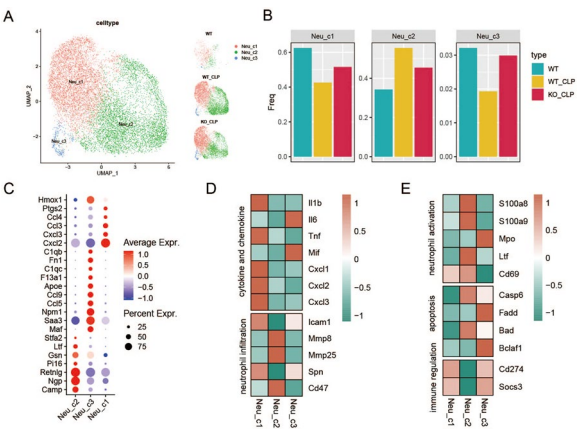


**Fig. 5 (abstract 001262)** The impact of Cmtm3 deletion on neutrophil function in lung tissue. (A) Subclustering of neutrophils in mice lung. (B) The proportion of neutrophil subclusters in each group. (C) Expression of specified genes among neutrophil subclusters. (D–E) Heatmap showing gene expression by the indicated neutrophil subclusters


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**Topic:** Sepsis

## 001264

### Evaluation of MACOCHA score for predicting difficult intubation in critically ill cancer patients: a prospective observational study

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**001264

**Introduction:** Tracheal intubation (TI) is often needed in the ICU but can have disastrous consequences as against when done in OT. The NAP4 audit reported that 25% of complications related to airway management occurred outside the OR, i.e., in the ED and ICUs. MACOCHA, simple 7-item score was described to predict difficult intubation in ICU. We evaluated if MACOCHA score was useful in predicting difficult intubation in critically ill adult cancer patients.
**Methods:** This prospective, observational single-center study was conducted after obtaining IEC approval and waiver for informed consent. We decided to include 500 adults (age > 18 y), whose trachea was intubated in our cancer hospital ICU by trainees with varying backgrounds. Pregnant patients and those patients in whom intubation was required during cardiopulmonary resuscitation were excluded. We collected the demographic data, details of ICU admission, presence of co-morbidities, and intubation related data for calculating MACOCHA score. Details of intubation i.e. indication, preoxygenation, drugs used, attempts at laryngoscopy and intubation, use of Sellick's maneuver were recorded. The complications occurring during and immediately after TI were recorded. We used SPSS software version 21 (SPSS-21; IBM, Chicago, USA) for statistical analysis. The ability and accuracy of the MACOCHA score for predicting difficult intubation was determined by AUC-ROC curve. The Hosmer–Lemeshow goodness-of-fit statistics was used to determine calibration.
**Results:** We analysed data of 449 (of 500 planned) patients due to availability of complete dataset. The mean age of patients was 51 (± 14.31) y, the commonest comorbidities were diabetes, hypertension and cancer therapy, and the commonest reasons for ICU admission were severe sepsis/septic shock and pneumonia. Acute respiratory failure requiring invasive mechanical ventilation, and shock were the most frequent reasons for TI. Most intubation procedures were supervised, and Ketamine was the most commonly used induction agent. Rocuronium was the most commonly used muscle relaxant, while 184 TIs were performed without a muscle relaxant. External laryngeal manipulation was needed in 125 patients, while bougie or stylet was used for TI in 160 patients. One hundred and sixty patients were receiving vasopressor infusion at the time of intubation. Mask ventilation was difficult in six patients, while more than 2 attempts at laryngoscopy and intubation were required in eight and eleven patients, respectively. The incidence of difficult intubation was 13.5% (60/449).

There were 30 patients whose Mallampati score was either III and IV, while 84 and 45 patients had severe hypoxemia and coma before TI, respectively. One hundred and seventy-one (26.5%) complications occurred during TI. Sixty-one patients had severe cardiovascular collapse in the peri-intubation period, while 8 patients died within 24 h of intubation. Nineteen patients had severe hypoxemia during TIThe area under the ROC curve for MACOCHA score was 0.659 (CI: 0.574–0.743) suggesting a moderate discrimination (Figure 1). The MACOCHA score showed sensitivity of 98.5%, specificity 20%, positive predictive value (PPV) 66.7% and the negative predictive value (NPV) was 88.9%. The Hosmer and Lemeshow goodness of fit test showed moderate calibration (X2- 3.142, with $p=0.208$).

**Conclusions:** MACOCHA score in adult critically ill cancer patients showed moderate discriminative ability in predicting difficult intubation in our study. Further studies are warranted to evaluate its utility in predicting difficult intubation so that it can be modified to increase its predictive ability, if required.

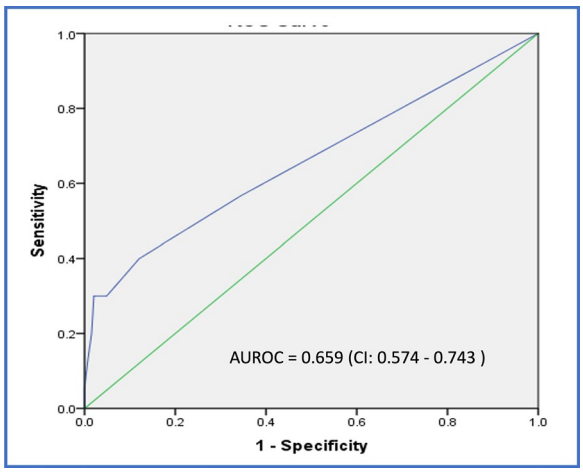


**Fig. 1 (abstract 001264)** Receiver operating characteristics curve for MACOCHA score

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001267

### Effectiveness of CRRT in a Greek ICU

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001267

**Introduction:** Continuous renal replacement therapy (CRRT) is considered to be the main treatment modality of acute kidney injury (AKI) in the Intensive Care Unit (ICU). Various dosages and modes of therapy have been used and lead to unpredicted and frequently suboptimal outcomes.

**Objectives:** The purpose of the present study was to evaluate the effectiveness of CRRT in critically ill patients, in the way it is delivered in the actual conditions of an ICU.

**Methods:** Patients with AKI, who were hospitalized in A' ICU of "G. Papanikolaou" hospital in Thessaloniki between 1/2/2020 and 31/5/2020 and who underwent CRRT, were included in the study. We recorded the demographic data, the severity of illness scores (APACHE II and SOFA), the past medical history, the causes of AKI, as well as data of the session (mode and dose of therapy, blood flow rate, heparin dose, effluent volume, net fluid removal, treatment time, urea and creatinine before and after treatment, and urea reduction ratio—URR).

**Results:** Fifty-seven continuous veno-venous hemodiafiltration (CVVHDF) treatment sessions were performed in 17 critically ill patients. Patients' mean age was $67\pm11$ years and the mean APACHE II and SOFA scores were $24\pm9$ and $10\pm4$, respectively. The cause of AKI was septic shock in the majority of the patients (76.5%). The delivered/prescribed ratio of effluent volume was $0.77\pm0.25$, while the respective ratio of net fluid removal was lower, $0.68\pm0.34$. The mean prescribed therapy dose was $24.2\pm2.9$ ml/kg/h, while the mean delivered dose was $18.6\pm6.8$ ml/kg/h. Overall, the sessions were accomplished in 78%, with the reasons for premature discontinuation of CRRT being mainly the circuit clotting and rarely the hemodynamic instability of the patient. The biochemical markers of kidney function decreased after CRRT (mean difference of urea and creatinine $18.25\pm32.04$ mg/dl and $0.53\pm0.72$ mg/dl, respectively) and the mean value of URR was $13.9\pm22$.

Patients with a history of vascular disease had significantly lower ratios of actual/scheduled operation time, effluent rate and fluid removed per session ($0.67\pm0.23$ vs $0.88\pm0.22$, $p=0.001$, $0.64\pm0.22$ vs $0.88\pm0.23$, $p<0.001$ and $0.52\pm0.26$ vs $0.82\pm0.34$, $p=0.001$, respectively). They also differed significantly, compared to patients without history of vascular disease, in terms of heparin dosage per session ($4.25\pm2.46$ vs $1.61\pm2.28$ IU/kg/h, $p<0.001$) and blood flow per session ($210.74\pm16.39$ vs $225.33\pm23.15$ ml/min, $p=0.008$).

**Conclusions:** Although the application of CRRT in our ICU leads to some degree to the achievement of the therapeutic targets, it should be improved in order to lead to better therapy and patient outcomes. Some issues that deserve special attention are patients with vascular disease, the prescribed therapy dose that could be increased so that the goal be reached in everyday clinical practice and the optimal anticoagulation strategy so that the scheduled treatment time be achieved.

**Topic:** Acute Kidney Injury and haemofiltration

**001268**

## Use of vasopressin in septic shock after two years of implementation of a management protocol

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001268

**Introduction:** Septic shock is associated with endothelial dysfunction leading to arterial and venous dilation, alterations in regional blood flow distribution, and microcirculatory disturbances. Fluids and vasopressors are the key elements of the hemodynamic support. Vasopressin is recommended by 2021 Surviving Septic Shock guidelines1 as second line vasopressor for patients presenting hypotension refractory to norepinephrine. The proposed cutoff defining refractory hypotension ranges from 0.25 to 0.5 mcg/kg/min but there is no clear indication on the timing of introduction.
**Objectives:** To describe the characteristics of patients admitted to a Critical Care Unit of a tertiary hospital from January 2022 to December 2023 in whom the vasopressin protocol was used in septic shock.
**Methods:** This is a observational, retrospective study in septic patients in the ICU of H.G.U Gregorio Marañón between January 2022 and December 2023. Epidemiological data, comorbidities, clinical characteristics, organ supports used, complications, severity scales, and outcomes were collected.
For descriptive analysis, quantitative variables were expressed as mean with standard deviation if normally distributed, or as median with interquartile range otherwise. Qualitative variables were expressed as percentages.
**Results:** Out of 140 patients, 57% were male. Age: 61 ± 15 years. Medical pathology: 95%, respiratory infection focus 54%, abdominal 22%, urinary 9%, soft tissues 7%, endovascular 6%, and others 2%. Comorbidities: Charlson 2 (1–4). Severity scales: APACHE II at admission 23 ± 7. SOFA at admission 9 ± 3, SOFA at 48 h 9 ± 4. The sepsis bundle was completed within the first hour in 64% of patients. Antibiotic accuracy was achieved in 65%.
Vasopressor use: time to NAD start from sepsis diagnosis 3 h (2–6), NAD dose before starting vasopressin 0.5 ± 0.3, time to Vasopressin start from sepsis diagnosis 8 h (6–11), positive response to vasopressin 73%, total vasopressin use time 28 h (24–48), time to NAD withdrawal after stopping vasopressin 12 h (9–24).
Vital signs: SBP on arrival at the emergency department 92 (81–110), SBP in ICU 110 (90–120). Hemodynamic monitoring: 75% transthoracic echocardiogram, 18% thermodilution, 7% pulse wave. Cardiac dysfunction: normal 70%, mild 10%, moderate 6%, severe 14%.
Volume resuscitation: volume in the initial 24 h 4500 (3500–6000).
Diuresis and balances: first 24 h diuresis 1040 ml (530–1482), positive balance in the first 24 h 94%, negative balance at 48 h only in 41%.
Preload optimization: preload was established to be optimized in 76% of patients before starting VAP. 100% of the series used corticosteroids before starting vasopressin.
Analytical data: pH in ICU 7.31 (7.26–7.41), lactate in ICU 5 ± 4.
Perfusion: lactate clearance in the first 24 h 60%, normalization of capillary refill 61% of the series.
Invasive mechanical ventilation 75%, days of IMV 5 (1–11), only 14% did not have renal failure during their ICU stay. Need for renal replacement therapy 47%.
Complications: 86% had no complications, only 8% had atrial fibrillation, 1.5% had distal ischemia, and 1.5% had mesenteric ischemia.
28-day mortality: 39% of the series. ICU days 9 (5–14), hospitalization days 14 (8–22).
**Conclusions:** Our series presents high severity at admission leading to high mortality, although we observed a favorable response to vasopressin in a large percentage of cases.

**Topic:** Cardiovascular issues in ICU

**001269**

## Sympathetic and microcirculatory response within a 30-min spontaneous breathing trial in the process of weaning from mechanical ventilation

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001269

**Introduction:** The spontaneous breathing trial (SBT) is a cardiovascular (CV) stress test, and failure to wean from mechanical ventilation (MV) often reflects CV insufficiency to cope with the increased oxygen cost of breathing (2). It has recently been shown that non-invasive tissue oxygenation (StO2) parameters were predictive of extubation outcome (1). It has been hypothesized that StO2 changes might reflect the degree of sympathetic response.
**Objectives:** To assess microcirculatory changes and plasma catecholamine levels within a 30-min SBT.
**Methods:** This is a prospective observational single-center study in a 30-bed general ICU. We included patients after at least 48 h of MV, and considered ready to wean by their medical team. Hemodynamic, respiratory, microcirculatory, and plasma catecholamine measurements were taken just before the start of the SBT (pressure support of 8 cmH2O, PEEP 0), and within 30 min of SBT. Microcirculatory evaluation of the brachioradial muscle using the VASCOVID system provided StO2 and microvascular flow (BFi). A vascular occlusion test (VOT) was performed at each time point to obtain StO2 deoxygenation (DeO2), local oxygen consumption (MRO2), StO2 reoxygenation (ReO2) and the StO2 and BFi hyperemic responses. Paired data analysis was performed to evaluate evolutionary changes. Weaning success (successful SBT and extubation) and weaning failure patients (either failed SBT or requiring reintubation within 24 h) were compared.
**Results:** Ten patients were included, 60 ± 17 years, with 6 ± 4 days of MV. Respiratory and hemodynamic stability, FiO2 30 ± 4%, PaO2 77 ± 15 mmHg, HR 92 ± 12 bpm, and MAP 87 ± 18 mmHg, without vasopressor support. Baseline catecholamine levels: NAD 404 ± 310 pg/mL, AD 27 ± 35 pg/mL, and DOP 25 ± 21 pg/mL. Baseline microcirculatory levels: StO2 66 ± 9%, DeO2 -5.6 ± 2.7%/min, ReO2 1.7 ± 1.5%/min, and BFi 8.1 ± 8.4 cm2/sec·10–9.
After the 30-min SBT, no significant changes were detected in catecholamine levels (Figure 1), but microcirculatory changes in local consumption (MRO2) and oxygen extraction (DeO2) were observed (Figure 2). No correlations between changes in plasma catecholamines and microcirculatory changes during the SBT were found.
Two patients failed the SBT, and 8 patients were extubated, one of them requiring reintubation within 12 h. Patients who failed the weaning process had lower baseline levels of NAD and DOP, as well as lower basal StO2 values, with higher oxygen extraction (DeO2). A previously described microcirculatory score (2), combining baseline StO2 and relative changes in DeO2 within the trial, showed significantly different values between patients who succeed and those who failed the weaning process (61 ± 9 vs 43 ± 12%, $p = 0.02$) (Figure 3).
**Conclusions:** Microcirculatory changes occur during the spontaneous breathing trial despite no detectable changes in the plasma catecholamine response. These microcirculatory alterations are non-invasively quantifiable and may have relevant significance in determining the success of the mechanical ventilation withdrawal process.

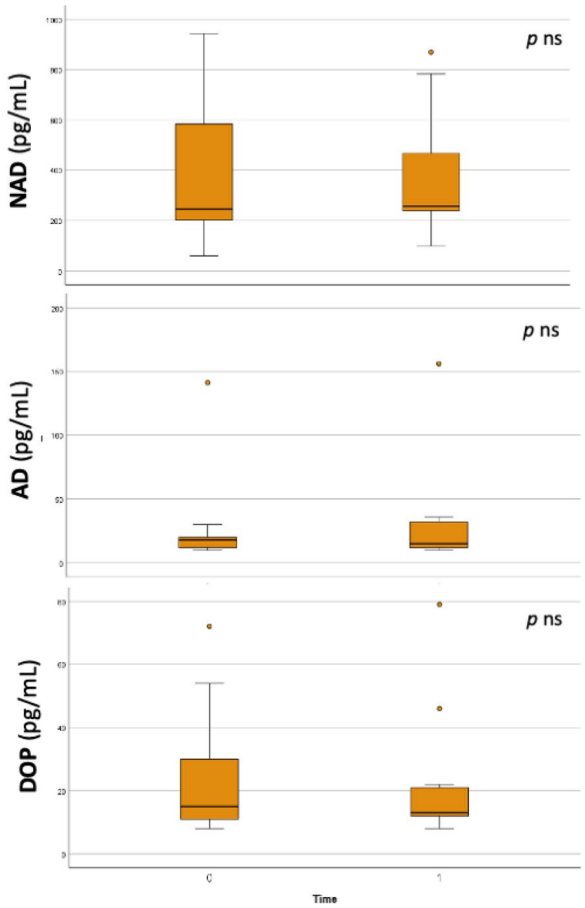


**Fig. 1 (abstract 001268)** Changes in catecholamine levels after the 30-min SBT. NAD: norepinephrine. AD: adrenalin. DOP: dopamine

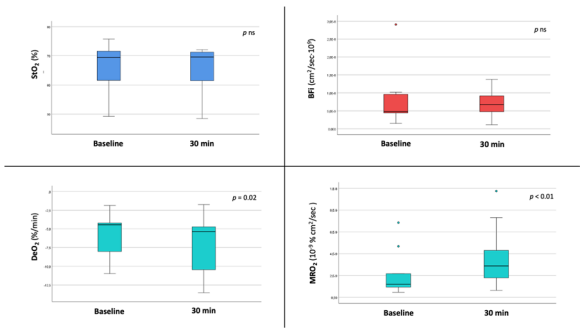


**Fig. 2 (abstract 001268)** Microcirculatory changes after 30-min SBT. BFi: microvascular flow. DeO2: StO2 deoxygenation. MRO2: local oxygen consumption

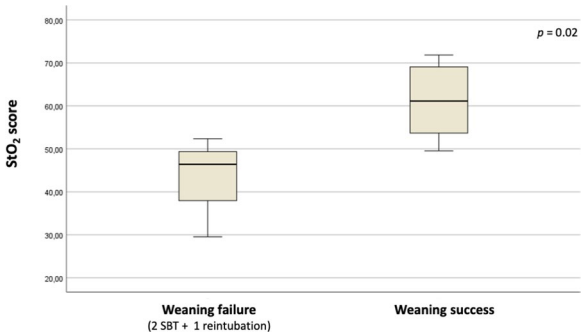


**Fig. 3 (abstract 001268)** Changes in StO2 score between weaning failure or success. SBT: Spontaneous breathing trial

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3. European Commission H2020: Project ID 101016087/VASCOVID
4. Research grant from the Catalan Society of Intensive and Critical Medicine (SOCMIC). 2020.

**Topic:** Cardiovascular issues in ICU

## 001270

### Concentrations of colistin in ICU patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001270

**Introduction:** Although colistin is a widely used antibiotic in the Intensive Care Unit (ICU) for the treatment of multidrug-resistant (MDR) microorganisms, its optimal dosing regimen remains a challenge. This is mainly due to the difficult methodology of its measurement and to its altered pharmacokinetics because of the various pathophysiological changes that seriously ill patients present.
**Objectives:** The purpose of the study was to determine the concentrations of colistin in plasma of ICU patients and to correlate them with the MICs of the bacteria that are most frequently encountered in these patients.
**Methods:** A loading dose of 9 MU of the antibiotic was administered in the first day, followed by 4.5 MU every 12 h, infused in 30 min. Blood samples were drawn just before the start of the infusion, at doses 2 to 6. The method of high-performance liquid chromatography (HPLC) was used to measure colistin concentrations (trough).
**Results:** Six patients were included in this preliminary study with a mean age of 60 ± 14 years. They presented with lower respiratory tract infections and they were treated with colistin either empirically or based on microbiological data. They were all severely ill, with high mean APACHE II (18 ± 7) and SOFA scores (7 ± 1.5) at admission and with no acute kidney injury. Colistin trough concentrations varied widely between patients, with mean values of 0.83 ± 0.45, 0.76 ± 0.44, 0.57 ± 0.35, 0.76 ± 0.41, 0.81 ± 0.54 mg/L, before the administration of the 2nd, 3rd, 4th, 5th and 6th dose, respectively. By administering the loading dose, the steady state of the antibiotic was achieved quickly. In half of the patients, colistin levels were maintained > 0.5 mg/L at all timepoints, which is the usual MIC of the MDR bacteria in our ICU.

**Conclusions:** Colistin, administered at the recommended dose, presents broad and frequently inadequate variations of its levels in ICU patients. Notably, it reaches quickly the steady state.

**Topic:** Infections and prevention

## 001271

### Rapid AST results for Gram-negative bacteremias and the time to effective and optimal antimicrobial therapy

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**Introduction:** Early reporting of antimicrobial susceptibility testing (AST) results for patients with bacteremia remains an important challenge for microbiology labs. Available solutions are incomplete, not always adapted to local antimicrobial resistance epidemiology, labor-intensive or expensive.
Recently, growth-based AST systems for Gram-negatives from positive blood cultures have become commercially available. We studied the clinical impact in antimicrobial decisions following acquisition of rapid AST results obtained with the ASTar-system (Q-Linea, Uppsala, Sweden).
**Methods:** We performed a prospective real-life clinical study in a + 800 beds tertiary care teaching hospital; we studied consecutive patients with Gram-negative bacteremia. AST was performed using the ASTAR system which provides MIC-values and EUCAST categorical interpretation for monomicrobial Gram negative blood cultures after 6 h (versus at least 24 h for regular AST). Results were reported in real time in the electronic medical record of the patient in combination with active antimicrobial stewardship interventions (including a telephone call and discussion at the daily multidisciplinary infection meeting). We studied the interval to effective and optimal antimicrobial therapy. Effective therapy was defined as an antimicrobial with confirmed susceptibility against the isolated Gram-negative rod. The antimicrobial therapy was considered optimal when it was the least broad antimicrobial, without unnecessary anaerobic or Pseudomonas coverage, or when a suitable oral option was administered. The study was approved by the ethics committee and informed consent was obtained.
**Results:** Over an 8-week period, we included 40 patients (22 males) with 1 or 2 episodes of Gram-negative bacteremia. Age of the patients varied between 0 and 91 years. Out of these 43 episodes of bacteremia, ASTar could determine susceptibility in 40 episodes; no MIC interpretation was available in 2 episodes because of insufficient growth, and in 1 episode (*Acinetobacter junii)* interpretation of the MIC-results was not possible.
In the 40 episodes in which AST was reported, antimicrobial resistance for the empirical antimicrobial therapy was detected in 6 patients (15%). In these patients, effective antimicrobial therapy was started within a median time of one hour and 13 min after releasing the result (12 min–6 h 22 min). In 31 episodes, the ASTar susceptibility results allowed for downgrading the empirical antimicrobial therapy. The advice for downgrading was followed in 16 cases (40%) after a median time of 3 h and 40 min. Reasons for not downgrading therapy included the lack of source control, unknown focus of infection or neutropenia. In 3 episodes, no adaptations were made as the empirical therapy was considered optimal, following the definition in the methods section (8%).
**Conclusions:** The implementation of more fast AST reporting for Gram-negative bacteremias in combination with the multidisciplinary approach and multi-modal communication resulted in the initiation of effective antimicrobial therapy within a median time of one hour and 13 min after communication of the ASTar-results and the adaptation to optimal therapy after a median time of 3 h and 40 min.

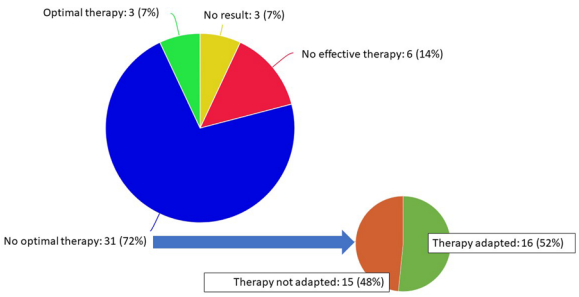


**Fig. 1 (abstract 001271)** Overview of ranges of optimal and effective therapies and the rapid adaptation of therapy

**References**
1. We thank Q-Linea for providing the ASTar and the reagents needed for this study.

**Topic:** Infections and prevention

## 001272

### Sarcopenia index to evaluate muscle mass and function in critically ill older adult trauma patients

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**Introduction:** Sarcopenia, characterized by the loss of skeletal muscle mass and strength, is prevalent among aging individuals, defined here as adults ages 60 and older. While traditional assessments for sarcopenia rely on various measurements such as muscle mass, strength, and physical performance, the Sarcopenia Index (SI) offers an alternative yet underutilized approach. The SI, which compares serum creatinine to cystatin C levels, provides an indirect assessment of muscle mass, particularly valuable in situations where direct measurement is challenging.
**Objectives:** This study aimed to explore the potential of the SI as a surrogate marker for traditional measures of malnutrition, sarcopenia, and functional status in older adult trauma patients.
**Methods:** A prospective observational study enrolled 40 older adult trauma patients upon admission. Functional measures, self-reported health, creatinine, cystatin C for SI, and MuscleSound data were collected. A multivariable regression model assessed the relationship between the SI and functional measures, including the 6-min walk distance (6MWD), 4-m walk (4 MW), 30-s sit-to-stand test, and grip strength, controlling for age and BMI.
**Results:** Of the 40 enrolled patients, 38 had baseline SI and functional measures. The mean age was 73 (SD 9.1) yr, with 62.5% females and 37.5% males. The majority had a BMI of 29 (SD 6.7) kg/m2, and the mean SI was 88 (SD 19). MNBA classified 20 participants as nourished and 16 as at risk of malnutrition or malnourished. Self-reported health was reported as good (28%), fair (61%), and poor (4%) on admission. In a multivariate regression analysis controlling for age and BMI, the SI was predictive of the MNA, SARC-F, 30-s sit-to-stand, 4-m walk, 6-min walk distance, and grip strength outcomes.

**Conclusions:** The study underscores the potential of the serum SI as a surrogate marker for malnutrition, sarcopenia, and functional status in older adult trauma patients. By providing an indirect assessment of muscle mass, the SI offers valuable insights into patient outcomes and may enhance clinical management strategies for this population. Further research is warranted to validate these findings and explore the utility of SI in clinical practice.

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2. Duke Claude D. Pepper Older Americans Independence Centers (OAICs) Pilot Award

**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001273

### Impaired muscle function years after critical illness: a transcriptomics quest for underlying mechanisms

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**Introduction:** Critically ill patients are at high risk of developing muscle weakness during their stay in the intensive care unit (ICU), which is associated with adverse short-term outcomes. Improved survival of critical illness with advances in intensive care revealed that a substantial proportion of the patients show persistent physical impairments up to years after hospital discharge, compromising quality of life [1–3]. Whereas major insight has been gained in the pathophysiology of ICU-acquired weakness, the pathophysiology of long-term weakness years after critical illness remains unclear. We previously performed a long-term follow-up of former critically ill patients in the context of the EPaNIC study, showing lower strength, worse functional capacity and worse self-reported physical function in former patients 5 years after ICU admission as compared with matched control subjects [4,5]. Availability of muscle biopsies of a subgroup of these participants provides a unique opportunity to study potential underlying mechanisms of the long-term physical impairments.
**Methods:** We analyzed the muscle transcriptome of 120 former ICU patients 5 years after critical illness and 30 matched controls via RNA sequencing. We identified differentially expressed RNAs with the R package DESeq2 [6], adjusting for age, sex and BMI and applying a false discovery rate (FDR) < 0.05. We further conducted pathway and gene set enrichment analyses to study the functions of the identified differentially expressed genes (DEGs) applying an FDR < 0.05 and performed a differential co-expression analysis of the DEGs.
**Results:** Good quality data were obtained for 115 former ICU patients and 30 matched controls. After excluding transcripts with too low read count, 16,685 transcripts remained for analysis. We identified 109 upregulated and 233 downregulated RNAs (-4.5 to 2.6 log2-fold changes) in former ICU patients, including 33 non-coding RNAs. Pathway analysis revealed that the upregulated DEGs were enriched in AMPK and PPAR signaling as well as collagen formation pathways, while downregulated DEGs showed enrichment in mitochondrial ATP synthesis/cellular respiration pathways. Gene set enrichment analysis indicated a downregulation of oxidative phosphorylation.
**Conclusions:** The observed distinct gene expression profile 5 years after critical illness as compared with controls may suggest effects on adiposity and fibrosis within muscle as well as impaired muscle metabolism due to disrupted mitochondrial function, to be investigated in further histological and molecular studies. Whether the abnormal transcriptomic profile correlates with adverse physical outcomes of the former ICU patients also remains to be investigated.

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**Topic:** Translational biology

## 001275

### Does referral during V-V ECMO in severe ARDS patients play a role on MDR infection and outcome? A retrospective observational study

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**Introduction:** Patients with severe ARDS need to be transferred in a center with an ECMO-based management protocol to significantly improve survival. Moreover, ECMO patients, are at high risk of hospital-acquired infections (HAIs) caused by multi-drug resistant bacteria (MDRb) (32–50%). No data are available on MDRb incidence and outcomes in patients supported with ECMO started on-site and then referred to regional center.
**Objectives:** Primary endpoint: incidence of MDRb in ECMO referral group. Secondary endpoints: role of MDR infections on multiorgan failure (MOF) and mortality in overall ECMO population.
**Methods:** This is a retrospective observational monocentric study conducted in the ICU of the University Hospital of Sassari. Inclusion criteria: patients with severe ARDS and refractory hypoxemia treated with V-V ECMO.
**Results:** From January 2017 to March 2024, 24 consecutive patients were recruited. 83.3% were male with mean age $51 \pm 10.7$ and BMI

31.9 ± 8.6. 50% of patients underwent to 3.4 ± 4 days of NIV Pre-MV and the mean VM was 42.7 ± 23.9 days. 25% of patients presented severe ARDS COVID-19 related and 37.5% received ECMO onsite by our team and then referred to our Regional Center. MDRb were isolated in 75% of ARDS patients enrolled (86% in COVID -19 population); in the referred group, incidence was 66.6%. Klebsiella pneumoniae was the most representative MDRb. Respiratory parameters, isolation sites and organ support therapies are summarized in Table 1. Overall, ICU mortality at 60 days was 45.8% with MDRb incidence of 63.6%, while in the referral group, 33.3% died all presenting MDRb infection.

| **ECMO V-V** | ***(n = 24)*** | | |
|---|---|---|---|
| Respiratory monitoring | *Mean (SD)* | | |
| | P/F | Pplat | CStat |
| Before-ECMO | 69,8 (12.3) | 28 (3.3) | 34 (14.1) |
| During ECMO | 193 (84) | 26 (2.5) | – |
| Infections | Overall n. 24 | | Referral during ECMO n. 9 |
| SOFA score at ICU Admission | 9.5 (4) | | 9 (3) |
| ECMO days | 19.4 (15.2) | | 14.8 (8.3) |
| PCT | 8 (10.4) | | 8 (12) |
| SOFA score | 10 (3.1) | | 10 (3) |
| mdr *n (%)* | 18 (75) | | 6 (66.6) |
| Klebsiella pneumoniae | 11 (45.8) | | 3 (33.3) |
| Pseudomonas aeruginosa | 3 (12.5) | | 0 |
| Acinetobacter | 4 (16.7) | | 2 (22.2) |
| E. coli | 1 (4.2) | | 1 (11.1) |
| MRSE | 5 (20.8) | | 0 |
| Candida species | 5 (71) | | 2 (22.2) |
| Microbial Cultures | | | |
| BAL | 17 (70.8) | | 6 (66.7) |
| Bloodstream | 10 (41.7) | | 1 (4.2) |
| Screening SCPE | 9 (37.5) | | 4 (44.4) |
| CVC | 6 (25) | | 1 (11.1) |
| Urine | 7 (29.2) | | 4 (44.4) |
| Organ support therapy | | | |
| Norepinephrine | 22 (91.7) | | 7 (77.8) |
| RRT | 14 (58.3) | | 5 (55.6) |

**Conclusions:** Our study confirms that V-V ECMO ARDS patients are at increased risk of MDRb infection with potential correlation to worst outcomes. However, starting ECMO support on site and then transferring to a referral center does not seem to affect outcome, although the sample size was small. Further evidence from high-quality prospective studies are warranted to better guide clinicians during the decision-making process.

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**Topic:** Infections and prevention

## 001276

### Vasopressor dependency as a predictor of mortality in septic shock patients in intensive care unit: a prospective observational study in a tertiary care hospital


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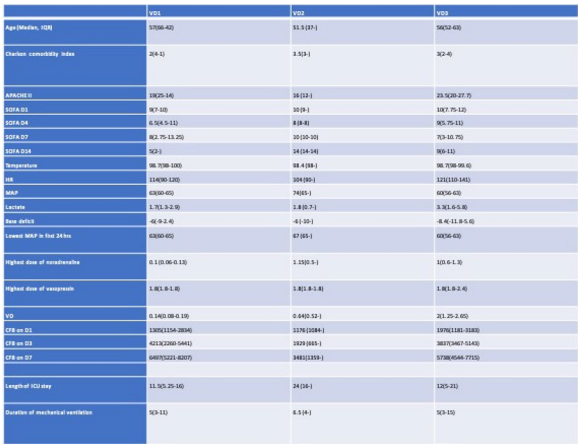
**Introduction:** Septic shock ensues when sepsis-induced hypotension remains refractory to fluid resuscitation. Mean arterial pressure is the key determinant of increased tissue blood flow and perfusion. The guideline recommends an initial target mean arterial pressure (MAP) of 65 mm Hg over higher MAP targets. (3) Effective fluid resuscitation and vasopressor are mainstay for maintaining the target MAP. The hemodynamic response of vasopressors to achieve a target MAP can be measured by vasopressor dependency (VD).
**Objectives:** To estimate the correlation between:
1. Vasopressor dependency with 28-day mortality.
2. Vasopressor dependency with organ failure (delta SOFA score).

**Methods:** This is a prospective observational study conducted over a period of 6 months, i.e. September 2023 to February 2024. All consecutive adult patients (> 18 years) with a diagnosis of septic shock were included in the study. Septic shock was diagnosed as per the sepsis-3 criteria by the treating physician. Lowest MAP during the first 24 h after inclusion to the study was recorded.
Vasopressor inotrope score (VI) was calculated using the following formula:
(Dose of dopamine1) + (Dose of dobutamine1) + (Dose of epinephrine100) + (Dose of norepinephrine100) + (Dose of phenylephrine100) + (Dose of vasopressin10).
All doses are in mcg/Kg/min except vasopressin, which is unit/hour.
Maximum value of vasopressor in the first 24 h was taken for calculation of VI.
Vasopressor dependency (VD) was calculated as VD = (VI/MAP) 100.
Patients were categorized into three groups according to the VD score, such as VD of < 0.5/mmHg as mild (VD1), 0.5 to 1/mmHg as moderate (VD2) and > 1/mm Hg as severe (VD3).
**Results:** Thirty-four patients (34) of median age (55 with IQR 33–66) were included in this study during this period. Demographic parameters and length of ICU stay are summarised in Table 1. 28-day mortality rate in VD1, VD2 and VD3 was 50%, 50% and 72%, respectively.
**Conclusions:** In this prospective observational study, we found that in adult septic shock patients, the 28-day mortality is higher in severe vasopressor-dependent group.

**Table 1 (abstract 001267)** .



| | VD1 | VD2 | VD3 |
|---|---|---|---|
| Age (Median, IQR) | 57(56-62) | 51.5 (37-) | 56(52-63) |
| Charlson comorbidity index | 2(4-1) | 3.5(3-) | 3(2-4) |
| APACHE II | 19(25-14) | 16 (12-) | 23.5(20-27.7) |
| SOFA D1 | 9(7-10) | 10 (9-) | 10(7.75-12) |
| SOFA D4 | 6.5(4.5-11) | 8 (8-8) | 9(5.75-11) |
| SOFA D7 | 8(2.75-13.25) | 10 (10-10) | 7(3-10.75) |
| SOFA D14 | 5(2-) | 14 (14-14) | 9(6-11) |
| Temperature | 98.7(98-100) | 98.4 (98-) | 98.7(98-99.6) |
| HR | 114(90-120) | 104 (90-) | 121(110-141) |
| MAP | 63(60-65) | 74(65-) | 60(56-63) |
| Lactate | 1.7(1.3-2.9) | 1.8 (0.7-) | 3.3(1.6-5.8) |
| Base deficit | -6(-9-2.4) | -6 (-10-) | -8.4(-11.8-5.6) |
| Lowest MAP in first 24 hrs | 63(60-65) | 67 (65-) | 60(56-63) |
| Highest dose of noradrenaline | 0.1 (0.06-0.13) | 1.15(0.5-) | 1(0.6-1.3) |
| Highest dose of vasopresin | 1.8(1.8-1.8) | 1.8(1.8-1.8) | 1.8(1.8-2.4) |
| VD | 0.14(0.08-0.19) | 0.64(0.52-) | 2(1.25-2.65) |
| CFB en D1 | 1305(1154-2834) | 1176 (1084-) | 1976(1181-3183) |
| CFB en D3 | 4213(2260-5441) | 1929 (665-) | 3837(3467-5143) |
| CFB en D7 | 6497(5221-8207) | 3481(1359-) | 5738(4544-7715) |
| | | | |
| Length of ICU stay | 11.5(5.25-16) | 24 (16-) | 12(5-21) |
| Duration of mechanical ventilation | 5(3-11) | 8.5 (4-) | 5(3-15) |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**Topic:** Sepsis

## 001277

## Understanding *Streptococcus pyogenes* infections in Guadalajara Province, Spain


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**Introduction:** Invasive infections by *Streptococcus pyogenes* have become increasingly common in recent years. These infections can range in severity and are more resistant to macrolides and quinolones due to their overuse. As a result, there are fewer treatment options available, which can lead to a poor prognosis.

**Objectives:** Evaluate the demographic, clinical, and microbiological characteristics of *Streptococcus pyogenes* infections in the province of Guadalajara, Spain.

**Methods:** The study was conducted as a retrospective descriptive study of individuals over 16 years old with documented *Streptococcus pyogenes* infection by cultures from January to December 2023.

**Results:** We included 95 patients with a microbiological diagnosis of *Streptococcus pyogenes* cultures. 57.89% of those were women, with a median age of 49.91 years (±18.51). The most frequent clinical syndromes were otorhinolaryngological infections (38.95%), skin and soft tissue infections (32.63%), necrotizing fasciitis (8.42%), pneumonia (8.42%), and gynecological infections (7.37%). Of all infections, 35.79% required hospitalization, with an average length of stay of 17 days (±22.9) and an APACHE II score of 8.6. 12.63% of the patients were admitted to the ICU, with an average length of stay of 17.6 days (±32.03) and an APACHE II score of 15.83. The overall mortality rate was 6.31%. The most commonly altered analytical parameters were leukocytes 13,777/uL (±7,784), C-reactive protein 218.36 mg/L (±156.43), and procalcitonin 34.98 ng/mL (±12.5). The time of administration of antibiotics was 12.31 days (±8.66), intravenously 11.57 days (±12.11), and orally for 9.22 days (±4.49). Focus control was performed in 38.95% of patients, of which 37.84% required surgical intervention. Organic failure occurred in 18.94% patients and immunoglobulins were administered in 4.21% patients (meeting criteria for toxic shock syndrome).The antibiotic susceptibility profile of the isolates was: universally sensitive to penicillins and aminopenicillins with or without beta-lactamase inhibitors. The bacteria was 89.41% sensitive to clindamycin, 91.8% sensitive to quinolones, 65.52% sensitive to macrolides, and 97.22% sensitive to trimethoprim/sulfamethoxazole.

**Conclusions:** Infections caused by *Streptococcus pyogenes* in the province of Guadalajara present a variety of clinical manifestations, with otorhinolaryngological and soft tissue infections being the most common. Despite high susceptibility to certain antibiotics such as penicillins and cephalosporins, increasing resistance to macrolides and quinolones underscores the need for judicious use of antibiotics to preserve treatment efficacy. Mortality rates associated with *Streptococcuspyogenes* infections remain significant, especially among patients admitted to the intensive care unit. Therefore, it is essential to provide appropriate clinical and therapeutic management to improve patient outcomes.



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**Topic:** Infections and prevention

## 001278

### Influence of fluid balance on the success of support pressure ventilation in mechanically ventilated critical patients without ARDS

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**Introduction:** Early transition from controlled to pressure support ventilation (PSV) may decrease the duration of mechanical ventilation (MV) and the risk of associated complications, potentially improving clinical outcomes in critically ill patients. Conversely, initiating spontaneous breathing prematurely may have adverse consequences. Several risk factors have been shown to predict PSV failure. However, the impact of fluid balance (FB) on PSV outcomes in non-ARDS patients remains unclear.
**Objectives:** To evaluate the influence of fluid balance (FB) on the failure of PSV in critically ill intubated non-ARDS patients.
**Methods:** This is a secondary analysis of a multicentric prospective observational study that included adult patients admitted to 534 ICUs across 32 countries requiring invasive mechanical ventilation (MV). We included patients who did not meet ARDS criteria at the time of intubation and in whom PSV was initiated between the 3rd and 7th day of ICU admission. Patients were excluded if fluid balance 48 h prior to the transition to PSV was unknown. PSV failure was defined as the need to relapse to a controlled mode of MV within 48 h after PSV onset. A multivariate analysis with binary logistic regression was performed to analyze the influence of FB on PSV failure, including as covariates all those variables that had a $p$-value < 0.1 in the univariate analysis. FB was categorized into tertiles.
**Results:** A total of 1020 patients were included. PSV failed in 435 (42.6%) patients. The median duration of MV prior to the transition to PSV was 4 (IQR 3–5) days. PSV failure was associated with higher 28-day mortality, longer duration of MV, and ICU stay (Table 1). After adjusting for possible covariables (age, SAPS II, reason for MV, leukocyte count, level of PEEP, and respiratory rate at PSV onset), a FB > 2112 ml in the 48 h prior to PSV onset was associated with a higher risk of PSV failure (OR 1.44 [95%CI 1.04–2.00]).
**Conclusions:** PSV failure was frequent among non-ARDS patients, and it was associated with positive fluid balance in the 48 h prior to PSV initiation. These findings highlight the importance of fluid management in critically ill patients, suggesting that limiting positive fluid balance could potentially improve PSV success rates and patient outcomes.

**Table 1 (abstract 001278)** Outcomes. LOS: length of stay; PS: pressure support; MV: mechanical ventilation. Data are expressed as median (IQR) or frequency (percentage)

| Variable | All | PS success | PS failure | p-value |
|---|---|---|---|---|
| | = 1020 | n = 585 | n = 435 | |
| ICU LOS | 11 (8-19) | 9 (7-14) | 16 (10-25) | <0.001 |
| Hospital LOS | 23 (14-39) | 23 (14-38) | 25 (14-40) | 0.8 |
| Days of MV | 7 (5-11) | 6 (4-8) | 9 (6-15) | <0.001 |
| Mortality at day 28 | 235 (23%) | 27 (5%) | 208 (48%) | <0.001 |

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001280

### Image recognition during bronchoscopy: development of a neural network-based software and its application for training purposes

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001280

**Introduction:** Bronchoscopy is a medical procedure frequently performed in intubated, critically ill patients. It carries inherent risks, such as worsening hypoxemia and CO2 accumulation, which depend upon the operator's expertise. Prioritizing patient safety necessitates comprehensive training of clinical staff in this area. Simulation-based training emerges as an effective, risk-free modality for procedural education.
**Objectives:** This study aims to develop a real-time image recognition software tailored to identify the major tracheobronchial structures and to demonstrate the non-inferiority of this artificial intelligence-based (AI) compared to traditional training.
**Methods:** Bronchoscopy procedures were performed using a video flexible bronchoscope "Insighters iS3-C5" (SEDA S.p.A., Italy), on TruCorp AirSim Advance X model (Lurgan, Co., North Ireland), an orally intubated manikin with high fidelity bronchial branches. An image recognition software was developed, using YOLOv8 neuronal network, for the recognition of the tracheobronchial structures. Model performance was evaluated using a Confusion Matrix.
A cohort of 22 second-year residents naïve in bronchoscopy procedures underwent theoretical training. Residents were divided into two groups to participate in 20 min of individual practical training. The first group was supervised by an expert, while the other was guided by the AI-based software. Before and after the practical training, residents were evaluated using a modified-BSTAT test, a tool designed to assess their performance during bronchoscopy. Test results were analyzed via Student's t-test. Data are reported as mean ± standard deviation.
**Results:** The ability of the AI-based software to predict the correct tracheobronchial structures is described in Figure 1. Notably, the sensitivity was high, ranging between 0.89 and 1.0. Results of the Pre and Post-training modified-BSTAT are reported in Table 1. No differences between the two groups were observed in terms of pre- and post-training scores.
**Conclusions:** Our AI-based image-recognition software is able to correctly identify the tracheobronchial structures and could be a valuable educational tool for bronchoscopy training.

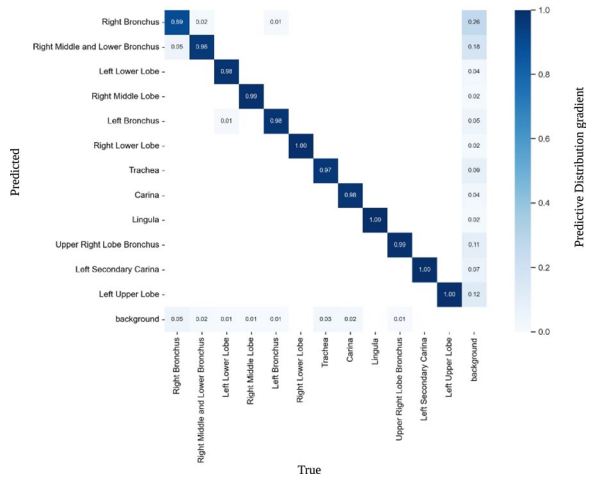


**Fig. 1 (abstract 001280)** Normalized confusion matrix for image recognition of main tracheobronchial structures

**Table 1 (abstract 001280)** Results of the modified-BSTAT examination, divided into pre (before the training) and post (after the training). Data are presented as mean ± standard deviation

| | | Traditional training | AI-based training | P-value |
|---|---|---|---|---|
| Pre-training | Score (points) | 29 ± 4 | 31 ± 5 | 0.49 |
| | Knowledge (points) | 18 ± 3 | 18 ± 2 | 0.87 |
| | Practical skills (points) | 13 ± 3 | 12 ± 2 | 0.44 |
| | Procedural time (minutes) | 3.46 ± 0.58 | 3.05 ± 0.83 | 0.22 |
| Post-training | Score (points) | 53 ± 2 | 53 ± 2 | 0.60 |
| | Knowledge (points) | 27 ± 1 | 27 ± 1 | 0.9 |
| | Practical skills (points) | 24 ± 2 | 25 ± 2 | 0.51 |
| | Procedural time (minutes) | 1.75 ± 0.44 | 1.40 ± 0.30 | 0.048 |

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**Topic:** Imaging in intensive care

## 001281

### Compartmental analysis estimates higher postabsorptive protein breakdown rates in critically ill patients, affecting its balance with dietary protein needs

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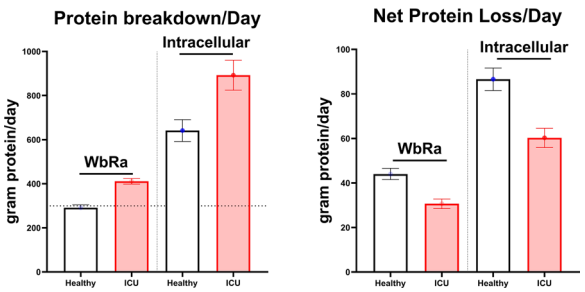
**Introduction:** Whole-body amino acid plasma rate of appearance (WbRa) in health and disease has predominantly been calculated using primed-constant and continuous stable isotope infusion of phenylalanine (PHE) and tyrosine (TYR). We used a new pulse tracer approach to compare the Ra and intracellular production of PHE and TYR to investigate the balance between protein breakdown rate and dietary protein intake in critically ill patients.
**Methods:** (Net) protein breakdown in the postabsorptive condition was measured in 51 ICU (~60 y, 15f, SOFA: 6.6) patients and 49 matched healthy individuals (~50 y, 22 f) using the pulse stable tracer approach with L-[ring-13C6]PHE and L-[ring-2H4]TYR stable isotopes (Posthoc Analysis ref1-3). We calculated both the intracellular production (compartmental analysis) of PHE and the WbRa. PHE to TYR conversion was used to calculate net protein loss. Data are mean [95% CI], stats: t-test (Prism).
**Results:** Daily protein breakdown, using WbRa data, was lower in the healthy than in the ICU group (292 [286, 305] vs ICU: 411 [398, 424] gram protein/individual ($P < 0.0001$), respectively). However, when calculating intracellular production, the absolute daily protein breakdown was much higher in both groups (healthy: 642 [592, 691] versus ICU: 892 [825, 960] gram protein/individual ($p < 0.0001$)). Consequently, lower values were found for net protein loss using both WbRa (Healthy: 44 [42, 47], ICU: 31 [29, 33], $p < 0.0001$) and intracellular production (Healthy: 87 [82, 92], ICU: 60 [56, 65] gram protein/day/individual, $p < 0.0001$). Using net intracellular protein loss when no food is provided, daily lean body mass loss was calculated to be in healthy versus critically ill (577 [544, 611] vs ICU: 402 [373, 431] gram/individual, respectively ($p < 0.0001$).
**Conclusions:** We conclude that using the estimation of daily human (net) protein breakdown from the plasma rate of appearance (WbRa) as was done in the past is too low both in healthy and ICU patients. We suggest using compartmental analysis after pulse tracer to better estimate protein breakdown rates.




**Graph (abstract 001281)** Graphic representation of the data (mean [95% CI])

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**Topic:** Sepsis

**001282**

## Empowering nurses for timely catheter removal: a study on CAUTI Prevention in kidney transplant patients

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**Introduction:** Catheter-associated urinary tract infection (CAUTI) remains a significant concern, particularly among kidney transplant patients (KT), as it contributes to prolonged hospital stays, increased costs, and elevated morbidity and mortality rates (1).CAUTIs represent approximately 9% of all hospital-acquired infections, with an estimated 65%–70% deemed preventable (2). However, consensus regarding the optimal timing for catheter removal in KT patients is lacking (3). Since 2021, our center implemented a CAUTI prevention bundle, followed by a nursing-led initiative in early 2024 to address rates and empower staff.
**Objectives:** The objective of this study is to assess the appropriateness of indwelling urinary catheter (IUC) use and to evaluate the timely removal of catheters in KT.
**Methods:** A group of nurses conducted a retrospective review of CAUTI cases from 2021 to 2023, focusing on KT patients. The review aimed to assess catheter promptness removal according to internal policies based on HICPAC 2009 guidelines. Infection rate was calculated per 1,000 catheter days. Adherence to early device removal within 5 days post-transplant was evaluated. Descriptive statistics and a quality improvement plan were provided.
**Results:** A total of 203 kidney transplant (KT) patients were evaluated, with 16 (7.8%) diagnosed with catheter-associated urinary tract infection (CAUTI): 5 cases in 2021 (1.8%), 4 in 2022 (1.86%), and 7 in 2023 (2.83%). The average timeframe between Foley catheter insertion and infection onset was 9.19 days (standard deviation ± 3.69; 95% CI 7.38–10.99). All identified pathogens were classified as Gram-negative (refer to Table 1–2), with 8 being multidrug-resistant organisms. Among the 16 CAUTI cases, 2 were in the ICU and 14 in a step-down unit. None of these patients had their indwelling urinary catheter (IUC) removed within 5 days post-transplant, and 7 subsequently developed sepsis. Of the 16 patients, 9 (56.2%) met the criteria for retaining their IUC: 4 met the 5th criterion, 3 the 7th, 1 the 1st, and 1 case did not have the IUC removed due to critical clinical condition. Conversely, 7 cases (43.7%) did not meet the criteria for retaining the IUC. Criteria for catheter removal (refer to Table 3) show 56.2% of patients meeting them, while 43.7% do not. Monthly educational sessions were organized to provide additional training for nurses on evidence-based practices (EBP) and to underscore the importance of adhering to bundles and nurse-driven protocols. In addition, posters outlining the bundles were created to promote adherence to CAUTI prevention among bedside staff.
**Conclusions:** Empowering nurses to make decisions on early catheter removal enhances patient care and nurse engagement in CAUTI prevention efforts (4,5). Implementing a nurse-driven protocol as part of a comprehensive intervention strategy fosters evidence-based decision-making, ensuring timely removal and empowering nursing staff.

**Table 1 (abstract 001282)** Pathogens

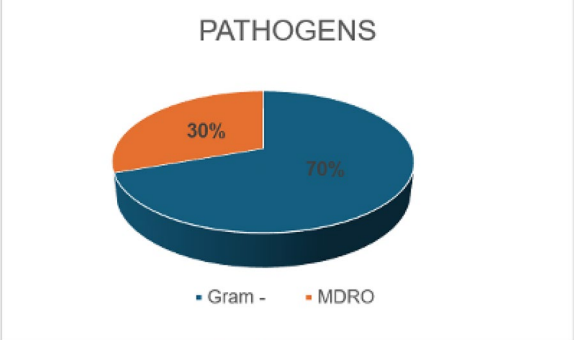


**Table 2 (abstract 001282)** Microorganisms associated with CAUTIs

| GRAM + | GRAM - | MDR | Fungus |
|---|---|---|---|
| *P. Mirabilis* | 1 | | |
| *Escherichia Coli ESBL* | 1 | 5 | |
| *Pseudomonas aeruginosa MDR* | | 2 | |
| *Pseudomonas aeruginosa* | 1 | | |
| *Klebsiella pneumoniae* | 4 | 1 | |
| *KPC* | | 1 | |
| | 7 | 9 | |

**Table 3 (abstract 001282)** Criterions for foley indication

| | Criterion | N patient |
|---|---|---|
| 1 | Required highly accurate output measurements in ICU | 1 |
| 2 | Required strict immobilization for trauma or surgery | 0 |
| 3 | Assist healing of severe perineal and sacral wounds | 0 |
| 4 | Placed by urology service | 0 |
| 5 | Urinary retention including obstruction and neurogenic bladder | 4 |
| 6 | Hospice/comfort care or palliative care | 0 |
| 7 | Short perioperative use in selected surgeries | 3 |
| 8 | other | 1 |

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**Topic:** Infections and prevention

## 001286

### The impact of Body Mass Index on mortality in critically ill patients: a single-center retrospective study

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001286

**Introduction:** Obesity is a chronic disease and a significant health problem that is associated with serious medical conditions, increased morbidity and mortality. The influence of obesity on outcomes in critically ill patients is being debated, as some studies have shown increased mortality and morbidity, while others have suggested a decrease in these rates or no association.
**Objectives:** This study aimed to evaluate the impact of Body Mass Index on the outcome of critically ill patients.
**Methods:** This retrospective single-center study included patients admitted to the Intensive Care Unit (ICU) between 2019 and 2023. The patients were categorized into four groups based on their Body Mass Index (BMI) (underweight: < 18.5; normal weight: 18.6–24.9; overweight: 25.0–29.9; obese: > 30 kg/m$^2$). Clinical and demographic data were collected, and the primary endpoint was to evaluate whether a higher BMI is associated with increased hospital mortality. The secondary endpoints were to assess whether a higher BMI is linked to increased ICU mortality, a longer duration of mechanical ventilation and an extended hospital stay in the ICU.
**Results:** A total of 3,042 patients were included in the study. The patients had a median age of 66.0 (55.0–75.0) years, with 62.0% being male and a mean BMI of 26.0 (23.0–31.0). The mean APACHE II score was 20.0 (15.0–26.0) and SAPS II was 49.0 (38.0–62.0). Of the admitted patients, 2.7% were underweight, 30.2% had a normal weight, 38.6% were overweight, and 28.4% were obese, with corresponding mortality rates of 42.8%, 40.0%, 41.6%, and 41.6%, resulting in an overall hospital mortality rate of 41.2%.
There was no significant difference in hospital mortality among the four BMI groups ($p = 0.606$) (Graph 1). BMI was also not associated with increased ICU mortality ($p = 0.091$), length of hospital stay ($p = 0.474$) or duration of mechanical ventilation ($p = 0.805$). However, we did find that higher BMI was associated with a longer duration of ICU stay ($p = 0.023$).
**Conclusions:** In this population, BMI did not influence hospital mortality. Although obesity has been considered a risk factor for mortality in critically ill patients, this increased risk was not evident in our study population. Nevertheless, higher BMI appears to be associated with an extended duration of ICU hospitalization.

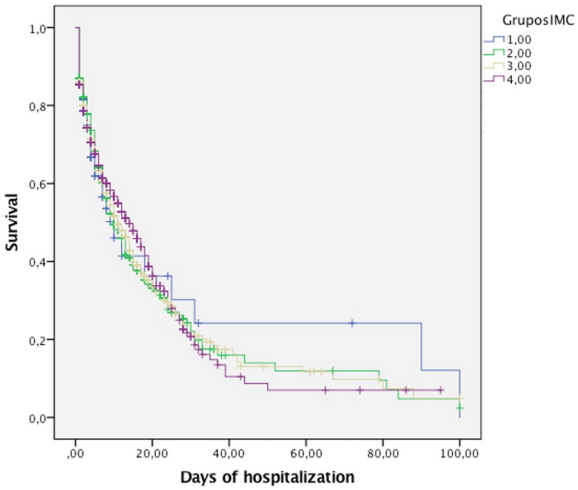


**Fig. (abstract 001286)** Hospital mortality according to BMI

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001288

### Efficacy of the use of vasopressin as a primary vasoconstrictor in critically ill patients

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001288

**Introduction:** Resuscitation protocols in critically ill patients are based on the administration of fluids and vasopressor drugs. According to the guidelines, the vasopressor drug that is primarily used in all patients with hemodynamic instability is noradrenaline. In recent years, a new vasopressor drug, vasopressin, has been recommended to be added to septic patients who need a small to moderate dose of noradrenaline to reduce the negative effects of circulating catecholamines at increased concentration.
**Objectives:** The purpose of the present study is to investigate the effect of early administration of vasopressin (as a first vasoconstrictor drug) over noradrenaline on the degree of multi-organ failure, in critically ill patients with a need for circulatory support with vasoactive drugs.

**Methods:** A randomized-controlled study was conducted. In group 1, vasopressin (VASg) was administered up 0.03 IU/min (2.3 ml/h), aiming a mean arterial pressure of 65 mmHg. If not reached, noradrenaline was started. In group 2, noradrenaline (NAg) was started first, up to 0.5 mcg/kg/min and if needed, vasopressin was initiated, up to 0.03 IU/min (2.3 ml/h). The primary endpoint of the study was the effect of the early administration of vasopressin, in multiorgan function assessed with SOFA score.
**Results:** Twenty-eight patients were included, of which 17 (60%) were allocated to the Vasopressin group and 12 (40%) to the Noradrenaline group. The median age was 60 (52.5, 67) vs 68.5 (53.25, 77.25, $p=0.303$, APACHE II 22.5 (15.75, 22.5) vs 29 (25, 33), $p=0.020$, SOFA 11 (9.5, 12.5) vs 11.5 (10.25, 13), $p=0.283$ in VASg and Nag, respectively. Septic, hemorrhagic and vasodilatory (apart from septic) types of shock were equally distributed in both groups (16.7% vs 12.5%, 8.3% vs 6.3%, $p=0.879$, 6.3% vs 33.3%, $p=0.133$, respectively). All patients in VASg received vasopressin at the highest dose vs 10 patients in the NAg, and the median noradrenaline dose (needed in 16/17 patients) was 1.79 (0.93, 4.2) vs 0.65 (0.37, 4.55), µg/kg/min, $p=0.294$. In VASg, SOFA score was significantly lower in Day 5 [4 (2, 8.75) vs 11 (9.5, 12.5)], $p=0.007$] and Day 7 [2.5 (2, 7) vs 11 (9.5, 12.5), $p=0.001$] compared to Day 0, while the SOFA score did not present significant differences during the subsequent days in the NAg [Day 3, 10 (4.75, 14.5) vs 11.5 (10.25, 13), $p=1.000$; Day 5, 6 (3.5, 13.25) vs 11.5 (10.25, 13), $p=0.483$; Day 7, 6 (3.5, 13.25), $p=0.853$].
The median duration of vasopressin administration was 2 (2, 4) vs 2.5 (0, 7.5) days, $p=0.777$ and of Noradrenaline administration was 2 (0.5, 4) vs 4.5 (2, 10.5) days, $p=0.107$, respectively. 28-day survival was 88.2 vs 58.3%, in the VASg and Nag, respectively, (Log Rank $p=0.056$).
**Conclusions:** Vasopressin seems an attractive first option in the management of circulatory failure, in terms of multiorgan function improvement. Further research is needed.

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8. None


**Topic:** Sepsis

## 001289

### Nosocomial infection associated to severe traumatic injury: a descriptive study


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**Introduction:** Nosocomial infections are a serious concern for critically injured patients who are hospitalized in the intensive care unit (ICU). Unfortunately, the risk factors that contribute to these infections are not well understood.
**Objectives:** To identify the primary risk factors of nosocomial infection after severe traumatic injury.
**Methods:** It was a descriptive, observational study of all patients aged over 18 years admitted for severe traumatic injuries in the medical ICU of Zaghouan's regional hospital between January 2019 and June 2023. Demographic, clinical, therapeutic and evolutionary data were collected. Risk factors of nosocomial infections were later determined.
**Results:** We included 117 patients. Mean age was $40\pm17$ years with a gender ratio of 8. Median IGSII and APACHEII scores were, respectively, 20 [12–56] and 9 [12–41]. Ninety-seven patients suffered from head trauma (83%), 83 from chest trauma (71%) and 49 from abdominal trauma (42%). Nosocomial infections were diagnosed in 32% of patients during their ICU stay on day $5\pm3$ of care. These were mainly ventilator-associated pneumonia (81%), followed by bacteremia (32.4%), urinary tract infections, catheter-related infections (13.5%) and neuro-meningeal infections (10.8%). These nosocomial infections were complicated by septic shock in 12% of cases. The univariate analysis identified the presence of comorbidities, lesion status, and hospitalization-related complications as the primary contributors. The observed risk factors included high blood pressure ($p=0.003$), cerebral contusion ($p=0.026$), haemothorax ($p<103$), status epilepticus ($p<103$), use of vasopressors at admission ($p=0.006$), invasive mechanical ventilation ($p=0.006$) or need to tracheostomy ($p=0.005$), acute respiratory distress syndrome ($p=0.020$), bedsores ($p<103$), and intensive care related neuromyopathy ($p=0.003$). Using receiver operating characteristic (ROC) curves and cutoffs, we found that performing a body scan after 1 h and 30 min of management (AUC = 0.70, 95% CI [0.52–0.88], $p=0.041$), administering catecholamines before 36 h of management (AUC = 0.70, 95% CI [0.53–0.87], $p=0.010$), mechanical ventilation for more than 108 h (AUC = 0.92, 95% CI [0.86–0.99], $p<103$), administering sedation for more than 84 h (AUC = 0.82, 95% CI [0.71–0.93], $p<103$), and extubation after 6 days of management (AUC = 0.84, 95% CI [0.65–1], $p=0.024$) were associated with high risk of nosocomial infection.
**Conclusions:** Identifying the main risk factors of nosocomial infections remains crucial to develop preventive strategies to improve patients' outcomes and reduce healthcare costs.

**Topic:** Sepsis

## 001290

### Respiratory variations of red blood cell velocities in the sublingual microcirculation of healthy volunteers

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**Introduction:** In clinical practice, changes in stroke volume during the respiratory cycle are used to estimate ventricular preload (1). Although capillary blood flow is laminar, the effects of respiratory changes on pulsatile systemic flow might modify red blood cell velocity (RBCv) in microcirculation. Whether these changes affect microcirculatory flow is unknown.
**Objectives:** To characterize the respiratory changes of sublingual RBCv in healthy volunteers throughout the respiratory cycle.
**Methods: Population:** 34 healthy volunteers were included.
**Design:** Cross-sectional study.
**Procedure:** Healthy volunteers were studied after 20 min of semirecumbent position. Age, body mass index (BMI), arterial blood pressure (ABP), heart rate (HR), respiratory rate (RR), pulse oximetry (SpO2), capillary refill time (CRT) and derived perfusion index (PI) were registered.
**Microcirculatory measurements:** Sublingual microcirculatory network was evaluated by means of an incident dark field illumination (IDF) imaging device. Each volunteer underwent 3 sublingual microcirculatory videos at baseline. In addition, 2 further videos were acquired at voluntary inspiratory and expiratory periods of apnea of 20 s. We performed a software-assisted analysis (AVA 3.2, Microvision Medical) to determine total vessel density (TVD), proportion of perfused vessels (PPV), perfused vascular density (PVD), microvascular flow index (MFI) and RBCv. Quantitative RBCv was measured using space–time diagrams in 10 capillaries per video.
**Statistical Analysis:** Differences in the microcirculatory variables between inspiration and expiration were explored by paired *t*-test. A P value < 0.05 was considered statistically significant.
**Results:** Healthy volunteers were 35 ± 9 years old and 60% were male. There were no differences in TVD, PVD, and PPV but RBCv was significantly higher in inspiration than in expiration: 1620 (170) vs. 1487 (134) µm/sec (p-value = 0.0008), respectively (Figure 1).
**Conclusions:** For the first time, we demonstrated the presence of respiratory changes in the sublingual RBCv of healthy volunteers. These changes are probably secondary to modifications in systemic flow induced by ventilation. Microcirculatory flow, though laminar, can reflect changes in systemic flow during the respiratory cycle.

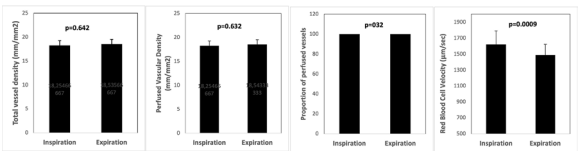


**Fig. (abstract 001290)** Differences in microvascular variables between inspiration and expiration

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**Topic:** Cardiovascular issues in ICU

## 001291

### Dipeptidyl peptidase 3 release in a preclinical model of acute myocardial infarction-related cardiogenic shock

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**Introduction:** Acute myocardial infarction-related cardiogenic shock (AMI-CS) is associated with severe organ hypoperfusion, leading to the release of several mediators in the blood. Dipeptidyl peptidase 3 (DPP3) is a cytoplasmic metallopeptidase released in the bloodstream during an acute ischemic tissue injury. Circulating DPP3 cleaves various bioactive peptides, including angiotensin II (AngII)1. The degradation of AngII worsens the circulatory failure, hence providing a key pathological role of DPP3 in shock2. Therefore, DPP3 could be considered as a marker of hypoperfusion and a mediator of circulatory failure. However, it remains unknown how organs contribute differently to its systemic concentration.
**Objectives:** To measure DPP3 released in the bloodstream by different organs and assess each organ contribution in an experimental swine model of AMI-CS3.
**Methods:** Embolization particles were injected in the left main coronary artery to induce AMI-CS. After shock induction VA-ECMO was used as resuscitation strategy for a total of 9.5 h. Blood samples were collected from different organ vessels to quantify DPP3 release during the experiment. We collected the venous drainage from portal, sushepatic and renal veins, as well as coronary and jugular sinuses. We estimated the release of DPP3 by measuring the ΔDPP3 activity, calculated as the veno-arterial difference for each organ. Mixed venous oxygen saturation (SvO2) and veno-arterial CO2 pressure gradient (P(v-a) CO2) were extracted from a pulmonary artery catheter.
**Results:** Preliminary results were gathered from the first three animals. After induction, CS was characterized by a drop in cardiac output (−48% from 6.37 ± 0.57 L/min at baseline to 3.30 ± 0 L/min at 120 min of ischemia), a decrease in mean arterial pressure below 60 mmHg (from 75 ± 4 mmHg at baseline to 53 ± 0.7 mmHg), SvO2(from 63 ± 6% at baseline to 43 ± 6%) and P(v-a)CO2 (from 8 ± 2 mmHg at baseline to 13 ± 5 mmHg). Support with VA-ECMO restored blood pressure to ≥ 60 mmHg and tissular perfusion marker (SvO2 and P(v-a)CO2) (Figure 1). Circulating DPP3 increased during CS induction and resuscitation, thus showing an overall release of DPP3 during AMI-CS (+45% from 301 ± 104 U/L at baseline to 435 ± 152 U/L at the end of resuscitation). All the organs contributed differently to the liberation of DPP3 during and after the AMI induction. Among them, myocardium and brain seemed to be the organs the most involved in the DPP3 release, as measured by the ΔDPP3 activity (Figure 2).
**Conclusions:** For the first time in an experimental cardiogenic shock model, we show the release of DPP3 with a different contribution of each organ to the circulating DPP3 concentration. The explanation to the greater contribution of the heart and the brain might be sought in the severity of their perfusion impairment, hence the more a tissue suffers the more the DPP3 is released.

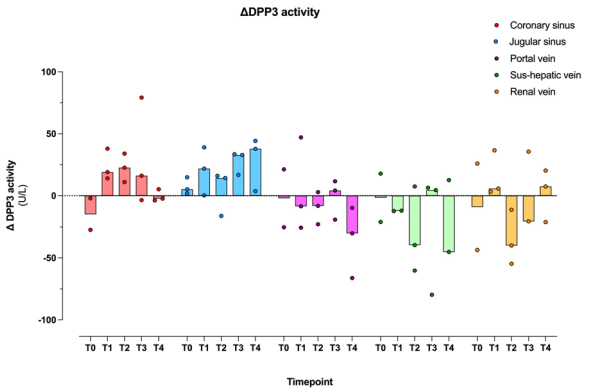


**Fig. 2 (abstract 001291)** Organs ΔDPP3 activity. ΔDPP3 activity was calculated as the difference between the venous blood and closest arterial blood of each organ. T0: baseline; T1: after 2 h of ischemia; T2: after 90′ of resuscitation; T3: after 5.5 h of resuscitation; T4: after 9.5 h of resuscitation

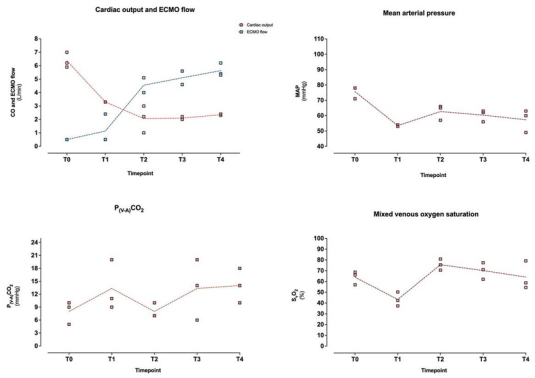


**Fig. 1 (abstract 001291)** Systemic hemodynamics and tissular perfusion markers. CO: cardiac output; ECMO: extracorporeal membrane oxygenation; MAP: mean arterial pressure; P(v-a)CO2: veno-arterial CO2 pressure gradient; SvO2: mixed venous oxygen saturation; T0: baseline; T1: after 2 h of ischemia; T2: after 90′ of resuscitation; T3: after 5.5 h of resuscitation; T4: after 9.5 h of resuscitation

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**Topic:** Translational biology

## 001293

## Provision of follow-up services for survivors of COVID-19 critical illness: a UK national survey

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**Introduction:** Recovery and rehabilitation are important stages following critical illness. Many patients experience post-intensive care syndrome and may benefit from additional input, made available through an ICU follow-up clinic. A survey in 2021 briefly described the impact of the COVID-19 pandemic on ICU follow-up services [1], but the follow-up provided to survivors of COVID-19 critical illness has not yet been described.
**Objectives:** The objective of this study is to evaluate the provision of follow-up services for adults in the UK who survived COVID-19 critical illness.
**Methods:** An online electronic survey was sent to ICU clinicians at all UK National Health Service (NHS) hospitals with an intensive care or high dependency unit. The survey was shared via mailing lists and social media. Non-responding sites were contacted directly. Once the a priori response rate of 70% was reached, the survey was closed.
**Results:** The survey ran from April to November 2023 and 174 of 242 (71.9%) NHS hospitals responded. An ICU follow-up service that survivors of COVID-19 critical illness could access was available in 80.5% (140/174) of UK hospitals. An existing follow-up service was in place in 64.4% (112/174) of hospitals prior to the COVID-19 pandemic.
Patients were usually first contacted by ICU follow-up teams within three months of hospital discharge (82.9%), and their initial clinic visit was most commonly between two and three months after hospital discharge (69.3%). The characteristics determining whether a patient was invited to ICU follow-up clinic varied between sites; the most common trigger for an invitation was referral by a clinician (36.4%), but 26.4% of hospitals invited all survivors of COVID-19 critical illness.
In 90% (126/140) of hospitals, the ICU follow-up service employed a multi-disciplinary team. The professions most commonly present in ICU follow-up clinics were nurses (89.3%), ICU doctors (79.3%), physiotherapists (62.9%) and psychologists (42.1%).
Respondents reported that COVID-19 pandemic restrictions forced their ICU follow-up clinics to adapt by introducing virtual and telephone consultations, which they found improved clinic attendance and improved equity of access to the clinic. Access to funding was a key determinant on whether follow-up services could be offered.
**Conclusions:** There was an expansion in the number of ICU follow-up clinics and the professions involved in delivering post-ICU care. Despite national guidance, there continues to be variation in the provision of ICU follow-up across the UK, due to funding restraints and where ICU follow-up services apply a more personalised approach. Future research should investigate the impact of online or hybrid models on equity of access to follow-up services, patient recovery, and level of patient retention compared to in-person, hospital-based interventions.

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2. Funding was provided by the Intensive Care Society (ICS) Young Investigators Award. Additional charitable funding was provided by the Mersey School of Anaesthesia (MSA).

**Topic:** Health Services Research and Outcome

## 001294

### Characteristics and outcomes of patients screened by the rapid response team and transferred to intensive care unit in South Korea

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**Introduction:** The rapid response system (RRS) is associated with a reduction in in-hospital mortality. This study aimed to determine the characteristics and outcomes of patients transferred to the intensive care unit (ICU) by a rapid response team (RRT).
**Methods:** This retrospective, multicenter cohort study included patients from nine hospitals in South Korea. Adult patients who were admitted to the general ward (GW) and required RRS activation were included. Patients with do-not-resuscitate (DNR) orders and without lactate level or Sequential Organ Failure Assessment (SOFA) score were excluded.
**Results:** A total of 8,228 patients were enrolled, and 3,379 were transferred to the ICU. The most common reasons for RRT activation were respiratory distress, sepsis and septic shock. The number of patients who underwent interventions, the length of hospital stay, 28-day mortality, and in-hospital mortality were higher in the ICU group than in the GW group. Factors that could affect both 28-day and in-hospital mortality included the severity score, low PaO2/FiO2 ratio, higher lactate and C-reactive protein (CRP) levels, and hospitalization time prior to RRT activation.
**Conclusions:** ICU transfer after RRT activation does not significantly affect patient outcomes, highlighting the need for more individualized patient assessments to better individualize ICU transfer and related interventions.

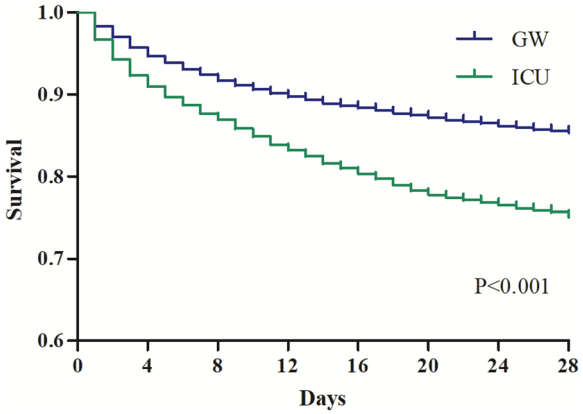


**Fig. (abstract 001294)** Twenty-eight-day mortality after RRT activation

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**Topic:** Health Services Research and Outcome

## 001296

### Is not enough to say, "Patient has sepsis", is it?

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001296

**Introduction:** Infections pose a significant challenge in clinical settings, often leading to Intensive Care Unit (ICU) admission. Studies often focus on sepsis, and less attention is given to the focus of infection. Understanding the association between infection focus and clinical severity can help guide prophylactic measures and patient management, improving their outcomes.
**Objectives:** To assess the correlation between the type and site of infection in patients with sepsis admitted to the ICU, in mortality, length of stay, and organ dysfunction.
**Methods:** This is a retrospective, observational, and cohort analysis conducted in the ICU at Hospital de Vila Franca de Xira, Portugal. All data were retrieved from the ICU database (BICU® care). All adult inpatients admitted between 1-1-2019 and 31-12-2023, with a diagnosis of sepsis or septic shock and a community-acquired infection, were included. Patients were categorized according to the primary site of infection. Clinical and demographic data were collected including the SAPS II score. The primary outcomes assessed were hospital and ICU mortality, as well as the need for organ support therapy (renal replacement therapy, and invasive mechanical ventilation), the impact of septic shock, and bacteremia.
**Results:** A total of 888 patients were included, 58.1% male and a mean average age of 69.1 ± 12.9 years. Almost 3/4 of the patients (73.4%) had a medical site of infection. The most prevalent infections (with a sample of $N > 100$ patients) were peritonitis ($N = 201$), pneumonia ($N = 232$), pyelonephritis ($N = 125$), intra-abdominal ($N = 139$), and skin and skin structures ($N = 64$). About 40.3% of all patients had septic shock and 14% had secondary bacteremia. Its presence was associated with septic shock (OR 1.7, 95% CI 1.2–2.5), especially in patients with pyelonephritis (OR 4.9 95% CI 1.7–14.5), but not mortality (OR 0.8, 95% CI 0.5–1.1). The presence of septic shock was more common in patients with peritonitis or intra-abdominal infections (roughly 50%) and less common in pneumonia (23.3%). Septic shock increased the odds of dying (OR 3.5, 95% CI 2.6–4.6), and this was mostly noted in patients with Intra-abdominal infections (OR 6.4, 95% CI 2.5–16.8). Renal replacement therapy and invasive mechanical ventilation were commonly used especially in patients with shock (37.2% vs. 13.2% and 48.9% vs. 26.8%, respectively). Patients with pneumonia and peritonitis more often needed invasive organ support.
According to the SAPS II score, the standardized mortality rate was higher in patients with peritonitis (0.95) and pneumonia (0.9), much higher than in the general population (0.78).
**Conclusions:** Sepsis is common in the ICU. The type and focus of infection seemed to have a strong influence on clinical severity, the need for invasive organ support therapy, the impact of septic shock, and mortality. In our study, pneumonia and peritonitis had the largest impact.

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**Topic:** Sepsis

## 001297

### Elderly patients with pelvic trauma—does age influence the outcome?

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**Introduction:** Pelvic injuries represent a serious and potentially deathly condition in any age. Elderly patients (> 65 y old) represent an especially fragile population, with greater morbidity and mortality compared to younger patients.
**Objectives:** To describe pelvic trauma (PT) in critically ill elderly patients and to evaluate the impact of advanced age on the outcome.
**Methods:** This is a retrospective, single-centre study of all patients with PT admitted to an adult ICU of a tertiary university hospital from January 2020 to December 2023. Besides demographic data, type of trauma, severity scores, treatment options, ICU and hospital length of stay (LOS) and mortalities were collected. The statistical analysis was done with SPSS.
**Results:** Twenty-two (19.6%) of 112 patients with PT were elderly, mostly male (68.2%) with median age of 72.5 y (IQR 68.75–80). The mechanism of trauma was significantly different between younger and elderly ($p < 0.001$), with falls being the most common mechanism in this group (54.5 vs 37.8%).
Although not statistically significant, elderly presented more frequently a Shock Index ≥ 0.9 (54.5 vs 48.9%; $p = 0.634$), an arterial pH < 7.35 (40.9 vs 35%; $p = 0.326$) and a serum lactate ≥ 2 mmol/l (63.6 vs 56.7%; $p = 0.553$). Median SAPS II (48.5 vs 22; $p < 0.001$), APACHE II (18 vs 12; $p < 0.001$) scores were significantly higher in the elderly. An Injury Severity Score ≥ 15 was more frequently found in the elderly (81.8 vs 72.2%; $p = 0.357$).
In this population, the most common type of fracture according to the Young Burgees classification was lateral compression (81.8 vs 75.6%), followed by antero-posterior compression (9.1 vs 15.6%) and vertical shear (9.1 vs 5.6%) ($p = 0638$). In the elderly, most PT were grade I of WSES classification (54.5%) followed by grade II (27.3%) and grade IV (13.6%) without significant differences compared to younger patients ($p = 0.292$).
Non-operative management (NOM) was more frequently performed in the elderly (72.7 vs 61.1%) but the difference did not reach statistical significance ($p = 0.311$). Definitive surgical treatment (DST) was performed in 35% of all PT cases: 45% in the elderly and 50% in the younger group. Time to DST was significantly different between two groups: early (< 48 h) DST was more frequent in the elderly (50% vs 6.7%; $p = 0.002$). Elderly presented a significantly shorter median ICU LOS (2 vs 6.5 days; $p = 0.048$) but a significantly longer hospital LOS (30 vs 20.5 days; $p = 0.039$). Overall mortality rate was low (4.5% in ICU and 11% in hospital) and no elderly patient died.

**Conclusions:** Elderly critically ill patients with PT presented a more severe condition on admission. The most frequent type of PT was lateral compression and grade I of WSES. NOM is more frequent in the elderly but when DST is performed, it is usually done earlier than in young people. Although not impacting on mortality, it is associated with shorter ICU LOS but longer hospital LOS.

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**Topic:** Trauma

## 001298

### A decade of critical care α chloralose poisoning: epidemiological, clinical, and prognostic analysis

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**Introduction:** Chloralose poisoning is a frequent issue in our country's intensive care units. Its accessibility makes it one of the most common used substance for suicide among pesticides. Understanding its mechanism of action is crucial for optimal management.
**Objectives:** Our study aimed to describe epidemiological, clinical, and evolutionary characteristics of patients admitted to the intensive care unit for acute chloralose poisoning.
**Methods:** It was a retrospective, observational study conducted over a period of thirteen years, from January 2011 to December 2023. Included patients were those admitted to the department of critical of toxicology with a confirmed diagnosis of chloralose intoxication based on positive toxicological findings. Patients under 14 years old and cases of polydrug intoxication were excluded.
**Results:** Eight hundred and sixty six patients were eligible, with a mean age of 26 ± 17 years and a sex ratio of 0.53. A low socioeconomic status was noted in 360 cases (41.6%). The main comorbidities were hypertension in 40 patients (4.6%) and diabetes in 46 patients (5.3%). Two hundred and thirty-two patients (26.8%) had psychiatric history, with depressive syndrome in 98 cases (11.8%). Two hundred and seventy-nine (32.2%) patients had a history of suicide, with chloralose in 205 (23.7%). The median duration of recurrence was 240 days ± 360. The circumstances of intoxication were attempted suicide in 830 cases (96.5%), chemical submission in 18 cases (2.16%) and accidental in 12 cases (8.6%) Patients arrived at the emergency department by their own means in 58% of cases. The median assumed ingested dose was 3 g ± 3. 822 (95.4%) patients were comatose with a median Glasgow Coma Scale score of 6 ± 3. Out of coma, the main symptoms were tremors in all cases, hypersalivation (95.4%). Orotracheal intubation was performed with a median delay of 3.5 h ± 3 for any patient presenting with coma; myoclonus was managed with propofol in 641 cases (74%) and benzodiazepine in 391 (45%) All patients had a positive toxicological finding in urine, and 445 (51.4%) in gastric fluid. The most frequent complication was aspiration pneumonia in 279 patients (32.2%). The mean duration of mechanical ventilation was 16 h ± 12. The majority of patients ($n = 863$) evolve favorably with a mortality rate of 0.3%.
**Conclusions:** Chloralose poisoning remains a challenge in intensive care, with specific epidemiological, clinical, and prognostic characteristics. Improved knowledge of these aspects could help enhance patient management and reduce associated complications.

**Topic:** Poisoning/Toxicology/Pharmacology

## 001299

### What do we know about carbamazepine poisoning? An epidemiological study

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**Introduction:** Carbamazepine (CBZ) is a widely prescribed treatment for neurological and psychiatric disorders. Its misuse can cause acute poisoning requiring intensive care unit management.
**Objectives:** This study aimed to carefully examine the epidemiological characteristics of this poisoning.
**Methods:** This was a retrospective, observational study conducted over a fourteen-year period, from January 2010 to December 2023. All symptomatic patients with positive toxicology screening were included in the study.
**Results:** A total of 408 patients were included, with a mean age of 29 ± 12 years and a sex ratio of 0.58. The main comorbidity was epilepsy ($n = 55$; 13.5%). Two hundred and fifty-two patients had psychiatric disorders (61.8%), including a history of suicide attempts in 117 cases (28%). Two hundred and fifty-three patients (62%) were on long-term treatment, for a median duration of 5 years. The mean consultation delay was 6.3 h ± 4, with an average ingested dose assumed to be 5 g ± 4.2 based on interrogation. An association with another molecule was reported in 175 cases (42.9%), mostly with benzodiazepines ($n = 63$, 15.4%). Intoxication was voluntary for 396 patients (97.1%) and due to a therapeutic error in other cases. Neurological manifestations were predominant. Anticholinergic toxidrome was present in 112 patients (27.5%). Deep coma was noted in 168 patients (41%), conscious failure in 202 (49%) with a mean Glasgow Coma Scale score at 10.4 ± 3.5, agitation in 76 (18.6%), dysarthria in 20 (4.9%) and seizure in 11 (2.7%). The most frequent ECG abnormality reported was sinus tachycardia ($n = 56$, 13.7%). Laboratory findings showed hyponatremia in 127 cases (31%), a mean blood carbamazepine level of 26.70 mg/l ± 11, measured at least twice in 308 cases, with a mean decreased to 21 mg/l ± 9 after 24 h of management. Intubation with requiring mechanical ventilation was performed in 202 patients with a median mechanical ventilation duration of 48 h. The median length of stay was 3 days. Nine patients (2.2) died from ICU complications.
**Conclusions:** CBZ poisoning can be serious, leading to death in 2.2% of cases. Hyponatremia is a very common metabolic consequence. There is currently no antidote and treatment is purely symptomatic. Early and appropriate management, including careful monitoring of clinical and biological parameters, is essential to ensure a favorable outcome.

**Topic:** Poisoning/Toxicology/Pharmacology

## 001301

### Immune cell phenotypic changes during bacterial infection reflect capillary perfusion and glycocalyx decoupling

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**Introduction:** Sepsis damages the endothelial glycocalyx, which is a carbohydrate-rich layer that covers the luminal capillary endothelium. In addition, capillary blood flow is significantly reduced in sepsis. However, our previous data indicates that these dysregulations are independent of each other. This pilot study aims to investigate this decoupling of glycocalyx thickness and functional capillary density and its potential relationship to changes in peripheral blood mononuclear cells (PBMCs).
**Methods:** This prospective, observational, clinical-experimental cross-sectional study was conducted in the interdisciplinary emergency department of the University Hospital Münster, Germany. Forty-nine adult patients with suspected bacterial infection or sepsis were prospectively enrolled, while 17 healthy volunteers served as controls. Hand-held, non-invasive sublingual video microscopy with a sidestream dark-field imaging device was used to estimate glycocalyx dimensions and measure functional capillary density. Blood samples for PBMC isolation were taken on enrollment and deep flow cytometric immune cell profiling was performed.
**Results:** Microvascular imaging showed reduced glycocalyx thickness and decreased capillary density during infection. Notably, the two parameters were not related to each other. Deep phenotyping revealed monocyte subpopulations up- and CD8+ naive T cells downregulated in patients with infection. Of those, several markers showed a strong correlation with either glycocalyx thickness (e.g. negative correlation of IL-8+ monocytes, mDC cells with correlation coefficient $r < -0.5$; strong positive correlation of intermediate monocytes, CD25+ mDC with $r > 0.5$) or capillary density (negative correlation of CD197+ monocytes, positive correlation of CD56+ dim CD69+) but without any meaningful overlap.
**Conclusions:** This study shows that distinct changes in immune cell phenotype coincide with the decoupling of glycocalyx properties and capillary density. These findings can serve as a basis for further mechanistic studies.

**Topic:** Sepsis

## 001302

### Maximum time to zero fluid balance association with ICU length of stay in neurocritical care patients in a tertiary care center of northeast Mexico

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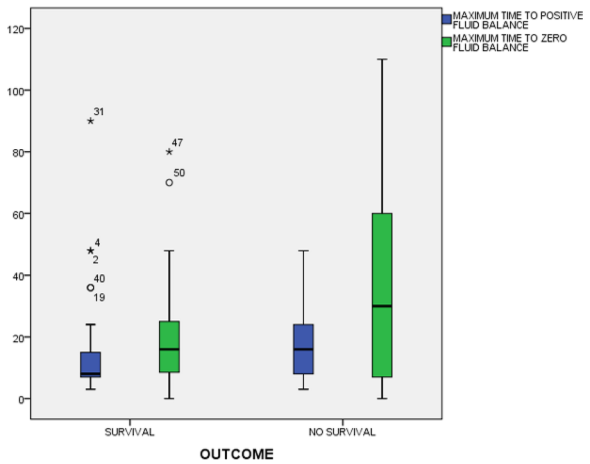
**Introduction:** Fluid resuscitation if often needed in neurocritical care patients to maintain perfusion and normovolemia, taking into account pathophysiological aspects such as tonicity, aedema and autoregulation (1). Plenty of evidence exist regarding type of fluid, goal-directed fluid therapy and assessing volume responsiveness (2). Deresuscitation begins when resuscitation has been successful and aims to obtain zero fluid balance, but the time that takes to complete that zero fluid balance remains to be determined (3).
**Objectives:** To evaluate maximum time to zero fluid balance (TmaxZFB) with duration of mechanical ventilation, ICU and hospital length of stay and mortality.
**Methods:** We conducted a prospective cohort study of neurocritical care patients admitted to an ICU in northeast Mexico, included adult patients during 2021–2022. TmaxZFB defined as the duration that took to accomplish zero fluid balance in hours. Continuous variables are described as median and interquartile range and categorical variables as frequency and percentages. To test null hypothesis, we used Mann–Whitney U test and a p value of $< 0.05$ as statistical significance.
**Results:** A total of 50 neurocritical care adult patients were included, 52% were males ($n = 26$), most frequent origin was OR 72% ($n = 36$), most common diagnosis were tumor resection 50% ($n = 25$), traumatic brain injury 24% ($n = 12$), subarachnoid hemorrhage and spontaneous brain hemorrhage 24% ($n = 24$), and stroke 2% ($n = 1$). 51% required hyperosmolar therapy, 32% were admitted with shock state requiring resuscitation with crystalloids. Two groups were evaluated according to survival (40/10), pre-ICU fluid balance median was 732 mL (IQR 223–1683) vs 510 mL (IQR −583.7–768.7) in no survivors group ($p = 0.053$), first 24 h fluid balance in survival group was 370 mL (IQR −365.7–1002) vs 547 mL (IQR −911.2–1172.7) in no survivors ($p = 0.56$) time to positive fluid balance in survival group was 8 h (IQR 7–16.5) vs 14 h (IQR 8–24) in no survivors ($p = 0.17$). Time to zero fluid balance in survival group was 16 h (8.2–25.5) vs 18.5 h (IQR 4–54) in no survivors ($p = 0.65$), mechanical ventilation days were 1.5 (IQR 1–4) vs 5 days (IQR 2.7–12.2) in no survivors (Graph 1) ($p = 0.012$), ICU length of stay 3.5 days (IQR 2–6) vs 5.5 days (IQR 3–8.2) in no survivors ($p = 0.25$), hospital length of stay 15 days (IQR 9.2–25.5) vs 11 days (IQR 3–14.5) in no survivors ($p = 0.02$).
**Conclusions:** There is a U-shaped relationship with fluid administration in which under resuscitation is associated with mortality and over administration of fluid therapy and associated with increased complications. In our study, there is a statistical difference between both groups regarding increased length of mechanical ventilation and hospital length of stay; however, TmaxZFB was not different between both the groups. Deresuscitation took longer time to be accomplished in no survivors group, although no statistical difference was found.




**Graph 1 (abstract 001302)** Boxplot for maximum time to positive fluid balance and maximum time to zero fluid balance in hours in survivors and no survivors

**Topic:** Neurointensive care

## 001303

### Impact of the Biofire® Filmarray ® Pneumonia Panel Plus molecular platform in time to directed antibiotic therapy in lower respiratory tract bacterial infections

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**Introduction:** The microbiological diagnosis of lower respiratory tract-associated infections is challenging due to the low sensitivity and prolonged wait times to conventional cultures' results. Biofire Filmarray Pneumonia Panel Plus (BFPP) can improve diagnosis performance (1), allowing for shorter times to culture positivity and faster directed therapy.
**Objectives:** To assess the impact of Biofire Filmarray Pneumonia Panel Plus (BFPP) and bronchoalveolar lavage (BAL) cultures in time from sample to directed antibiotic therapy in patients with ventilator-associated pneumonia (VAP), nosocomial pneumonia (NP) that requires mechanical ventilation or community-acquired pneumonia (CAP) with risk factors for treatment failure (2).
**Methods:** This is an observational prospective study. Adult patients admitted to the intensive care unit between January 2022 and May 2023 and diagnosed with VAP, NP or CAP and any of the following risk factors for antibiotic failure were selected: risk factors for infection for multidrug-resistant microorganisms (MDRO) such as previous colonization by MDRO, antibiotic treatment within the previous 90 days, previous admission in areas with high prevalence of MDRM or risk factors related to the patient (immunosuppression on septic shock).
Bronchoalveolar lavage samples were processed both with BFPP and conventional cultures. BFPP was available from 8 to 20 h Monday to Friday. Conventional cultures were processed and interpreted Monday to Sunday from 8 to 22 h. Positive results were notified via direct call and uploaded to the clinical report systems.
The population is described using frequency and percentage, mean and standard deviation (SD) or median and interquartile range (IQR) as appropriate. Differences in time to directed therapy were assessed using Student's T test for unpaired data. Statistical significance was set at $p < 0.05$.
The project received approval by the ethics committee.
**Results:** Sixty patients that met inclusion criteria were identified. 36 (60%) were male. Median age was 59 (IQR 50–66) years old. Median APACHE was 20 (IQR 11–28). The most frequent comorbidities were pulmonary disease (16–26.7%), diabetes mellitus (12–20%) and chronic kidney disease (11.7%). 32 patients had risk factors for MDRO, 14 were in septic shock at diagnosis and 30 were immunosuppressed. Median duration of mechanical ventilation was 35 (18–55) days. The most common lower respiratory tract infection diagnosis was VAP (44, 73.3%), followed by CAP (11, 18.3%) and NP (5, 8.3%). Three (5%) received inadequate empirical antibiotic treatment that required escalation after microbiological results.
BFPP led to therapeutic changes in 21 patients. Definitive culture results led to 9 further treatment modifications (Table 1).
Average time from sample obtention to antibiotic modification was < 1 day (mean 4, 8 h SD 9.6 h) for BFPP and over four days (mean 105.6 h, SD 79.2 h) for conventional cultures ($p < 0.001$).
**Conclusions:** BFPP may lead to faster directed antibiotic therapy and decreased inadequate empirical therapy in patients with lower respiratory tract bacterial infections and risk factors for treatment failure.

**Table 1 (abstract 001303)** Modifications of antibiotic treatment according to BFPP and culture results

| | BFPP (n=60) | | | BAL culture after BFPP (n=60) | | |
|---|---|---|---|---|---|---|
| | Negative (36 – 60%) | Positive (24 -40%) | Total | Negative (39 – 65%) | Positive (21 -35%) | Total |
| Escalation | 1 | 3 | 4 | 0 | 0 | 0 |
| De-escalation | 3 | 7 | 10 | 2 | 4 | 6 |
| Stop | 5 | 2 | 7 | 2 | 1 | 3 |
| Total | 9 | 12 | 21 | 4 | 5 | 9 |

**Topic:** Infections and prevention

## 001305

### Diagnostic value of the Biofire® Filmarray ® Pneumonia Panel plus molecular platform in lower respiratory tract bacterial infections

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**Introduction:** The diagnosis of lower respiratory tract associated infections is challenging due to the low sensitivity and prolonged wait times to conventional cultures' results. Biofire Filmarray Pneumonia Panel Plus (BFPP) can improve diagnosis performance (1), allowing for shorter times to culture positivity and faster directed therapy.
**Objectives:** To assess differences in agreement and time to validation between BFPP and conventional bronchoalveolar lavage (BAL) cultures (including antibiogram) in patients with ventilator-associated pneumonia (VAP), nosocomial pneumonia (NP) that requires mechanical ventilation or community acquired pneumonia (CAP) with risk factors for treatment failure (2).
**Methods:** This is an observational prospective study including adult patients admitted to the intensive care unit and diagnosed with VAP, NP or CAP and risk factors for antibiotic failure.
Bronchoalveolar lavage samples were processed both with BFPP and conventional cultures. BFPP was available from 8 to 20 h Monday to Friday. Conventional cultures were processed and interpreted Monday to Sunday from 8 to 22 h.
Agreement between tests was calculated using Cohen's kappa test, both for all results and later exclusively for the 16 bacterial targets contained in BFPP. Differences in time to positivity were calculated using Wilcoxon signed-rank test. Statistical significance was established in $p < 0.05$.
The project received approval by the ethics committee.
**Results:** Sixty patients that met inclusion criteria were identified. 36 (60%) were male. Median age was 59 (IQR 50–66) years old. Median APACHE was 20 (IQR 11–28). The most frequent comorbidities were pulmonary disease (16–26.7%), diabetes mellitus (12–20%) and chronic kidney disease (11.7%). 32 patients had risk factors for MDRO, 14 were in septic shock at diagnosis and 30 were immunosuppressed. Median duration of mechanical ventilation was 35 (18–55) days.
The most common lower respiratory tract infection diagnosis was VAP (44, 73.3%), followed by CAP (11, 18.3%) and NP (5, 8.3%).
There was fair agreement between tests (68.3%, $k = 0.326$ SE = 0.128 $p = 0.0055$).
Six of the 11 cases with positive BFPP and negative cultures were due to positivity of viral targets. Regarding positive BAL and negative BFPP, disagreement was caused by isolation of enterococci in 2 cases, plasma coagulase-negative staphylococci in 3 cases, polymicrobial sample contamination in 2 and *Chryseobacterium indologenes* in one. When only comparing molecular targets contained by the test,

agreement was substantial (85%, $k = 0.603$ $p < 0.001$). Test results are summarized in Table 1.
Median time to validation was 2.5 h (2–10) for BFPP and 43.3 h (40–48.3) to BAL cultures, including antibiogram ($p < 0.001$).
**Conclusions:** BFPP leads to a faster microbiological diagnosis, with fair to substantial agreement with conventional cultures.

**Table 1 (abstract 001305)** Positive and negative test results (conventional cultures vs. Biofire® Filmarray® Pneumonia Panel Plus)

| | Negative BAL | Positive BAL | Total FA |
|---|---|---|---|
| Negative BFPP (%) | 28 (71.8) | 8 (38.1) | 36 |
| Positive BFPP (%) | 11 (38.3) | 13 (61.9) | 24 |
| Total BAL | 39 | 21 | 60 |

**Topic:** Infections and prevention

## 001310

### Investigating muscle and bone loss in the intensive care unit with opportunistic computed tomography imaging

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**Introduction:** Critical care patients are susceptible to muscle weakness and bone loss. This can lead to fractures and long-term physical impairment. Muscle biopsies indicate that muscle weakness may be associated with muscle atrophy and muscle fatty infiltration. However, it is unclear how these mechanisms contribute to muscle weakness in critical care patients. Bone loss among critical care patients has been scarcely investigated. Novel internal calibration methods (1,2) have enabled the repurposing of computed tomography (CT) images acquired in the intensive care unit (ICU) to evaluate muscle density and bone mineral density (BMD).
**Objectives:** 1) Measure changes in muscle cross-sectional area (CSA), muscle density, and BMD over the course of critical illness using clinically acquired CT images. 2) Determine risk factors associated with muscle loss.
**Methods:** We retrospectively acquired abdominal CT scans of ICU trauma and sepsis patients. Patients were included if they had a CT scan within 48 h of ICU admission (baseline) and a second CT scan taken > 3 days later (follow-up). We assessed mean psoas muscle CSA ($cm^2$) by segmenting the psoas muscle at L3 using an automated algorithm (3) with manual correction. For a subsample of patients with non-contrast enhanced scans, we measured psoas muscle density using an internal calibration approach (2). We assessed femur BMD for a subsample of patients with > 14 days between their baseline and follow-up scans using a machine learning algorithm and internal calibration approach (1). We acquired patient information using electronic medical records.
**Results:** Critical care patients ($n = 164$) experienced an 8% reduction in psoas muscle CSA (1.2 $cm^2$, IQR = 0.1, 2.3) over a median 9 days in the ICU. This represents a median muscle CSA loss of just under 1% per day. Patients ($n = 23$) experienced a 0.4% reduction in psoas muscle density ($p < 0.05$). Patients in the bone analysis subsample ($n = 14$) had no difference between baseline and follow-up femur BMD ($p = 0.46$). Patients with greater muscle at baseline or greater time in the ICU experienced more profound muscle CSA loss ($p < 0.001$). Rapid muscle CSA loss was associated with ICU mortality in sepsis patients ($p < 0.05$). Lesser muscle CSA at follow-up was associated with female sex, sepsis, greater time in the ICU, and greater illness severity ($p < 0.05$).
**Conclusions:** Muscle loss in the ICU involves a reduction in muscle CSA and density. Patients with the most rapid muscle CSA loss differed from patients with the lowest follow-up muscle CSA. Future work is necessary to determine how muscle loss and CSA affect physical function post-ICU. As bedrest studies have observed BMD loss in 7–14 days (4,5), we were surprised that BMD loss was not observed in this study. This may indicate that our analysis is not sufficiently sensitive for clinically acquired CT images. While future work is needed, opportunistic CT imaging is a promising modality for clinical and research investigations of musculoskeletal changes in the ICU.

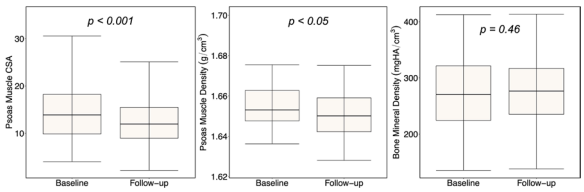


**Fig. (abstract 001310)** Box and whisker plots comparing A) psoas CSA ($n = 164$), B) psoas muscle density (g/cm^3) ($n = 23$), and C) BMD (mgHA/cm^3) ($n = 14$) at baseline and follow-up. The box represents the interquartile range. The bottom of the box is the 1st quartile, the line in the middle of the box is the 2nd quartile or the median, and the top of the box is the 3rd quartile

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2. This work was funded by the University of Calagry VPR Catalyst Grant (SLM). ACJS was supported by the Canadian Institutes of Health Research (CIHR) Vanier Scholarship.

**Topic:** Imaging in intensive care

## 001311

### A multi-center cohort study of Esomeprazole versus Omeprazole prophylaxis in critically ill patients at high risk for stress ulceration

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001311

**Introduction:**
Stress ulceration can be defined as extensive superficial erosions, which mainly affect the fundus and body of the stomach. Gastrointestinal bleeding (GIB) is the most frequent sign of stress ulcers, and GIB in critically ill patients leads to a higher fatality rate. Stress ulcer prophylaxis is the standard of care to prevent stress ulcer-related bleeding in critically ill patients at high-risk (e.g., mechanical ventilation and coagulopathy). Proton pump inhibitors (PPIs) are superior to other agents in preventing GI bleeding. There is a lack of evidence of superiority among the PPI agents; therefore, we aimed to evaluate the effectiveness and safety between different PPI agents (i.e., Esomeprazole and Omeprazole) as SUP in critically ill patients
**Methods:**
This is a multicenter retrospective cohort study of critically ill adult patients admitted to the ICUs at four centers between January 1, 2018, and December 31, 2021. Eligible patients were categorized into two sub-cohorts based on the type of PPI agent as SUP (Esomeprazole versus Omeprazole). The primary outcome was the incidence of

confirmed GI bleeding, while mortality, MV duration, ICU/hospital LOS, and complications during ICU stay were considered secondary outcomes. Propensity score (PS) matching was employed based on the patient's age, body mass index (BMI), APACHE II score, baseline INR, baseline total bilirubin, MV status within 24 h of ICU admission, history of bleeding within six months prior to ICU admission, liver disease as comorbid conditions and the dosing of PPI as SUP prophylaxis. Multivariable logistic, Cox proportional hazards, and negative binomial regression analysis were utilized as appropriate

**Results:**

We screened 10,507 critically ill patients; 5566 patients were eligible. After PS matching (1:3 ratio) based on the predefined criteria, the demographic variables (e.g., Age, BMI), severity scores (e.g., APACHE II, SOFA), MV status, and coagulation profile at admission were comparable between the groups. The incidence of confirmed GI was higher in patients who received Omeprazole than Esomeprazole as SUP (7.3% versus 2.3%; aOR: 3.34, 95% CI: 1.99, 5.57; $p=0.01$). In addition, the MV duration and ICU LOS were significantly longer in the Omeprazole group versus esomeprazole (beta coefficient: 0.19, 95% CI: 0.01, 0.36; $p=0.04$, and beta coefficient: 0.48, 95% CI: 0.38, 0.58; $p=0.01$). Patients who received Omeprazole as SUP had a higher 30-day and in-hospital mortality compared with Esomeprazole (HR: 1.49, 95% CI: 1.27, 1.75; $p=0.01$, and HR: 1.75, 95% CI: 1.51, 2.03; $p=0.01$, respectively)

**Conclusions:**

Omeprazole use as SUP in critically ill was associated with a higher incidence of confirmed GI bleeding with increased MV duration and length of stay. Moreover, Omeprazole was associated with higher mortality rates. Further randomized control studies are needed to confirm these findings

**Topic:** Haematologic-oncologic issues in the ICU

## 001312

### Outcomes of haematological patients in the ICU: a single-centre cohort study 2018–2022

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**001312

**Introduction:** Mortality of critically ill cancer patients admitted to intensive care units has drastically reduced over the last decades (1). Characteristics and outcomes of patients with haematological malignancies needing treatment in a university hospital's tertiary intensive care units during 2018–2022 were assessed in this retrospective cohort study.

**Objectives:** To describe the population of intensive care unit (ICU) patients with haematological malignancies at Tartu University Hospital and to assess the outcomes of intensive care and risk factors for death. The primary outcome was ICU mortality, and secondary outcomes included hospital and one-year mortality.

**Methods:** All patients admitted to tertiary ICU-s at Tartu University Hospital in 2018–2022 were screened for diagnoses of any malignant haematological neoplasm (ICD codes C81-C96, D45-D47). Patients that were admitted to ICU due to complications or for the treatment of their haematological illness were included. Data were collected retrospectively from paper and electronic health records.

**Results:** 152 patients were included in the study. The main reason for ICU admission was shock ($n=57$, 37.5%), followed by respiratory failure (RF) ($n=48$, 31.6%). Median APACHE II score was 28 points. On admission day, most patients had sepsis ($n=102$, 67.1%) with 61 patients presenting with septic shock (40.1%). Vasopressor therapy was used in 66.4% of patients during the first 24 h ($n=101$). During their ICU stay, acute RF developed in 114 patients (75%), out of whom 80 (70.2% of those with RF) received invasive ventilation. Acute kidney injury (AKI) developed in 99 patients (65.1%) and renal replacement therapy was used in 43 patients (43.4% of those with AKI). Extracorporeal membrane oxygenation was used in 2 patients. In 41 patients (27.0%), a decision on limitation of care was made during ICU stay. Median hospital length of stay (LOS) before ICU admission was 0 days (IQR 0–8 days) and median ICU LOS 3 days (IQR 1–9 days). Readmission to ICU occurred in 10 patients (6.6%).ICU mortality was 34.2% ($n=52$), hospital mortality 41.4% ($n=63$) and one-year mortality 62.5% ($n=95$). In ICU long-stayers (LOS > 7 days; $n=42$; 27.6%), outcomes were similar. Predictors of ICU mortality are shown in Table 1.

**Table 1 (abstract 001312)** Risk factors for mortality

| | | 95% C.I. for OR | | |
|---|---|---|---|---|
| | OR | Lower | Upper | *P*-value |
| Use of vasopressors on admission day | 5.865 | 1.387 | 24.791 | 0.016 |
| No invasive mechanical ventilation during ICU | 3.539 | 1.154 | 10.856 | 0.027 |
| pH at admission | 0.008 | < 0.001 | 0.714 | 0.035 |
| Lactate at admission | 1.208 | 1.001 | 1.459 | 0.049 |
| SOFA on admission day | 1.477 | 1.194 | 1.826 | < 0.001 |

**Conclusions:** Shock, often caused by sepsis, is the primary reason for ICU admission in patients with haematological malignancies in our cohort. ICU admission is not a universally fatal event in this patient population, as more than one-third are still alive one year after intensive care. Our data suggests that the presence of a haematological malignancy should not in itself limit access to intensive care.

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2. Not applicable.

**Topic:** Haematologic-oncologic issues in the ICU

## 001313

### Short-term effects on urinary output and electrolyte excretion of mannitol versus furosemide administration

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**001313

**Introduction:** Diuretics are primarily used to eliminate body water excess. To excrete water, the final mechanism of natriuretic diuretics is to increase the number of osmoles eliminated. Furosemide acts by increasing urinary sodium and chloride osmoles, while mannitol acts by adding un-physiological sugar osmoles.

**Objectives:** In this study, we investigated the differences between furosemide and mannitol on water elimination and urinary electrolytes handling.

**Methods:** The study population consisted of 37 ICU patients, with normal kidney function, prospectively treated with mannitol (1 g/kg of ideal body weight) in whom urinary electrolytes and pH were analysed by K.IN.G.® (Kidney Instant Monitoring). Urinary output, pH and sodium, potassium, chloride, and ammonium concentrations before (BASAL) and after a single-dose mannitol administration were assessed for 3 h at 30 min intervals. Urinary sodium to potassium ratio (Na/K ratio), sodium fractional and total excretion were computed. Data from 39 patients treated with a single-dose furosemide (12 ± 5 mg) reported in a previous study (Zazzeron et al., 2016) were considered for comparison.
**Results:** Time course of urinary output, sodium and chloride concentrations are shown in Figure 1. Urinary output was similar after furosemide or mannitol ($p = 0.447$). Sodium and chloride concentrations, sodium fractional and total excretion were markedly higher in patients treated with furosemide (all $p < 0.05$). Time course of potassium and ammonium concentration in the two populations were similar, with progressive increase in their excretions, likely due to pH and aldosterone effects. Indeed, urinary ammonium concentration significantly increased with decreasing urinary pH (R2 = 0.03, $p < 0.001$) and was significantly and negatively correlated with urinary Na/K ratio (R2 = 0.28, $p = 0.047$).
**Conclusions:** This study suggests that water elimination is similar after treatment with furosemide or mannitol. The main difference was found in the urinary electrolytes' modifications. In patients in whom the clinical target is water elimination rather than natriuresis, mannitol may be considered as a possible alternative to furosemide.

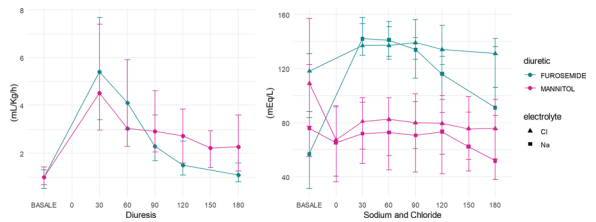


**Fig. (abstract 001313)** Time course of diuresis and urinary sodium and chloride concentration before (BASAL) and after administration of diuretic
Two-way ANOVA for repeated measures. Data are expressed as median (IQR). A $p$-value < 0.05 was considered as significant. Differences between the two populations (Furosemide vs Mannitol) are the following: Diuresis ($p = 0.447$), Sodium ($p = 0.002$), Chloride ($p < 0.001$).

**Topic:** Poisoning/Toxicology/Pharmacology

## 001316

### Fluid balance in critically ill patients: assessing the impact on outcomes

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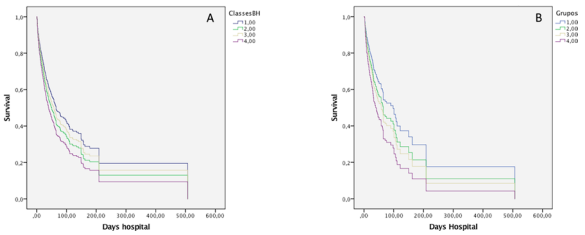
***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001316

**Introduction:** Fluid therapy aims to increase intravascular volume to improve left ventricular preload and enhance cardiac output. This improves oxygen delivery to the tissues and prevents hypoperfusion. However, fluid overload can have detrimental effects at both microcirculatory and macrocirculatory level and affect the patient's outcome.
**Objectives:** This study aimed to evaluate the impact of fluid balance at 24 and 48 h on the outcome of critically ill patients.
**Methods:** This is a retrospective single-center study which included patients admitted to the Intensive Care Unit (ICU) from 2019 to 2023. Patients under 18 years old, those hospitalized for less than 24 h and chronic kidney disease patients on kidney replacement therapy were excluded. The patients were divided into four groups based on their first 24-h fluid balance (FB) quadrants (< 0 ml; 0–869 ml; 870–1855 ml; > 1856 ml). Primary endpoint was to evaluate whether a higher FB in the first 24 and 48 h after ICU admission is associated with higher hospital mortality. Secondary endpoints were to evaluate association with higher ICU mortality, days on mechanical ventilation (MV) and days in ICU and hospitalization.
**Results:** We included 2103 patients, with a median age of 66.0 (55.0–75.0) years, 62.7% being male, and a mean FB of 869 mL (0–1855). The mean APACHEII score was 20.0 (15.0–26.0). Hospital mortality in the four different 24-h FB groups was 30.6%, 36.9%, 38.3%, and 49.0%, with a 38.7% overall hospital mortality. In the four 48-h FB groups, hospital mortality was 30.9%, 33.8%, 34.2%, and 45.3%, with a 39.5% overall hospital mortality.
Higher FB in the first 24-h was associated with increased mortality ($p < 0.001$). This trend was also observed with 48-h FB ($p < 0.001$). Cox regression analysis using four different groups (separated by quartiles) revealed a significant increase in mortality in higher quartiles (except between groups 2 and 3—0–1855 mL; Graph A and B, 24 and 48 h, respectively).
In addition, an increase in FB in the first 24 h after ICU admission was associated with increased ICU mortality ($p < 0.001$), prolonged ICU stay ($p < 0.001$) and duration of MV ($p < 0.001$). However, no difference was found in the number of days hospitalized ($p = 0.104$). Similar results were observed with FB in the first 48 h, showing an increase in ICU mortality ($p < 0.001$), ICU stay ($p < 0.001$), and MV days ($p < 0.001$). No difference in the number of days hospitalized ($p = 0.232$).
**Conclusions:** In our population, higher 24 and 48 h of FB were associated with increased hospital and ICU mortality, longer ICU stay and an extended duration of MV.




**(abstract 001316)** Hospital mortality according to 24 h (A) and 48 h (B) fluid balance in patients admitted in the ICU

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**Topic:** Cardiovascular issues in ICU

## 001317

### Analysis of pericardial effusion and tamponade management over 4 years in a Portuguese ICU

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001317

**Introduction:** Cardiac tamponade is a medical emergency, due to the accumulation of fluid in the pericardial sac that compresses the heart chambers and leads to a decrease in cardiac output. Pericardial effusions (PE) causing tamponade arise from diverse etiologies across acute and sub-acute time courses.
Management is guided by the hemodynamic impact, size, and suspected etiology. In an emergency setting, prompt recognition,

through clinical signs and echocardiography, and drainage at the bedside are critical to prevent cardiovascular collapse.
Catheter pericardiocentesis guided by ultrasound is the treatment of choice in most patients, as it allows for rapid decompression and sample collection for etiology investigation. Observational studies show that for practitioners proficient in echo-guided pericardiocentesis, the rate of major complications is 0.3–3.9%, and the rate of minor complications is 0.4–20%.
**Objectives:** We aim to quantify the prevalence of pericardial effusion and cardiac tamponade in the ICU, analyze the etiological entities, pericardiocentesis procedures, associated complications, length of stay (LOS) and mortality.
**Methods:** We report a retrospective observational study at a single-center Portuguese ICU over a period of 4 years (2020–2023), on patients with the diagnosis of pericardial effusion.
**Results:** Among the 32 patients analyzed, 62.5% ($n=20$) were men and the mean age was 60 years old. 69% ($n=22$) were transferred from the emergency room. Mean ICU and hospital LOS was 5 and 20 days, respectively.
At the time of admission, 72% ($n=23$) presented cardiac tamponade and 31% ($n=10$) were hemodynamic unstable. Ultrasound-guided pericardiocentesis was performed in 94% ($n=30$) of the cases, 7 of which, although were not tamponade, were drained due to increased volume and etiological investigation. We report only one complication of a small hemoperitoneum from a transhepatic subcostal approach.
ICU, hospital and 90-day mortality were 12.5% ($n=4$), 22% ($n=7$) and 28% ($n=9$), respectively.
Regarding etiology, 41% were neoplastic (28% related to lung cancer), 28% were idiopathic, 22% infectious, 6% auto-immune, and 3% hemodynamic (cardiac failure). In 7 patients, tamponade was the inaugural presentation that led to cancer diagnosis. We report 2 cases of viral pericarditis in COVID patients, who unfortunately passed away due to respiratory failure.
**Conclusions:** The casuistic presented reflects the epidemiology of a polyvalent ICU in a non-trauma nor cardiac surgery center. Nonetheless, medical etiologies represent important causes of PE that require a high index of suspicion and emergent management. Malignancies represent the primary cause of PE, the majority with inaugural presentation and diagnosis, followed by idiopathic and infectious causes.
We report only one mild complication associated with ultrasound guided pericardiocentesis, which has proven to be the safest technic, compared to blind drainage. The choice of cardiac puncture approach depends on the size and distribution of the effusion. Considering its best safety profile and high effectiveness, we believe this procedure should be included in point-of-care ultrasound training for critical care physicians.

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**Topic:** Cardiovascular issues in ICU

## 001318

### Inflammatory effects of therapeutic mild hypothermia and two rewarming strategies after experimental acute respiratory distress syndrome

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**001318

**Introduction:** Ventilator induced lung injury (VILI) is a cause of acute respiratory distress syndrome (ARDS). We hypothesized that inflammatory response and cytokine production during ARDS can be decreased by means of therapeutic hypothermia (TH) and influenced by the rewarming strategy used.
**Objectives:** To explore the effects of therapeutic hypothermia at 32 °C and two rewarming strategies applied after the induction of VILI in an animal model of severe ARDS, assessed by repeated measurements of cytokine concentration.
**Methods:**
Lung injury was induced in 16 anesthetized piglets using a two-hit lung injury model, composed by repeated lung lavages and injurious ventilation to reach an arterial oxygen partial pressure to fractional inspired oxygen ratio (PaO2/FiO2) of 200 mmHg corresponding to moderate ARDS. After lung injury, eleven piglets underwent TH reaching a core temperature of 34 and then 32 °C, with an intended constant decrease in temperature of 1 °C /hour. Five piglets were used as controls (i.e. ARDS without TH).
For rewarming to 38 °C, the TH group was then divided into two groups: 1) the quick rewarming (QR) group ($n=4$) exposed to a rewarming rate of 1 °C/hour; 2) the slow rewarming (SR) group ($n=7$) with a rewarming rate of 0.5 °C/hour. Lung mechanics, hemodynamics, gas exchange, plasma for cytokine determinations (IL-6, TNF-a) were collected after each temperature step change. Cytokine values were analyzed after their indexing using as reference level the concentration at 32 °C.
**Results:** All animals developed moderate ARDS; the TH animals were cooled to 32 °C and rewarmed to the baseline temperature 38 °C. During hypothermia, TH groups and controls were similar in cytokines levels (Figure 1). The animals increased in plasma IL-6 and TNF-a concentration during rewarming ($p<0.01$ for both). The SR group showed higher IL-6 concentrations than QR during rewarming phase ($p<0.02$; Figure 1b). No difference was detected in TNF-a after indexing.
**Conclusions:** In this model of moderate ARDS, re-warming phase was associated with a rebound increase in cytokine levels in blood plasma. The optimal rate of rewarming warrants further studies for differentiating the effect of temperature from the effects of its time course.

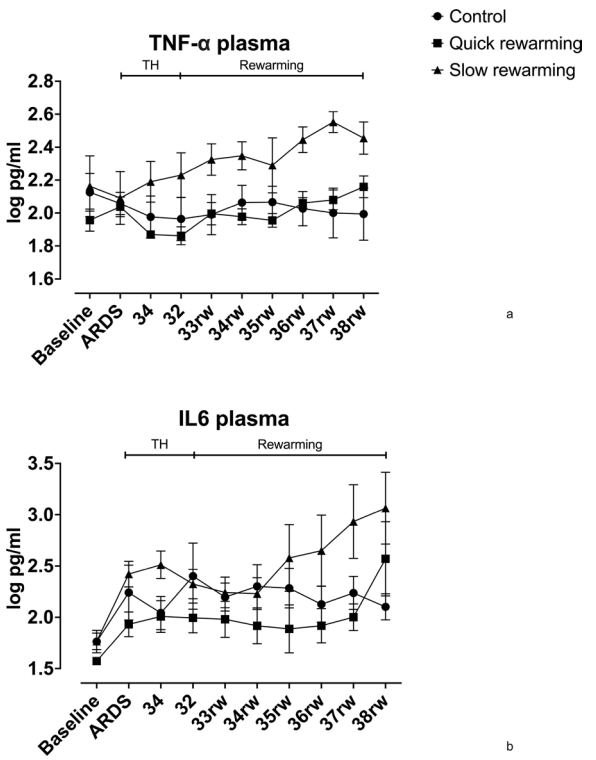


**Fig. (abstract 001318)** Cytokine concentrations during the various phases of the experiment. Numerals on the x-axis indicate the temperature in Celsius degrees. The suffix "rw" denotes temperatures reached during the rewarming phase

**References**

1. The present study has received grants from the Swedish Heart and Lung foundation (20220536, 20200841, 20200877, 20200825, 20220681, 20230767) the Swedish Research Council (2018-02438), the Swedish Society for Medical Research (463402221), the Swedish Society of Medicine (SLS-959793), the Alvar Gullstrand research grant (ALF-977974, ALF-977586, ALF-938050).

**Topic:** Acute respiratory failure and mechanical ventilation

## 001321

## Dobutamine plus levosimendan as a protective factor for the development of acute kidney injury in on-pump cardiac surgery

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**001321

**Introduction:** Acute kidney injury has an incidence of up to 40% in cardiac surgery, adding morbidity–mortality and increasing the days of hospital stay. Levosimendan, a calcium-sensitizing inotrope that improves cardiac contractility, has a vasodilatory effect and is cardioprotective against ischemia due to reperfusion, among others. On the other hand, despite a wide range of inotropic agents available, the most appropriate agent to prevent postoperative complications such as acute kidney injury or low output syndrome is still unknown.

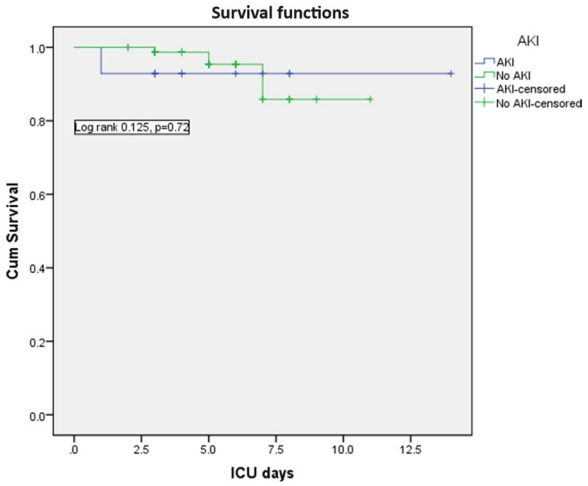
**Methods:** Prospective cohort of hospitalized patients from 2021 to 2023 in the HRAEV of Northeast Mexico. 91 post-cardiac surgery patients with extracorporeal circulation admitted to the ICU were included, authorized by the ethics committee. The objective was to evaluate the association of the use of dobutamine + levosimendan vs dobutamine with the presence of acute kidney injury during their stay, days of stay in the ICU and mortality. Continuous variables are described as means and standard deviation, categorical variables as frequencies and percentages. Relative risk was used and statistical significance was taken with a $p$ value < 0.05. A Kaplan–Meier survival curve was obtained.

**Results:** 91 patients were included and the observation was divided into two groups, dobutamine + levosimendan ($n = 25$) and dobutamine ($n = 66$), with a greater frequency of men in both groups, mean age (53 ± 16) and (57 ± 11), significant difference in the presence of hypertension as comorbidity 23% vs 42.2% ($p = 0.02$) and the presence of more patients in NYHA functional class II–III in the dobutamine group (Table 1). The incidence of AKI was 15.4% in total, and for the dobutamine + levosimendan group, it was 6.6% and for dobutamine 8.8% ($p = 0.16$), cardiovascular complications defined as arrhythmias 0% vs 8.7% ($p = 0.23$) and heart failure 2.1% vs 8.7% ($P = 0.13$). There was no difference in mortality during the ICU stay between both groups (Graph 1). Relative risk for acute kidney injury and use of dobutamine + levosimendan was 2.28 (95% CI 0.7–7.4, $p = 0.16$).

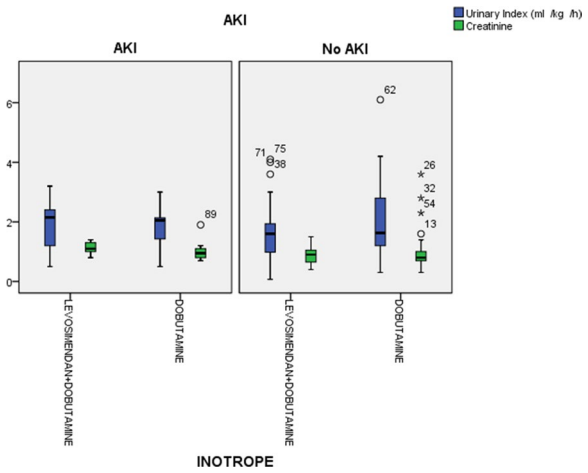
**Table 1**

| Demographics | Dobutamine + levosimendan | Dobutamine | *p* value |
|---|---|---|---|
| Gender (*n*/%) | M18 (19.8)/F7 (7.7) | M40 (44)/26 (28.6) | 0.31 |
| Age (years) | 53 (± 16) | 57 (± 11) | 0.28 |
| IMC (kg/m2) | 28.3 (± 4.3) | 30.2 (± 4.1) | 0.06 |
| Hypertension (*n*/%) | 21/23.3 | 38/42.2 | 0.02 |
| T2DM (*n*/%) | 15/16.5 | 36/39.6 | 0.64 |
| NYHA (I/II/III/IV) | 4.4/12.1/8.8/2.2 | 25.3/30.8/16.5/0 | 0.04 |
| EUROSCORE | 2.3 (± 1.5) | 2.1 (± 1.09) | 0.65 |
| LVEF (%) | 50 (± 14) | 55 (± 10) | 0.07 |
| pH | 7.35 (± 0.05) | 7.37 (± 0.05) | 0.30 |
| HCO3 (mEq) | 22.9 (± 3.4) | 22.7 (± 3.38) | 0.82 |
| ScvO2 (%) | 71 (± 7) | 72 (± 10) | 0.41 |
| Lactate (mmol/l) | 2.6 (± 2.1) | 2.4 (± 1.9) | 0.72 |
| Fluid balance (ml/1° day ICU) | 616 (± 817) | 449 (± 1786) | 0.65 |
| NT-proBNP | 1756 (± 2938) | 467 (± 668) | 0.001 |
| Creatinine (mg/dl) | 0.9 (± 0.2) | 1.5 (± 5.1) | 0.54 |
| MAP (mmHg) | 88 (± 16) | 91 (± 20) | 0.42 |
| ICU length of stay | 4.5 (± 2.6) | 4.6 (± 1.8) | 0.87 |
| Outcome (survival/death) | 25.3/2.2 | 70.3/2.2 | 0.3 |

**Conclusions:** In our study, we found no difference in the development of AKI in the intervention group vs dobutamine. Perioperative dobutamina + levosimendan is not associated with beneficial or harmful effects on days of stay in the ICU, mortality or acute kidney injury (Graph 2). There is a lack of large, high-quality randomized clinical trials that compare different therapeutic strategies with inotropes on postoperative outcomes. There is not much literature on the use of two inotropes in cardiac surgery.




**Graph 1 (abstract 001321)** Kaplan–Meier ICU days of AKI vs non-AKI




**Graph 2 (abstract 001321)** Box and whisker plots AKI and non-AKI vs dobutamine and dobutamine + levosimendan

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**Topic:** Cardiovascular issues in ICU

## 001323

### "Recovery roadmap after ICU"

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**Introduction:** Improvements in critical care medicine have led to a marked increase in survivors of the intensive care unit (ICU). Surviving critical illness does not always equate to recovery, with its aftermath frequently complicated by post-intensive care syndrome (PICS) (1). The term PICS provides a framework for identifying the most common symptoms which fall into three domains: cognitive, physical, and mental health (2). There are numerous risk factors for the development of PICS including premorbid conditions and specific elements of ICU hospitalizations.
**Objectives:** To identify the incidence of PICS and evaluate the quality of life after ICU in the short and long terms.
**Methods:** This is a prospective observational study from 2019 to 2024. Setting: Medical ICU of a University Hospital with 18 beds and 1200 annual admissions.
Sample: Patients with ICU admission ≥ one week and at least one of the following: 3 ≥ days of mechanical ventilation, delirium or shock. Follow-up protocol: Assessment at 3, 6 and 12 months after discharge from ICU in a follow-up consultation. The scales were Barthel, SF-12, HADS, IES-6. A long-term follow-up assessment was also done between 3 and 4 years.
PICS was considered the presence of alterations in any of the three domains. Impairment in physical (P) domain was a deterioration in one category on the Barthel dependency scale with respect to admission to the ICU; impairment in cognitive domain (C) a score of > 3 points on the Pfeiffer test; and impairment in mental health domain (MH) a score of > 11 on the HADS test and/or 1.75 on the IES-6 score.
**Results:** A total of 88 patients were included in the follow-up. The overall incidence of PICS was 54.7% 3 months, 36.99% at 6 months and 8.22% at 12 months. The incidence of P-PICS decreases over time, from 24% at 3 months to 11% at 12 months. The other spheres do not follow this trend pattern, with a progressive increase in incidence in the MH-PICS, from 36.9% at 3 months to 46% at 12 months, and an upturn at 6 months in the C-PICS (22.6%). The mean follow-up was 4.38 years (dt 0.48). 12 patients (13.6%) died during the follow-up. At the last long term follow-up consultation, 49 patients were interviewed. The presence of PICS at 3 months was not related to survival (log rank test $p = 0.4$). 38 patients (43.1%) have had a hospital readmission during follow-up. Mean SF12 physical was 41.36 (dt 12.3) and 44.1 (dt 11.9). Scores were lower in the PICS group at 4 years for physical SF12 (52.91 vs 35.7, $p = 0.06$) but not for the mental health component (38.17 vs 40.87, $p = 0.87$).
**Conclusions:** The incidence of PICS varies over the follow-up time and the associated risk factors are different depending on the sphere studied. The health-related quality of life at long-term follow-up continues to be lower compared to the reference population. By identifying PICS and assessing the quality of life over time, this study contributes to a better understanding of the multifaceted impacts of critical care interventions on patient well-being.

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**Topic:** Health Services Research and Outcome

## 001324

### Oxiris® membrane in real world clinical practice: a principal component analysis on a multicenter observational study from the OxirisNet registry

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**Introduction:** Oxiris® (Baxter, Deerfield, IL, USA) is a hemodiafilter designed for renal replacement therapy, indicated to clear both cytokines and endotoxins [1,2]. In septic patients, its use has been demonstrated to be associated with lower 28-day mortality [3]. Considering the lack of specific recommendations on blood purification, physicians pragmatically prescribe Oxiris® based on their perception of patients' needs and treatment appropriateness.
**Objectives:** This study aims at clustering phenotypes of patients currently treated with Oxiris® and describing patients' short-term mortality, defined as death during the first 4 days of treatment, according to phenotypes identified with a principal component analysis [4,5].
**Methods:** This observational study is based on the OxirisNet Registry, an Italian, multicenter registry of critically ill patients undergoing treatment with Oxiris®. Patients were divided into two groups according to short-term mortality (4 days after treatment initiation with Oxiris®). Principal component analysis and clustering were used to identify clusters of patients who seem to benefit the most from Oxiris®.
**Results:** Among the 277 patients observed, 71 (25.6%) died within four days. As shown in Figure 1 and summarized in Table 2, the cluster analysis demonstrated that physicians mainly prescribed Oxiris® a) to support renal function postoperatively in patients with chronic kidney disease and systemic inflammation (Blue Cluster), b) to immunomodulate critically ill patients with systemic inflammation, in the absence of absolute or relative indications for renal support (Red Cluster), c) to support renal function and immunomodulate critically ill patients with abdominal septic shock (Green Cluster). The mortality rates associated with each cluster were 16.70%, 21.30% and 30.80% for the Blue, Red and Green Cluster, respectively.
**Conclusions:** Critically ill patients undergoing an extracorporeal blood treatment have a high mortality risk. Patients with no kidney dysfunction do not seem to benefit from treatment with Oxiris® in terms of mortality, regardless of their inflammatory clinical state. The identification of clusters of patients who benefit the most from Oxiris® membrane might be quintessential to guide clinical practice and design pragmatic trials to test its effectiveness.

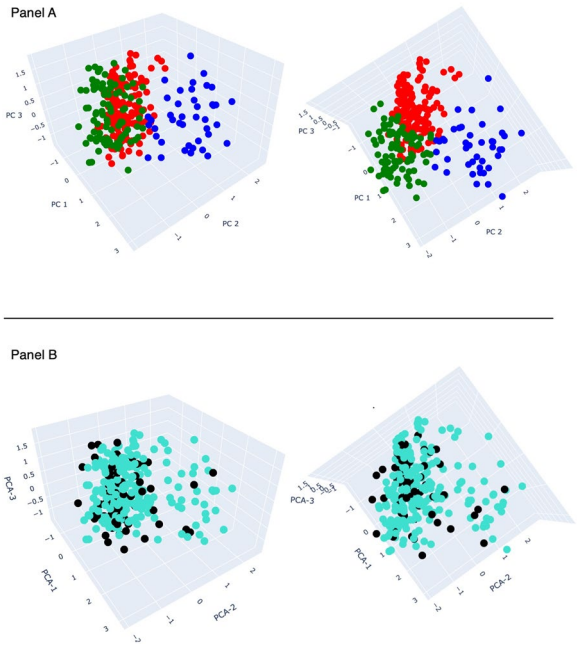


**Fig. (abstract 001324)** Panel A shows two projections of PCA analysis identifying the three clusters of patients treated with Oxiris®: Blue, Red and Green Clusters. In Panel B (using the same projections of Panel A), patients are distinguished according to short-term mortality (survivors in turquoise and non-survivors in black). Legends: PC-1 = Principal Component 1; PC-2 = Principal Component 2; PC-3 = Principal Component 3

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**Topic:** Acute Kidney Injury and haemofiltration

## 001325

### Impact of daily chest X-rays in a multidisciplinary ICU

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**Introduction:** Chest radiography (CXR) is a routine imaging test in intensive care units (ICUs), owing to its ease and speed in detecting pleuropulmonary alterations as well as medical complications associated with the use of invasive devices, and also for monitoring the progression of the patient's disease and enabling the implementation of appropriate treatments. However, its routine use presents a series of controversies between daily or on-demand requests due to the rate of detection of complications, the potential risk of unnecessary or secondary treatments due to false positives, radiation exposure, associated costs, and possible complications derived from the procedure itself. Although the scientific literature on the benefits of restricting the routine use of chest radiography is limited, some studies suggest that it may be safe, and reduce costs and radiation exposure, without increasing the risk of complications, ICU length of stay, and mortality.
**Objectives:** To determine the percentage of routine CXRs with new findings and how many result in a change in clinical approach.
**Methods:** This is a retrospective study (September–October 2023) in patients admitted to the University Hospital of Guadalajara Intensive Care Unit.
**Results:** A total of 521 CXRs from 70 patients were evaluated. Most were men (65.71%), with a mean age of 59.48 ± 14.14 years. An average of 7.45 ± 9.6 CXRs per patient were performed, with an average length of stay of 7.1 ± 9.34 days. Of the total CXRs performed, 75.05% were routine and 24.95% were non-routine. Among the most frequent admission reasons were: respiratory 33.0%, digestive 15.7%, cardiological 15.4%, neurological 9.2%, and traumatic 7.7%, among others. 36.0% of CXRs showed findings: new device (central venous catheter, endotracheal device) 10.7%, pulmonary infiltrate 8.8%, device misplacement 8.1% (5.9% endotracheal tube), pleural effusion 6.3%, atelectasis 1.2%, and pneumothorax 1.0%. Findings were detected in 20.9% of routine CXRs and 81.6% of non-routine ones (Odds ratio: 3.41 CI 2.95–6.3, favours non-routine CXR). We found that out of the total CXR performed on patients in the ICU, 40.1% of them resulted in changes in clinical approach. Of these, 36.3% came from routine chest X-rays and 51.5% from non-routine chest X-rays (Odds ratio: 0.53 CI 0.35–0.80 against routine CXR). The most common changes in clinical approach were: modification of mechanical ventilation 20.7%, device repositioning 7.7%, and new device placement 5.4%.
**Conclusions:** Routine CXRs have limited utility compared to non-routine ones for obtaining new findings (24.95% vs. 75.05%).
The lower odds ratio associated with routine CXRs suggests the need for further exploration into their potential overuse while emphasizing the value of non-routine CXRs in guiding clinical management.
According to our results, the risk of not identifying changes by restricting the daily prescription of CXRs seems to be low.
Restricting the number of CXRs would likely result in economic savings and a reduction in radiation exposure.

**Table 2 (abstract 001325)** New findings in chest X rays

| | |
|---|---|
| New device | 10.7% |
| Pulmonary infiltrate | 8.8% |
| Device malposition | 8.1% |
| Pleural effusion | 6.3% |
| Atelectasis | 1.2% |
| Pneumothorax | 1.0% |
| Total | 36.0% |

**Table 3 (abstract 001325)** New findings in routine and non-routine chest X-rays

| | Routine | Non-routine | Total |
|---|---|---|---|
| **With new findings** | 82 (20.9%) | 106 (81.6%) | 188 (36.0%) |
| **Without new findings** | 309 (79.1%) | 24 (18.4%) | 333 (64.0%) |
| **Total** | 391 (100%) | 130 (100%) | 521 (100%) |

**Table 4 (abstract 001325)** Changes in clinical management

| | |
|---|---|
| - Modification of mechanical ventilation | 20.7% |
| - Device repositioning | 7.7% |
| - New device placement | 7.6% |
| - Onset of postural changes | 1.5% |
| - Start/modification of antibiotic therapy | 1.4% |
| - Obtaining microbiological samples | 0.8% |
| Total | 39.7% |

**Table 5 (abstract 001325)** Changes in clinical management after routine and non-routine chest X-rays

| | Rutine | Non-routine | Total |
|---|---|---|---|
| With changes in clinical management | 142 (36.3%) | 67 (51.5%) | 209 (40.1%) |
| Without changes in clinical management | 249 (63.7%) | 63 (48.5%) | 312 (59.9%) |
| Total | 391 (100%) | 130 (100%) | 521 (100%) |

**Table 1 (abstract 001325)** Demographic results

| | |
|---|---|
| **Patients** | 70 patients |
| **Chest X-rays**<br>**- Routine**<br>**- Non-routine** | 521<br>391 (75.05%)<br>130 (24.95%) |
| **Male** | 65.71% |
| **Age** | 59.48 +/- 14.14 |
| **Stay time in ICU** | 7.1 +/- 9.34 |
| **Chest X-rays per patient**<br>**- Routine**<br>**- Non-routine** | 7.45 +/- 9.6<br>5.5<br>1.8 |
| **Reasons for admission:**<br>**- Respiratory**<br>**- Digestive**<br>**- Cardiological**<br>**- Neurological**<br>**- Traumatic**<br>**- Post surgical**<br>**- Intoxication**<br>**- Infectious**<br>**- Vascular**<br>**- Others** | <br>33.0%<br>15.7%<br>15.4%<br>9.2%<br>7.7%<br>5.8%<br>3.6%<br>3.1%<br>3.1%<br>3.4% |

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**Topic:** Imaging in intensive care

**001326**

## Neurocognitive function change based on the neurocognitive test battery 3 month after transcatheter aortic valve replacement under monitored anesthesia care

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**Introduction:** Assessment of cognitive function is important for risk stratification and predicting the quality of life after transcatheter aortic valve replacement (TAVR) among the elderly. Although reduced preoperative neurocognitive function has been known to correlate with poor clinical operative outcomes after TAVR, limited study shows the change between preoperative and postoperative neurocognitive function.
**Objectives:** We wanted to determine the changes before and after TAVR according to domains of neurocognitive test battery.
**Methods:** From January 2021 to July 2022, 70 patient undergoing transcatheter aortic valve replacement under monitored anesthesia care were included. The patients had Seoul Neuropsychological Screening Battery (SNSB) which is one of the standardized neurocognitive test batteries widely used in Korea. We tested specific domain of attention, language function, visuospatial function, memory, and executive function a day before TAVR and 3-month follow-up after hospital discharge. Total of 60 patients completed the 3-month follow-up at outpatient clinic. Z-scores were based on normative means and standard deviations (SD), combined into a composite z-score. Scores of standard deviation (-) 1.5 or below the normative were defined as abnormal function.
**Results:** The prevalence of mild cognitive impairment measured by SNSB reduced from 48.6% before TAVR to 26.7% after TAVR. The median composite z-score increased significantly 3-month after TAVR compared to before TAVR (−0.73 SD [−1.58, −0.31] to −0.61 SD [−1.31, 0.1] below the normative mean, $P=0.003$). In specific, language-related function ($P=0.004$), memory function ($P=0.001$), psychomotor speed of executive function ($P=0.006$) showed significant improvement after TAVR (Table 2). Of 34 patients who showed preoperative mild cognitive impairment 38.2% patients showed improvement to normal cognitive function after TAVR. The proportion of patients who improved to normal cognitive function in each domain was as follows: attention (75.0%), language (50.0%), visuospatial function (14.3%), memory function (71.4%), and executive function (46.7%) (Figure 1).
**Conclusions:** Patients undergoing TAVR showed significant portion of mild cognitive impairment before TAVR. However, cognitive function significantly improved 3-month after TAVR and reduced the number of patients with mild cognitive impairment. Further studies are needed to find the mechanism of improvement in cognitive function after TAVR.

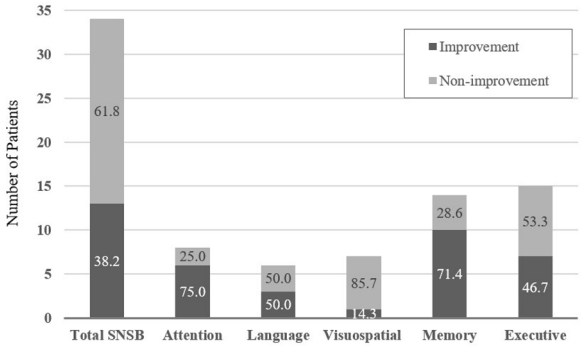


**Table 1 (abstract 001326)** Baseline characteristics of patients who were previously normal cognitive function and who had mild cognitive impairment

| | Normal (n = 36) | With MCI (n = 34) | *P* |
|---|---|---|---|
| **Baseline characteristic** | | | |
| Age (years) | 81 (78, 83) | 83 (81, 86) | 0.03 |
| Male sex | 20 (55.6) | 12 (35.3) | 0.1 |
| Comorbidities | | | |
| Diabetes | 13 (36.1) | 13 (38.2) | > 0.999 |
| Hypertension | 30 (83.3) | 26 (76.5) | 0.557 |
| Cerebrovascular disease | 3 (8.3) | 4 (11.8) | 0.706 |
| Chronic kidney disease | | | 0.799 |
| With Hemodialysis | 6 (16.7) | 3 (8.8) | |
| Without Hemodialysis | 2 (5.6) | 2 (5.9) | |
| Previous cardiac procedure or surgery | 3 (8.3) | 3 (8.8) | > 0.999 |
| **Abnormal function based on the domain of neurocognitive test battery** | | | |
| Attention | - | 8 (23.5) | |
| Language and related function | - | 6 (17.6) | |
| Visuospatial function | - | 7 (20.6) | |
| Memory function | - | 14 (41.2) | |
| Frontal/Executive function | - | 15 (44.1) | |

Data are presented as median (25th percentile, 75th percentile) or frequency (percent). MCI, mild cognitive impairment.

**Table 2 (abstract 001326)** Preoperative and postoperative neurocognitive test battery by domains and Mini-Mental State Examination (MMSE)

| | Subsets | Preoperative (n = 70) | Postoperative (n = 60) | *P* |
|---|---|---|---|---|
| Attention | Digit span Forward plus Backward* | (-) 0.54 [(-) 1.24, 0.01] | (-) 0.57 [(-) 0.99, (-) 0.10] | 0.353 |
| Language and related function | Korean-Boston naming test (Naming)* | (-) 0.16 [(-) 0.99, 0.59)] | 0.14 [(-) 0.6, 0.91)] | 0.004 |
| Visuospatial function | Rey complex figure test copy score* | (-) 0.37 [(-) 1.29, 0.4] | (-) 0.33 [(-) 0.93, 0.50] | 0.794 |
| Memory function | Seoul verbal learning test delayed recalls* | (-) 0.74 [(-) 1.28, (-) 0.08] | (-) 0.54 [(-) 0.99, 0.11] | 0.001 |
| Frontal/Executive function | Contrasting program† | 20 | 20 | - |
| | Go-no-go test† | 20 (18, 20) | 20 (19, 20) | 0.907 |
| | Korean-Trail Making Test* | 0.29 [(-) 1.51, 0.53] | 0.23 [(-) 2.07, 0.57] | 0.203 |
| | Korean-Color Word Stroop Test* | (-) 0.83 [(-) 1.47, (-) 0.22] | (-) 0.98 [(-) 1.46, (-) 0.17] | 0.426 |
| | Controlled Oral Word Association Test | | | |
| | - COWAT (Animal)* | (-) 0.54 [(-) 1.21, 0.14] | (-) 0.62 [(-) 1.19, 0.34] | 0.556 |
| | - COWAT (guit)* | (-) 0.63 [(-) 1.3, 0] | (-) 0.33 [(-) 0.98, 0.45] | 0.033 |
| | Digit Symbol Coding test* | (-) 0.47 [(-) 1.42, 0.16] | (-) 0.3 [(-) 0.80, 0.43] | 0.006 |
| Composite score of SNSB* | | (-) 0.73 [(-) 1.58, (-) 0.1] | (-) 0.61 [(-) 1.31, 0.1] | 0.003 |

Data are presented as median (25th percentile, 75th percentile). SNSB, Seoul Neuropsychological Screening Battery. † Statistical analysis were performed base on the exact value and * statistical analysis were performed base on the *z*- scores.

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**Topic:** Perioperative care

## 001328

### Factors that influence mortality in solid cancer patients with an unplanned ICU admission

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001328

**Introduction:** The current therapies' innovations have led to improvement in prognosis and life expectancy of solid cancer patients and, therefore, higher eligibility to Intensive Care Unit (ICU) admission, mainly due to acute medical pathology.
**Objectives:** This study aim was to evaluate factors that influence ICU, one-year and two-year mortality of solid cancer patients admitted for acute medical pathology.
**Methods:** A retrospective study was conducted, including patients with solid malignancies admitted for medical reasons in the ICU from January/2017 to January/2022. Patients submitted to surgery in the 30 days prior admission were excluded. ICU, one-year and two-year after discharge mortality were accessed and correlated with clinical factors and severity scores obtained in the first 24 h.
**Results:** A total of 229 patients were admitted in the ICU, with a median age of 65 years (IQR 17), predominantly male ($n=151$, 65.9%), with ECOG Scale 0/1 ($n=124$, 54.1%). The most frequent primary tumor sites were gastro-intestinal ($n=60$, 26.2%), head and neck ($n=44$, 19.2%) and lung ($n=41$, 17.9%), predominantly stage IV ($n=82$, 35.8%) and with no malignancy recurrence/progression ($n=183$, 79.9%). 72.5% ($n=166$) presented with sepsis and, of these, 45.2% ($n=75$) with multiorgan dysfunction. The median length of stay was 3 days (IQR 6), 52.4% ($n=120$) required invasive mechanical ventilation (IMV) with a median IMV time of 79 h (IQR 139.5). The overall mortality in the ICU was 25.3% ($n=58$), among survivors, one-year mortality was 45.0% ($n=77$) and two-year mortality was 22.3% ($n=21$). Age, sepsis with multiorgan dysfunction, IMV and the SAPS II value were predictors of mortality. The presence of chronic lung disease, multiple comorbidities, worst admission performance status and advanced cancer staging were predictors of one-year mortality. Type of malignancy, previous treatments and recurrence/progression of malignancy did not influence mortality.
**Conclusions:** The multiplicity of available treatments, as well as the emerging of precision medicine programs with targeted therapies, are transforming cancer into a chronic day-to-day disease, that influences short and long ICU outcomes globally as others comorbidities. The results suggest that ICU mortality did not correlate with type, stage nor recurrence/progression of malignancy, as it is related to the severity of the acute illness at admission. The one-year mortality appears to be correlated to worst performance status, presence of multiple comorbidities and advanced refractory malignancy, as expected in the literature. The two-year mortality has no clear correlating factors, which reinforces the chronic disease overview.

**Topic:** Haematologic-oncologic issues in the ICU

## 001329

### Analysis of mortality in severely burned patients admitted to an Intensive Care Unit

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**Introduction:** The care of severely burned patients in the intensive care setting presents considerable challenges, with a mortality rate reflecting the complexity of their management. Analyzing the various determinants of severe complications in this patient population poses a challenge, as does understanding their impact on mortality. By comprehending these factors, we can better guide our strategies to improve outcomes in this highly vulnerable population.
**Objectives:** Analyzing the epidemiological and clinical characteristics, as well as the development of complications in severely burned patients admitted to an Intensive Care Unit, identifying factors that may influence increased mortality in these patients.
**Methods:** This is a descriptive, retrospective, and observational study of patients with severe burns admitted to a third-level hospital ICU over a period of three years. Background information (Charlson comorbidity index) and clinical variables were collected, including the burned body surface area, fluid resuscitation in the first 24 and 48 h (Parkland formula), severity scores such as SOFA and ABSI, days on mechanical ventilation, presence of ventilator-associated pneumonia, as well as length of stay in the ICU and hospital. The study aimed to identify patients who died and the cause of death (associated with hypoxemia or sepsis).
**Results:** The study included 85 patients, of whom 23 died (27.1%). The mean age was $57.9 \pm 13$ in the deceased group and $41.59 \pm 14.9$ in the survivors ($p < 0.001$). In the deceased group, the mean Charlson comorbidity index was $1.5 \pm 1.4$ vs $0.67 \pm 1.38$ in survivors ($p$ 0.023). Severity scores showed higher values in the deceased group: SOFA of $8.26 \pm 2.5$ vs $4.23 \pm 2.2$ in survivors ($p$ 0.01), ABSI of $10.6 \pm 1.92$ vs $7.62 \pm 2.51$ in survivors ($p$ 0.001), as well as statistical significance ($p$ 0.001) when analyzing the burned body surface area (deceased $50.5 \pm 18.33$ vs survivors $32.86 \pm 19.35$). Similarly, more aggressive fluid resuscitation (adjusted by the Parkland formula) in the first 24 h was associated with higher mortality (deceased 16,400 ml $\pm$ 6,600 vs survivors 10,700 $\pm$ 5,900, $p$ 0.002), with no significant difference between both groups in resuscitation in the first 48 h. The most common burn mechanism in both groups was deflagration (60% of cases). Septic shock predominated as the cause of death (n 15, 68.1%). There was no statistical significance ($p < 0.05$) regarding the analysis of days on mechanical ventilation or ventilator-associated pneumonia in this study concerning mortality.
**Conclusions:** In our experience, medical history, burned body surface area, severity scores at admission, and initial fluid resuscitation play important roles in the outcome of severely burned patients. Severe burns remain a significant cause of mortality in the ICU, either due to the consequences of the thermal trauma itself or potential serious complications during their hospital stay.

**Topic:** Trauma

## 001330

### Neurological Pupil Index (NPi) for early prediction of clinical neurological deterioration

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**Introduction:** The recently published ORANGE study1 described the association of the Neurologic Pupil Index (NPi), measured via an automated pupillometry, with neurologic outcome and mortality after acute brain injury (ABI). No data on the predictive value of NPi for clinical neuroworsening are available.
**Objectives:** To assess the relationship between changes in NPi values and the occurrence of clinical neuroworsening in patients with head trauma.
**Methods:** Secondary analysis of traumatic brain injury (TBI) patients included in a previous multicenter, prospective, observational cohort study. NPi measurements and clinical evaluation were performed at least six times per day from recruitment day up to seven days maximum. The lowest NPi value between both eyes was used. Clinical neuroworsening was defined as one point decrease in the motor Glasgow Coma Scale (mGCS). In all patients, NPi data in the days with neuroworsening (starting from the previous day) were compared to those without neuroworsening (using the same timeframe). A multilevel mixed-effects logistic regression model with a random intercept was employed to estimate the association between the NPi and clinical neuroworsening.
**Results:** Among the 514 patients in the study, 224 (44%) suffered from TBI and were included in the final analysis. Median age was 54 (34–72) years, and 170 (76%) patients were male; 66% of patients had GCS on admission < 9, while 44% had a mGCS of 5–6. Over a total of 2950 days on available monitoring, 263 (8.9%) episodes of clinical neuroworsening were identified. In the multilevel mixed-effects logistic regression model, a reduction of NPi was associated with a decreased probability of clinical neuroworsening (odds ratio 0.93 [0.86–1.00]; $p = 0.054$).
**Conclusions:** According to this analysis, we observed an association between changes in NPi values and the occurrence of clinical neuroworsening.

**Topic:** Neurointensive care

## 001331

### Comparison between pressure support ventilation and spontaneous ventilation during emergence and extubation in reducing post operative atelectasis in patients undergoing major abdominal surgeries: a randomized controlled trial—an interim analysis

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**Introduction:** General anaesthesia reduces functional residual capacity (FRC), which is mainly contributed by formation of atelectasis in the dependent lung region. Atelectasis causes postoperative hypoxemia and may contribute to the development of postoperative pulmonary complication (POPC), which is common in open abdominal surgeries. In comparison to patients with pressure support ventilation, risk of atelectasis is higher in patients with manual support due to pain induced respiratory muscle restriction, fatigue, inadequately restored FRC. PSV applies a fixed amount of pressure through each breath and thus augments one's respiration and helps in preventing post op atelectasis.
**Objectives:** The primary objective was to compare the effects of pressure support ventilation and spontaneous ventilation (control) during emergence and extubation on incidence of atelectasis and oxygenation during extubation and in post-anaesthesia care unit (PACU) in patients undergoing major open abdominal surgeries.

- Comparison of PaO2 between both groups.
- Events of Spo2 < 92% during PACU stay and 48 h after surgery in both groups.
- Comparison of POPC.
- Duration of hospital stay.
- Extubation time (Time taken from start of extubation protocol till extubation).

**Methods:** It is a single centred randomized controlled double-blinded trial. The sample size was calculated to be 134. We have done interim analysis after recruitment of 62 patients ($n = 62$). Patients were randomly assigned to pressure support ventilation group ($n = 27$) and control group ($n = 32$). During emergence, PSV was used in the pressure support group versus intermittent manual assistance in the control group. Lung ultrasound score was noted at four time points (T1-T4). POPC (post-operative pulmonary complication) was assessed till third postoperative day by Melbourne Group Scale. All patients were followed till hospital discharge and duration of postoperative hospital stay was also noted.
**Results:** Incidence of atelectasis was lower in PSV group than control group during both extubation and in PACU extubation—2 of 27 [7%] vs. 10 of 32 [28%] $P = 0.052$; at 30 min in PACU—4 of 27 [14%] vs 12 of 32 [34%] $P = 0.14$). PaO2—pressure support group than in control group in PACU (131?70 mmHg vs 115?57 mmHg $P = 0.4$). There was no difference in incidence of Spo2 < 92% during 48 h postoperatively between the groups ($P = 0.25$). There were no difference in incidence of POPC ($P = 0.2$) or duration of extubation ($P = 0.2$) or duration of hospital stay ($P = 0.26$) between two groups.
**Conclusions:** The incidence of postop lung atelectasis was lower and PaO2 was higher in patients who received pressure support ventilation compared to control group.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001332

### Is SpO2/FiO2 a surrogate of PaO2/FiO2 in ARDS assessment?

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**Introduction:** The ratio of SaO2/FiO2 has been recently proposed as a surrogate of PaO2/FiO2 in the finding of ARDS severity. In this study, we investigated the relationship between these two variables in theory and practice.
**Methods:***Effect of pH: Theory:*
1. We compute, at a given SpO2/FiO2 ranging from 50 to 350, what was the FiO2 fraction which generated 97% hemoglobin oxygen saturation;
2. We then iteratively computed the PaO2 corresponding to that FiO2 fraction (Kelman's equation) in the standard hemoglobin oxygen dissociation curve (pH 7.4, PaCO2 40 mmHg, temperature 37 °C);
3. The same procedure was repeated using the hemoglobin oxygen dissociation curve at pH of 7.0 and 7.8, according to Kelman.

SpO2/FiO2 and PaO2/FiO2 relationship in practice
In 304 ARDS patients, we compared the SpO2/FiO2 and PaO2/FiO2 measured at 5 and 15 cmH2O of PEEP.
**Results:** In Panel A and Panel B, we show the effect of pH on the relationship between PaO2/FiO2 and SpO2/FiO2. As an example, at FiO2 of 0.4, patients classified as moderate according to PaO2/FiO2 classification (Panel B), may shift to the mild category if pH is 7.0 and to the severe category if pH is 7.8 (Panel A). Note that the blood pH is only one of the several variables that may affect the oxygen dissociation curve (as PCO2, 2,3-DPG, and temperature). The relationship between PaO2/FiO2 and SpO2/FiO2 in real life is presented in Panel C; as shown, a PaO2/FiO2 of 100 may be associated, as an example, with a SpO2/FiO2 ranging from 100 to over 300.

**Conclusions:** The use of SpO2/FiO2 as a surrogate of PaO2/FiO2 is highly questionable and may lead to inadequate clinical decisions when used to classify the ARDS severity instead of the PaO2/FiO2.

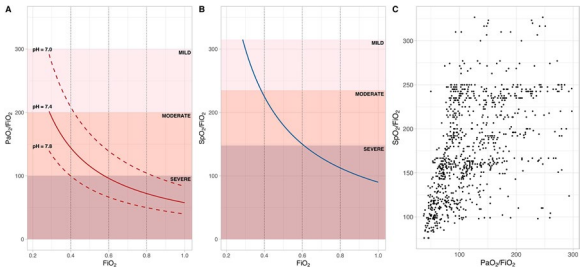


**Fig. (abstract 001332)** Comparison between PaO2/FiO2 and SpO2/FiO2. Panel A represents a theoretical model referred to PaO2/FiO2 at different FiO2 computed with Kelman's equation at three different pH. Panel B represents a theoretical model referring to SpO2/FiO2 at different FiO2; this second model is computed starting from SpO2/FiO2, ranging from 50 to 350, and SpO2 of 97% (see text for mathematical details). Panel C represents the relationship between PaO2/FiO2 and SpO2/FiO2 in a population of 304 ARDS patients

**Topic:** Acute respiratory failure and mechanical ventilation

## 001333

### Ultrasonographic subcutaneous oedema assessment for cumulative fluid balance and ICU outcome—an interim analysis of prospective observational study

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**Introduction:** Maintaining fluid homeostasis is an integral part of caring for critically ill patients.
When a critically ill patient has excess fluid in their body, it is associated with organ failure, higher morbidity and mortality. There are multiple shortcomings to the conventional techniques for monitoring changes in fluid status. Subcutaneous edema formation may result from positive cumulative fluid balance, which can be measured objectively with ultrasonography (USG).
**Objectives:** In our study, we used USG to quantify subcutaneous edema on days 1, 3, and 7 of the ICU stay, assessed its prognostic utility in predicting 28-day mortality, and analyzed how it correlated with cumulative fluid balance (CFB).
**Methods:** This study is being conducted in AIIMS Delhi from November 2023 to December 2025. Patients admitted in ICU within 72 h of hospitalization after meeting the inclusion criteria are being enrolled. Ultrasonography is performed at 12 defined regions, and ultrasonographic subcutaneous edema is scored between 0 and 4 as per the FLUID protocol (*). The total USG scores at day-1, 3, 7, along with the change in the USG scores at day3 (day3-day1), day7 (day7-day1) are calculated.
We are reporting an interim analysis of the patients enrolled till 10 March 2024.
Data have been analysed using SPSS software version 29.0.
**Results:** 44 patients (18 surgical, 26 medical) were included in this interim analysis. The median age was 33.5 years (IQR: 25–44). 15

patients had ICU stay < 7 days (7 died, 8 shifted out) and 28-day mortality was 42%. The median CFB on day-1, 3 and 7 were + 1050 ml (range: − 800 ml to + 4750 ml), + 1600 ml (− 1350 ml to + 3750 ml), and + 2500 ml (+ 80 ml to + 4595 ml), respectively.
The total USG score and CFB at day-1 did not correlate with the 28-day mortality. The change in USG score at day-3 and 7 weakly correlated with CFB at day-3 ($r = 0.25$, $p = 0.03$) and CFB at day-7 ($r = 0.37$, $p = 0.038$), respectively. The 28-day mortality showed moderate and strong correlation with the change in USG score at day-3 ($r = 0.52$, $p = 0.005$), and the change in USG score at day-7 ($r = 0.78$, $p = 0.001$), respectively, whereas it showed weak and moderate correlation with CFB at day-3 ($r = 0.32$, $p = 0.03$) and CFB at day 7 ($r = 0.58$, $p = 0.001$), respectively.
A decreasing trend in the USG score by day 7 from day 1 or day 3 showed very high correlation with 28-day ICU mortality ($r = 0.82$, $p = 0.0001$). Receiver operator curve which was plotted for the same showed an area under the curve of 0.90 (CI: 0.88-0.92, $p = 0.0001$). Cutoff value of -8 showed sensitivity of 100% and specificity of 82%, respectively.
**Conclusions:** The ultrasonographic subcutaneous edema score performed better in predicting the 28-day mortality in ICU patients and had a limited correlation with cumulative fluid balance. One novel and more precise method for determining the cumulative fluid status of ICU patients is subcutaneous ultrasonography.

**Topic:** Imaging in intensive care

## 001334

### Impact of pre-transplant renal dysfunction on 6-month graft survival: a propensity score matched analysis of living versus deceased donor liver transplantation

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**Introduction:** Pre-existing renal dysfunction before liver transplantation (LT) is related to the transition to post-LT renal complications, which increases in-hospital stay, graft failure, and mortality. Although living donor liver transplantation (LDLT) is known to have superior post-transplant outcomes compared with deceased donor liver transplantation (DDLT), a previous study among patients with low eGFR showed worse survival for eGFR-low patients receiving LDLT compared to DDLT.
**Objectives:** We attempted to compare medically matched transplant recipients and evaluate the effect of pre-existing renal dysfunction on short-term graft survival of LDLT versus DDLT.
**Methods:** This was a retrospective cohort study of 1,530 LDLT recipients and 549 DDLT recipients between May 1995 and December 2021. To reduce selection bias, a 1:1 ratio propensity score-matched analysis between LDLT recipient and DDLT recipient was performed. After matching, 445 cases in each group were additionally divided into subgroups based on the presence of pre-LT renal dysfunction. Pre-LT renal dysfunction was defined as serum creatinine level ≥ 1.5 mg/dL at the time of LT or the need for renal replacement therapy within 3 months before LT. Six-month graft failure, and mortality between groups were analyzed.
**Results:** Of the 445 patients in each group, the prevalence of pre-LT renal dysfunction was 162 (36%) in LDLT group and 178 (40%) in DDLT group. The incidence of 6-month graft failure was significantly higher in patients with pre-LT renal dysfunction regardless of donor type ($p = 0.002$ in LDLT and $p = 0.016$ in DDLT) (Table 2). However, no statistically significant difference was found in 6-month graft failure and 6-month mortality between DDLT recipients (D group) and LDLT recipients with pre-LT dysfunction (LR group) ($p = 0.435$ and $p = 0.31$, respectively). After adjustment, the Cox proportional hazard regression analysis revealed that the donor type of LT and the presence of pre-LT renal dysfunction were independent predictors of 6-month graft failure [Hazard ratio (HR) 1.73 (95% CI, 1.11–2.61) and HR 1.66 (95% CI, 1.03–2.69), respectively]. In addition, compared to group LR, there was no significant difference in graft failure risk between the D and DR groups (Figure 1).
**Conclusions:** In conclusion, the presence of pre-LT renal dysfunction at the time of LT shows negative effect in both LDLT and DDLT. Interestingly, LDLT recipients with pre-LT renal dysfunction did not show superior graft and patient survival over DDLT recipients without pre-LT renal dysfunction. Our findings suggest that optimal renal function is an important factor for postoperative liver transplantation outcome regCardless of the donor type.

**Table 1 (abstract 001334)** Recipient characteristics at transplantation

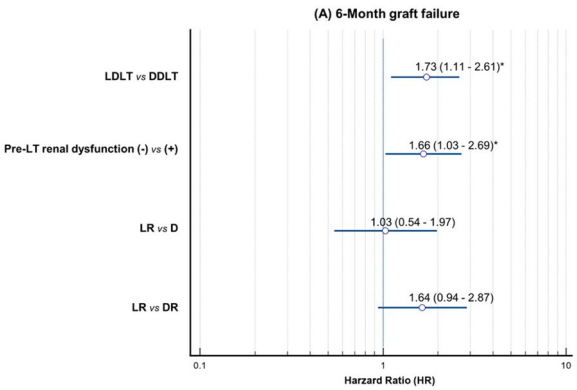
| Variable | Before matching | | | 1:1 After matching | | |
|---|---|---|---|---|---|---|
| | LDLT (n=1530) | DDLT (n=549) | p-value | LDLT (n=445) | DDLT (n=445) | p-value |
| Age, years | 53 [47 – 58] | 51 [43, 59] | 0.002 | 51 [45 – 57] | 51 [43 – 60] | 0.144 |
| Male, n (%) | 1174 (77) | 363 (66) | <0.001 | 301 (68) | 303 (68) | 0.886 |
| Height, cm | 167 [161 – 172] | 166 [160 – 172] | 0.193 | 167 [160 – 172] | 166 [161 – 172] | 0.888 |
| Weight, kg | 67 [60 – 75] | 65 [57 – 74] | 0.272 | 66 [57 – 74] | 66 [58 – 74] | 0.659 |
| Body mass index, | 24.1 [22.1 – 26.4] | 23.8 [21.3 – 26.5] | 0.477 | 23.8 [21.7 – 26.4] | 23.8 [21.4 – 26.5] | 0.513 |
| Diabetes, n (%) | 311 (20) | 118 (21) | 0.562 | 90 (20) | 101 (23) | 0.369 |
| MELD score | 17.8±10.41 | 29.68±10.48 | <0.001 | 28 [18 – 37] | 29 [19 – 37] | 0.927 |
| **Underlying diagnosis (multiple diagnosis possible)** | | | | | | |
| Hepatitis A virus | 15 (1) | 7 (1) | 0.563 | 7 (2) | 7 (2) | >0.999 |
| Hepatitis B virus | 1080 (71) | 305 (56) | <0.001 | 286 (64) | 277 (62) | 0.531 |
| Hepatitis C virus | 100 (7) | 36 (7) | 0.986 | 27 (6) | 33 (7) | 0.422 |
| Hepatocellular carcinoma (HCC) | 857 (56) | 153 (28) | <0.001 | 136 (31) | 143 (32) | 0.613 |
| Alcoholic | 177 (12) | 114 (21) | <0.001 | 76 (17) | 83 (19) | 0.540 |
| Others | 151 (10) | 59 (11) | 0.558 | 54 (12) | 49 (11) | 0.600 |
| **Preoperative laboratory findings** | | | | | | |
| Serum creatinine (SCr) | 0.82 [0.68 – 1.00] | 1.11 [0.79 – 1.90] | <0.001 | 1.00 [0.71 – 1.59] | 1.04 [0.75 – 1.73] | 0.155 |
| Albumin | 3.19±0.65 | 3.02±0.51 | <0.001 | 2.9 [2.6 – 3.3] | 3.0 [2.7 – 3.3] | 0.257 |
| International normalized ratio (INR) | 1.84±1.19 | 2.65±1.65 | <0.001 | 2.27 [1.62 – 3.20] | 2.12 [1.69 – 2.99] | 0.392 |
| Total bilirubin (TB) | 8.27±12.93 | 18.55±15.48 | <0.001 | 10.4 [ 3.2 – 32.2] | 12.2 [3.3 – 30.3] | 0.629 |
| **Preoperative status, n (%)** | | | | | | |
| Previous mechanical ventilation | 35 (2) | 74 (13) | <0.001 | 29 (7) | 40 (9) | 0.168 |
| On-dialysis | 114 (7) | 66 (12) | 0.001 | 43 (10) | 47 (11) | 0.657 |
| Presence of ascites | 859 (56) | 369 (67) | <0.001 | 338 (76) | 312 (70) | 0.050 |
| Hepatic encephalopathy | 305 (20) | 195 (36) | <0.001 | 166 (37.3) | 152 (34) | 0.327 |
| Varix bleeding | 256 (17) | 88 (16) | 0.879 | 84 (19) | 80 (18) | 0.884 |

Data are expressed as median [interquartile range] or frequency (%). DDLT, deceased donor liver transplantation; LDLT, Living donor liver transplantation; MELD, Model for End-Stage Liver Disease.

**Table 2 (abstract 001334)** Postoperative outcomes following liver transplantation

| | Group, No. of recipients (%) | | | | | Post hoc analysis, p-value | | | |
|---|---|---|---|---|---|---|---|---|---|
| | L, 283 | LR, 162 | D, 267 | DR, 178 | P value | L vs LR | D vs DR | LR vs D | LR vs DR |
| 6-month graft failure | 17 (6) | 21 (13)* | 28 (11)* | 33 (19)*‡ | <0.001[a] | 0.002 | 0.016 | 0.435 | 0.161 |
| 6-month mortality | 25 (9) | 31 (19)* | 41 (15)* | 51 (29)*†‡ | <0.001[a] | 0.002 | 0.001 | 0.31 | 0.041 |

[a]p-value was derived from Kruskal-Wallis test.
[b]p-value was derived using Chi-square test.
Post hoc analysis of each subgroup was performed using the chi-square test or Mann–Whitney U test.
* P <0.05 versus Group A
† P <0.05 versus Group B
‡ P <0.05 versus Group C

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**Topic:** Perioperative care

## 001335

### Greek health care workers' compliance concerning the hand hygiene in the Intensive Care Unit

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**Introduction:** Intensive Care Units (ICUs) are among the hospital wards with the highest prevalence of healthcare acquired infections (HAIs) leading to increased length of stay, significantly higher costs, morbidity, and mortality. Most HAIs can be avoided with the implementation of infection prevention measures among which hand hygiene is of paramount importance in the reduction of infection transmission in hospitals [1].
**Objectives:** To measure hand hygiene compliance of health care workers before and after implementing an educational program according to WHO guidelines in a Greek University hospital.
**Methods:** The study was conducted in the ICU of Patras University Hospital and was divided into three parts, assessment of baseline compliance, training, and finally compliance assessment after training. Total duration was three months and the method used for measuring compliance was "direct observation".
**Results:** The overall hand hygiene compliance rate increased from 33.3% to 49.4%. Hand washing was the preferred hand hygiene technique and its rate increased from 27.8% to 33.4% followed by alcohol-based hand rubbing reaching 16% from 5.5%. The use of gloves as a substitution for hand hygiene was reduced from 66.8% to 49.6%. Among healthcare workers (HCW), nurses almost doubled their compliance rate (37.5% to 60.6%), whereas doctors rates remained unchanged by the training program (29.6% to 29.8%). Hygiene moment rates that were affected the most were before touching a patient (10% to 21%), after touching a patient (59.9% to 73%) and after touching patient surroundings (46.2% to 56.7%). Nurses increased their compliance rates in all five hygiene moments, doctors in the first and the fifth moment and the rest of the personnel in the first and fourth moment. Alcohol-based handrub use increased among nurses from 23.2% to 76.8%, among doctors from 33.3% to 66.7% and remained at 50% for the rest HCW. Finally, hand washing with soap rate was increased among nurses from 40.7% to 59.7% and decreased among doctors and the rest HCW from 55.9% to 44.1% and from 54.5% to 45.5%, respectively.
**Conclusions:** The results of this study demonstrate that a training program can be effective and successful in increasing overall hand hygiene compliance among most healthcare workers. Further research is needed to elucidate the causes that contributed to the physician's low compliance rates and lack of improvement after training. Education and training of health care workers in hand hygiene are recommended as essential practices for improving hand hygiene but differences between HCW groups suggest the need for a tailored training program.

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**Topic:** Infections and prevention

## 001337

### Effects of ventilator settings on the indexes of inferior vena cava in critically ill patients during respiratory support with spontaneous activity

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**Introduction:** The distension of the inferior vena cava (IVC) has been widely accepted for assessing fluid responsiveness in critically ill patients undergoing passive positive pressure ventilation. However, the use of ultrasound to assess the IVC poses challenges, particularly regarding whether the IVC collapses or distends in critically ill patients receiving ventilatory support with spontaneous activity.
**Objectives:** Therefore, this study aimed to investigate the impact of pressure support ventilation (PSV) on the likelihood of IVC collapse or distension.
**Methods:** A total of 12 PSV-mode ventilator settings, comprised of pressure support (PS) and positive end-expiratory pressure (PEEP) at 0/0, 0/5, 0/10, 5/0, 5/5, 5/10, 10/0, 10/5, 10/10, 15/0, 15/5, and 15/10 cmH2O, were randomly assigned to patients to minimize biases from period and sequence effects. After two minutes on each ventilator setting, we observed whether the IVC collapsed or distended during the inspiratory phase of ventilation and measured IVC diameter at end inspiration (IVCei) and end expiration (IVCee). The IVC collapsibility index (cIVC) and IVC distensibility index (dIVC) were calculated as (IVCee-IVCei)/IVCee*100 and (ICVei-ICVei)/IVCee*100, respectively.
**Results:** Sixty adult ICU patients were involved, with an average age of 67 and 55% male. The IVC were mostly collapse at almost 85% of all observations. The probability of IVC collapse was notably higher at lower PS and PEEP levels, while the IVC exhibited a trend toward distension at higher ventilator settings. The IVC collapsed at low levels of PS/PEEP (at 0/0 and 0/5, probability of IVC collapse = 100%). The probability of IVC collapse was lower at higher PS/PEEP (at 10/10 and 15/10, probability of IVC collapse = 82% and 60%, respectively). Furthermore, there were greater calculated cIVC values at lower levels of PS/PEEP compared with higher levels. For instance, the cIVC at PS/PEEP 0/0, 0/5, 10/10, and 15/10 cmH2O were 38%, 30%, 20%, and 19%, respectively. A greater level of PS had a significantly negative impact on the cIVC, with $p < 0.001$ at all PEEP levels (Fig. 1A). This negative impact was also found when the level of PEEP was increased, with $p < 0.001$ at all PS levels (Fig. 1B).
**Conclusions:** In patients ventilated with spontaneous activity, it was observed that the IVC often exhibited collapsibility, especially at low levels of PS/PEEP. In addition, the cIVC was found to be lower with high levels of PS and PEEP. This might be one reason that limits the interpretation of IVC to assess FR among patients with spontaneous activity.

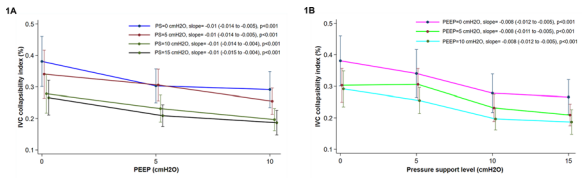


**Fig. (abstract 001337)** The IVC collapsibility index according to the levels of pressure support (1A) and positive end expiratory pressure (1B)

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**Topic:** Imaging in intensive care

## 001340

### Respiratory failure in severe burn patients: prevalence and risk factors

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**Introduction:** Severe burn injury constitutes a complex pathology that involves longer ICU and hospital stay compared to other critical care entities, with a high mortality rate in published European registries and studies. Up to 34% of death causes after the first 48 h is due to acute respiratory failure, yet its prevalence among burn patients, severity and etiology are not well documented.
**Objectives:** To determine the prevalence of hypoxemic respiratory failure in severe burn trauma patients and the risk factors associated with its occurrence.
**Methods:** Analytical, observational, and retrospective study of patients admitted to a third-level ICU for severe burn injury between 2021 and 2023. Demographic variables, comorbidities using the Charlson index, burn-related factors (mechanism, burned body surface area (BSA), fluid therapy administered in the first 24 and 48 h, airway involvement, and inhalation syndrome), onset of severe hypoxemia (PaO2/FiO2 < 200) in the first 14 days and its etiology (adult respiratory distress syndrome (ARDS), fluid overload, respiratory infection (VAP)), hospital mortality, and ICU and hospital stay are collected. Means and standard deviations of quantitative variables, as well as proportion of qualitative variables are calculated. Student's *T*-test and Chi-square test are used for hypothesis testing. For the statistical analysis, SPSS package (v. 25) is used.
**Results:** A total of 70 patients were registered, with a mean age of 45 years (SD 16). The observed population was constituted mostly by males (54%) with a low Charlson comorbidity index (1, SD 1) and mean BSA of 39% (SD 21).
Thirty-five patients (50%) presented hypoxemic respiratory failure in the first 14 days, with a clinical onset on the 6th day as mean (SD 11). 80% had clinically documented fluid overload (OR 132, 95% CI [15, 238]) and 82.4% had a VAP diagnosis when respiratory deterioration occurred (OR 12.9, 95% CI [4, 41]). 57% met ARDS criteria.
An association was observed between the onset of hypoxemia and higher BSA (34% vs. 45%, $p = 0.03$); and higher score on the Abbreviated Burn Severity Index (ABSI) (8 vs. 9, $p = 0.019$). Fluid therapy administered in the first 24 h was also associated with this (10,338 vs. 14,740 ml, $p < 0.01$). Airway involvement or inhalation were not associated with a higher risk of hypoxemia.
Regarding the course of the disease, 68% of patients required neuromuscular blockade, and 11 subjects (31.4%) prone positioning, with an average improvement in PaO2/FiO2 of 108 (SD 69). 40.6% required tracheostomy, and associated with longer ICU stay (33 vs. 14, $p = 0.05$) and days of mechanical ventilation (23 vs. 7, $p < 0.01$). Mortality was higher but not significant compared to patients who did not experience hypoxemia (37% vs. 17%, OR 2.8 [0.93, 8.78]).
**Conclusions:** In our center, the incidence of moderate-severe hypoxemic respiratory failure in the first 14 days is high (50%). Factors associated with its development are VAP, fluid overload, high ABSI score, and greater fluid therapy in the first 24 h. Its onset determines higher mortality and longer ICU stay.

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**Topic:** Trauma

## 001345

### Predictive models for admission in patients with solid organ tumors assessed in the ICU

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**Introduction:** The increasing incidence of cancer and technological advancements highlight the growing importance of oncology in the ICU, complicating decisions regarding intensive treatment. Collaboration between oncologists and intensivists is crucial for establishing admission guidelines. Admission to the ICU may not involve new treatments but intensive monitoring to optimize existing measures and align treatment with the patient's values and goals.

**The decision not to admit to the ICU requires a comprehensive evaluation of the patient, considering their cognitive, functional, and clinical status, preferences, comorbidities, and prognosis. To identify the variable or combination thereof that best predicts the probability of ICU admission is key.**
**Methods:** This is a prospective observational study that includes patients over 18 years old with solid-organ tumors experiencing an acute event and requiring evaluation by the intensive care team for ICU admission.
**Results:** The total cohort consists of 215 patients, of which 173 were admitted to the ICU. We found a higher probability of admission in men than in women (OR = 2.62, [95% CI = 1.10–6.23]) ($p = 0.029$) and a lower probability of admission if the patient was a smoker (OR 0.27, [95% CI = 0.09–0.80]) ($p = 0.018$).
Significant differences were found between admitted and non-admitted patients in the presence of heart disease and renal insufficiency. 28.57% ($n = 12$) of patients with heart disease were not admitted to the ICU, while only 14.45% ($n = 25$) of patients were admitted ($p = 0.038$). Regarding renal insufficiency, 11.90% ($n = 5$) of non-admitted and 2.31% ($n = 4$) of admitted patients had this condition ($p = 0.005$).
Regarding tumor status, patients in stage II and stage III had a reduced risk of ICU admission by 97–98% compared to patients in stage I (OR = 0.03 [95% CI = 0.01–0.16] for stage II) and (OR 0.02 [95% CI = 0.00–0.13] for stage III). Patients in progression status were 86% less likely to be admitted to the ICU than those in induction status (OR = 0.14, (OR = 5.94, [95% CI = 0.05–0.39]).
34.68% ($n = 60$) of patients who had undergone surgical treatment were admitted to the ICU, however, only 11.90% ($n = 5$) of those with

such treatment were not admitted to the ICU. All patients in neoadjuvant treatment were admitted to the ICU and no patient in palliative treatment did so. Patients undergoing previous surgical treatment increased the risk of ICU admission by 6 times compared to those who had no oncological treatment (OR = 5.94, [95% CI = 1.59–22.15].
Patients with ECOG 2 or Karnofsky 70–50 have a significantly lower probability (OR = 0.05 [95% CI = 0.01–0.14]) ($p < 0.001$) of being admitted to the ICU compared to those with ECOG 0–1 or Karnofsky 100–80, respectively. Patients in ECOG 3–4 or Karnofsky 40–10 situations have an even lower probability of admission to the ICU (OR = 0.02 [95% CI = 0.00–0.09]) ($p < 0.001$).
The models evaluated in this study comprise different combinations of relevant clinical variables. Model 1, includes the weighted sum of the following variables: ECOG, tumor status, vital prognosis, oncological disease status, age, former smoker status, tumor extent, and renal insufficiency. Subsequent models (2, 3 and 4) represent variations of Model 1, each selectively removing one or more specific variables. In Model 2, the ECOG was excluded; in Model 3, ECOG and tumor status; in Model 4, ECOG, tumor status and vital prognosis.
Graph 1 shows the predictive capability of these models for ICU admission. The results revealed that Model 1 had the highest AUC of 0.962 (95% CI: 0.939–0.985), followed by Model 2 with an AUC of 0.952 (95% CI: 0.926–0.979).
**Conclusions:** In our work, we present different predictive models for income in patients with solid-organ tumors experiencing an acute event. The model that encompasses the ECOG scale, tumor status, vital prognosis, oncological disease status, age, former smoker status, tumor extent, and renal insufficiency is the one that best predicts the probability of admission to the ICU.

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**Topic:** Ethics and end of life care

## 001349

## The mechanism of ACE2/MasR/ERK signaling pathway involved in LPS-induced inflammatory injury of human pulmonary microvascular endothelial cells

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**Introduction:** The main pathophysiological features of acute lung injury and acute respiratory distress syndrome (ALI/ARDS) are damage of pulmonary microvascular barrier, and overactivation of the inflammatory cascade. Angiotensin converting enzymes 2 (ACE2) may reduce the inflammatory response by enhancing angiotensin-(1-7) [Ang-(1-7)] and its receptor (Mitochondrial assembly receptor, MasR).
In this study, the inflammatory injury model of human pulmonary microvascular endothelial cells (HPMECs) induced by lipopolysaccharide (LPS) was used to investigate the dose-related changes in ACE2 expression. We also used the ACE2-specific agonist DIZE and antagonist MLN-4760 to preliminarily elucidate the mechanism of ACE2 regulation of the pulmonary microvascular barrier in ARDS. Trying to find theoretical basis for the identification of potential therapeutic targets for ARDS.
**Methods:** 1. Establishment of an LPS-induced acute lung injury cell model.
2. The effect of activating or inhibiting ACE2 on cell damage and related protein expression in HPMECs. HPMECs were pre-cultured with $2 \times 10\text{-}5$ M ACE2 agonist DIZE for 12 h, then 100 ng/ml LPS was added for 24 h; HPMECs were pre-cultured with 10-4M ACE2 antagonist MLN-4760 for 30 min then 100 ng/ml LPS was added for 24 h.
3. The effect of inhibiting MasR on cell damage and related protein expression in HPMECs. HPMECs were pre-cultured with $5 \times 10\text{-}5$ M MasR antagonist A779 for 4 h, then 100 ng/ml LPS was added for 24 h.
**Results:** 1. Dose experiments showed that: LPS stimulation caused a decrease in the cell viability of HPMECs and an increase in LDH activity released into the culture medium compared to the control group. In addition, the cell viability became worse with increasing concentrations of LPS stimulation in a dose-related manner;
2. LPS stimulation promoted ACE2 protein expression. Compared with the control group, ACE2 protein levels were increased in HPMECs at different doses of LPS for 24 h with the most significant increase in ACE2 in the 100 ng/ml group, which was $(2.24 \pm 0.57)$ times higher compared with the control group;
3. ACE2 agonist DIZE acting on HPMECs under stimulation of LPS injury: (1) did not affect ACE2 protein expression, (2) decreased its LDH release activity, (3) decreased its release of pro-inflammatory factors IL-1β and IL-6, (4) down-regulated LPS-induced increased Ang II release, (5) did not affect the level of Ang-(1-7) release, (6) increased the expression of the Ang-(1-7) receptor MasR, approximately $(1.30 \pm 0.08)$ times of the LPS group, (7) attenuated the phosphorylation level of ERK, approximately $(0.82 \pm 0.10)$ times of the LPS group;
4. ACE2 antagonist MLN-4760 acting on HPMECs under stimulation of LPS injury: (1) decreased ACE2 protein expression, (2) elevated its LDH release activity, (3) promoted the release of the pro-inflammatory factors IL-1β and IL-6, (4) had no effect on the LPS-induced Ang II release induced by LPS, (5) reduced the level of Ang-(1-7) release, (6) reduced the expression of the Ang-(1-7) receptor MasR, approximately $(0.66 \pm 0.07)$ times of the LPS group, (7) attenuated the phosphorylation level of ERK approximately $(0.74 \pm 0.04)$ times of the LPS group.

5. MasR inhibitor A779 acting on HPMECs under stimulation of LPS injury: (1) did not affect ACE2 expression, (2) did not affect Ang II and Ang-(1-7) release induced by LPS, (3) decreased the expression of Ang-(1-7) receptor MasR, approximately ($0.72 \pm 0.13$) times of the LPS group, (4) attenuated the phosphorylation level of ERK, approximately ($0.77 \pm 0.03$) times of the LPS group.
**Conclusions:** The expression of ACE2 was up-regulated in the HPMECs cell injury model induced by LPS. Activation of ACE2 could up-regulate the expression of MasR, reduce the phosphorylation level of ERK and reduce the release of inflammatory factors. It indicated that during the development of ALI/ARDS, ACE2 may act through MasR/ERK signaling pathway. The pathway reduces pulmonary microvascular endothelial cell damage and plays a role in lung protection.

**Topic:** Acute respiratory failure and mechanical ventilation

### 001350

### Optimizing linezolid therapy in critically ill septic adults following high-risk cardiovascular surgery

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**Introduction:** Sepsis-induced pathophysiological changes can result in serious alterations in the pharmacokinetic parameters of antibiotics. Drug exposure is consequently difficult to predict in critically ill septic patients. The latest Surviving Sepsis Campaign guidelines recommend routine therapeutic drug monitoring (TDM) to optimize antibiotic therapy in this patient population. Linezolid is an oxazolidinone antibiotic used to treat infections caused by Gram-positive bacteria. The prevalence of its adverse effects is associated with higher exposure, while suboptimal concentrations can lead to treatment failure and an increased risk of clonal evolution of resistant strains.
**Objectives:** The aim of the study was to determine optimal dosing strategies guided by TDM results among critically ill septic adult patients following high-risk cardiovascular surgery within the intensive care units of a national cardiovascular surgery center.
**Methods:** Consecutive patients receiving empiric or targeted linezolid therapy with TDM guidance were included between April 2022 and March 2024. Blood samples, promptly centrifuged, allowed for the measurement of serum linezolid levels within 24 h using high-performance liquid chromatography with light absorbance detection (HPLC–UV). Trough levels were assessed under intermittent dosing, while random post-steady state samples were collected during continuous infusion.
**Results:** Twenty-six patients (16 men, 10 women) included, from whom a total of 82 samples were taken. Median age was 58 years (interquartile range: 49–68). Target concentration was defined as Cmin: 5–7 mg/l for pathogens with MIC = 2 mg/l with intermittent dosing, while AUC/MIC: 80–120 (area under the plasma concentration–time curve and minimal inhibitory concentration ratio) with continuous infusion. TDM-guided dose adjustments were executed in 20 patients. Optimal linezolid exposure was only achieved with continuous infusion of higher doses (1800–3000 mg/24 h), except for one case. Dose reduction necessitated by clinical improvement could be accomplished in six patients. Serum linezolid levels showed no correlation with kidney function, body mass index (BMI) age, or gender.
**Conclusions:** Standard dosing regimens may fail to provide optimal linezolid exposure among critically ill septic adults following high-risk cardiovascular surgery. Continuous infusion and close monitoring emerge as potential requisites in this population. TDM stands out as a tool in guiding tailored therapeutic strategies, enhancing the precision and efficacy of linezolid therapy.

**Topic:** Infections and prevention

### 001351

### Neuromonitoring in UK Intensive Care Units; a survey of practice in 2024

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**Introduction:** Multiple modalities exist for neuromonitoring in the unconscious patient with neurological injury1. Where clinical neurological examination is not possible, a combination approach is advocated, previous surveys have highlighted the widespread use of intracranial pressure monitoring in UK ICUs2. Publications highlight the broad range of possible modalities targeting our expanding understanding of cerebral physiology; however, with varied evidence to support their use the uptake of these modalities across the country is likely similarly varied.
**Objectives:** We sought to determine the current state of neuromonitoring in the UK.
**Methods:** Units managing adult patients in the UK were identified using the Neuro Anaesthesia and Critical Care Society (NACCS) list of neuroscience centres. 26 centres were identified in England, Northern Ireland and Wales managing adult traumatic brain injuries. A single page survey was completed by telephone to the departments or link sent via the intensive care medicine trainee WhatsApp network. Remaining departments were contacted via email to the NACCS linkman.
**Results:** All 26 centres responded to the survey. All centres used ICP monitoring with a clear protocol to manage patients in keeping with previous surveys2. All centres reported access to and variable use of electrophysiological testing. Brain tissue oxygenation monitoring PbtO2 was available in 31% (8/26). Transcranial Dopplers in 42% (11/26), Serum biomarkers in 23% (6/24). 4 centres utilised thermal diffusion monitoring. 5 were able to use optic nerve sheath diameter assessment. 1 centre used cerebral microdialysis and a further single unit utilised pressure reactivity monitoring. 6 centres performed assays of serum biomarkers in selected patients.
All units had protocols for management of ICP with a further 7 centres having protocols that incorporated electrophysiology monitoring. 3 of the 11 centres utilising transcranial Dopplers incorporated this into a protocol. 5 centres incorporated brain tissue oxygenation into their standard management protocol with a further centre indicating a protocol was in development at the time of survey. The unit with cerebral microdialysis reported a protocol for management, 1 of the 4 units with thermal diffusion managed according to a protocol. All parameters without a standardised protocol were set on an individual patient basis by a senior clinician when indicated.
**Conclusions:** Across the UK, ICP monitoring and electrophysiology assessment is the most common form of neuromonitoring available to the ICU. All units have a standard protocol for management of ICP variation, with many having protocols incorporating electrophysiology monitoring, transcranial Doppler assessments and brain tissue oxygenation.

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3. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

**Topic:** Neurointensive care

## 001353

### Heart donors in controlled asystole Maastricht type III: evaluation of initial experience in heart transplantation

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**Introduction:** Heart transplantation has proven to be an effective treatment for end-stage heart failure, providing a significant improvement in both quality and quantity of life. However, the limitation in the availability of donor organs has been a persistent obstacle. The reintroduction of cardiac donation after circulatory determination of death (DCD) in 2014 has boosted transplant activity by 30%.
This study focuses on evaluating the clinical outcomes of heart transplants performed at Bellvitge University Hospital.
**Objectives:** To evaluate the feasibility of heart donors in controlled asystole (DCD). To analyze the outcomes of heart transplantation with this type of donors.
**Methods:** This is a retrospective unicentric observational study, in a tertiary hospital in Barcelona, from January 2020 to October 2023, of heart donors in DCD as well as their respective transplants. Donor and recipient characteristics were evaluated including variables such as demographic characteristics, ischemia times, duration of extracorporeal circulation (ECC) and clamping, days on mechanical ventilation, ICU stay, post-surgical complications, need for pharmacological or mechanical support, and survival at ICU and hospital discharge.
**Results:** Seventeen donors were included, with a mean age of 39.4 years (±11.4), 70.6% were men. The most frequent cause of life support limitation was hemorrhagic stroke 23.5%, followed by subarachnoid hemorrhage (SAH) 17.6%. The most frequent cause among recipients was non-ischemic cardiomyopathy with 52.9%, with 93.3% being elective transplants. The mean cold ischemia time was 115.33 min (±39.5) and ECC time 96.27 min (±18.74). The mean ICU stay was 10.40 days (±10.35). As complications, 23.5% presented primary graft dysfunction and 47.1% acute renal failure. Survival was 100% at 90 days.
**Conclusions:** DCD donors significantly expand heart transplantation, showing comparable results to brain death donors. This option can address the growing demand for heart donors. Further investigation is needed into the effects of DCD on organ quality and functionality.

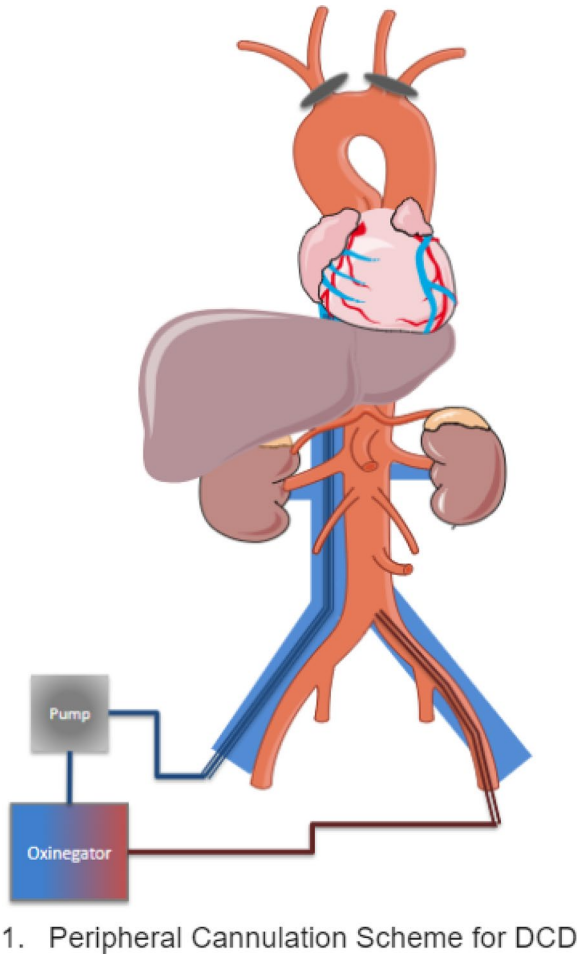


**Fig. (abstract 001353)** Peripheral cannulation scheme for DCD

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**Topic:** Brain death, organ donation and transplantation

## 001354

### Evaluation of the BioFire FilmArray Pneumonia Panel in determining the microbiological etiology of severe lower respiratory tract infections

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001354

**Introduction:** Severe community and hospital-acquired lower respiratory tract infections are associated with high morbidity and mortality. Delay or failure to identify the causative pathogen further worsens the prognosis, and on the other hand, inappropriate antibiotic use contributes to antimicrobial resistance and augments cost.
The BioFire FilmArray Pneumonia Panel (BioFire PN; BioMérieux) is a multiplex polymerase chain reaction (PCR) assay that analyzes respiratory specimens for the presence of bacteria, viruses, and genetic markers of antimicrobial resistance within some hours.
**Objectives:** To evaluate the performance of the BioFire PN in the pathogen recognition of lower respiratory tract infections of Intensive Care Unit (ICU) patients (pts), and to compare it with conventional microbiological methods.
**Methods:** All BioFire PN lower respiratory samples (bronchial aspirates, BAL) received from ICU pts with lower respiratory tract infections (community-acquired pneumonia—CAP, hospital-acquired pneumonia—HAP, ventilator-associated pneumonia—VAP, and tracheobronchitis) in a period of 18 months were retrospectively analyzed. Results were compared with simultaneously received cultures' results and with clinical indices.
**Results:** The analysis included 79 BioFire PN samples from 52 pts [34 men, age 69 (25–88) years, APACHE II score 18 ± 5.82, LOS: 35.60 ± 24.91 days, survival 23.07%]. Of the 79 evaluations, there were 23 cases of CAP and 56 cases of nosocomial infections (HAP, VAP, tracheobronchitis) (Table 1).

**Table 1 (abstract 001354)** Evaluation of filmarray pneumonia panel results

| | SOFA | Septic shock | FA positive | Culture positive | Methods agreement* | Improvement | Antibiotics' change* | Antibiotics' de-escalation |
|---|---|---|---|---|---|---|---|---|
| CAP ($n=23$) | 10.43 ± 2.71 | 17 (73.9%) | 20 (86.96%) | 5 (21.74%) | 7 (35%) | 86.96% | 14 (70%) | 5 (35.71%) |
| Nosocomial infections ($n=56$) | 8 (3–18) | 35 (62.5%) | 38 (67.86%) | 13 (23.21%) | 24 (63.16%) | 75% | 25 (65.79%) | 5 20%) |

*antibiotics' de-escalation included.

In the 23 CAP infections, BioFire PN detected both a virus and a bacterium in 11 cases, a single virus in 6 cases, a single bacterium in 2 cases, and polybacterial etiology in 1 case.
In the 56 nosocomial infections, BioFire PN detected a single bacterium in 15 cases, polybacterial etiology in 13 cases, both a virus and one or more bacteria in 7 cases, and a single virus in 3 cases.
Results of BioFire PN were available within 6–12 h, even though samples were transmitted to another facility, whereas positive cultures were completed in 24–48 h, and another 24 h were needed for the susceptibility testing.
**Conclusions:** FilmArray Pneumonia Panel compared to cultures showed a high sensitivity for the identification of pathogens in cases of lower respiratory tract infections in critically ill pts, especially for severe community-acquired pneumonia. The rapid results allowed for antibiotics' de-escalation within 12 h.

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**Topic:** Infections and prevention

## 001355

### Is hyperkalemia at ICU admission a predictor of mortality?

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**Introduction:** Potassium is a crucial electrolyte involved in numerous physiological processes. Hyperkalemia is a common electrolyte imbalance encountered in critically ill patients, with potential implications for adverse outcomes itself. Due to this recognized link (1), levels of potassium are frequently considered in severity illness scores, such as the Acute Physiology and Chronic Health Evaluation II (APACHE II), which attempt to predict the risk of mortality based on several parameters upon admission to Intensive Care Units (ICUs). Some studies have indicated an independent correlation between hyperkalemia upon ICU admission and in-hospital mortality, although a causal relation could not be demonstrated (2,3,4).
**Objectives:** We aim to investigate the correlation between hyperkalemia at ICU admission and both ICU and in-hospital mortality, through a retrospective study.
**Methods:** A retrospective analysis was conducted on data collected from electronic medical records of patients admitted to our ICU from 2022 to 2024. Patients were divided in two groups based on their serum potassium levels at admission: hyperkalemia (potassium > 5.0 mmol/L) and non-hyperkalemia (potassium ≤ 5.0 mmol/L). The statistical analysis involved comparing the baseline demographics, admission characteristics and length of stay of survivors and non-survivors within each group. This comparison was conducted using the Chi-square ($\chi 2$) test for categorical variables and Mann–Whitney U-test for continuous values, to evaluate proportional differences in outcomes. In addition, we performed a logistic regression analysis, adjusting for potential confounders such as age, presence of septic shock or ketoacidosis upon admission, APACHE II score, and the need for Renal Replacement Therapy (RRT) during ICU stay for both ICU mortality and in-hospital mortality. Odds ratios (OR) were calculated with 95% confidence intervals. Statistical significance was set at a predetermined P value of < 0.05.
**Results:** In this study, 1065 patients were enrolled, of whom 17.7% ($N=189$) presented hyperkalemia at admission. Among the hyperkalemia group, 69.3% were male ($N=131$) with an average age of 66.1 ± 17 years, while in the non-hyperkalemia group, 61.2% were male ($N=536$) with an average age of 64.1 ± 17 years. The mean APACHE II score for the hyperkalemic and non-hyperkalemic groups was 20.8 ± 11 points and 17.9 ± 12 points, respectively ($p<0.001$). The average ICU stay was 5.9 ± 6 days for hyperkalemic patients and 7.3 ± 9 days for the others (p 0.042), while the in-hospital stay was

16.1 ± 18 for hyperkalemic patients and 18.6 ± 23 days for others (p 0.178). Septic shock at admission was present in 33.3% ($N = 63$) of the hyperkalemic patients and 28.1% ($N = 246$) of the others (χ2 2.081, p 0.149), while ketoacidosis was present in 3.7% ($N = 7$) of hyperkalemic patients and 2.9% ($N = 25$) of the others (χ2 0.38, p 0.535). The need for RRT was 31.2% ($N = 59$) in the hyperkalemia group and 9.7% ($N = 85$) in the non-hyperkalemia group (χ2 61.5, $p < 0.001$). ICU mortality rate was 19.6% ($N = 37$) and 16.8% ($N = 147$) for hyperkalemic and non-hyperkalemic patients, respectively (χ2 0.852, df 1, OR 0.19, p 0.356), while in-hospital mortality rates were 32.8% ($N = 62$) and 23.3% ($N = 204$) for hyperkalemic and non-hyperkalemic patients, respectively (χ2 7.514, df 1, OR 0.48, p 0.006). The logistic regression analysis revealed a weak association between hyperkalemia at admission and ICU mortality (OR 0.90, df 1, p 0.647)—Table 1—but a slightly stronger association with in-hospital mortality (OR 1.29, df 1, p 0.163)—Table 2. Notably, more significant predictors of mortality in this sample were the need for RRT ($p < 0.001$; p 0.002), septic shock (p 0.053; p 0.461), APACHE II score (p 0.117; p 0.011), and age (both $p < 0.001$).

**Conclusions:** Hyperkalemic patients showed higher APACHE II scores, longer ICU stays, and more need for RRT. Mortality rates were higher in both ICU and in-hospital settings, but only with significance in the latter. However, establishing a conclusive correlation between hyperkalemia and mortality was not possible due to the influence of other confounding variables.

Contrary to expectations, hyperkalemia at admission did not correlate significantly with ICU mortality. However, a subtle link with in-hospital mortality suggests its impact on longer term outcomes. More research is needed to confirm and understand these findings better.

**Table 1 (abstract 001355)** ICU mortality (logistic regression analysis)

Coefficients

| | Estimate | Standard Error | Odds Ratio | z | Wald Test: Wald Statistic | df | p | 95% Confidence interval: Lower bound | Upper bound |
|---|---|---|---|---|---|---|---|---|---|
| (Intercept) | -3.687 | 0.421 | 0.025 | -8.753 | 76.621 | 1 | < .001 | -4.513 | -2.861 |
| Age | 0.025 | 0.006 | 1.026 | 4.547 | 20.671 | 1 | < .001 | 0.014 | 0.036 |
| APACHE score | 0.010 | 0.007 | 1.010 | 1.565 | 2.450 | 1 | 0.117 | -0.003 | 0.023 |
| Hyperkalemia at admission (Yes) | -0.100 | 0.219 | 0.904 | -0.458 | 0.210 | 1 | 0.647 | -0.530 | 0.330 |
| Septic shock at admission (Yes) | 0.341 | 0.177 | 1.406 | 1.932 | 3.733 | 1 | 0.053 | -0.005 | 0.687 |
| Ketoacidosis at admission (Yes) | 0.092 | 0.482 | 1.097 | 0.191 | 0.037 | 1 | 0.848 | -0.852 | 1.037 |
| RRT (Yes) | 0.812 | 0.219 | 2.252 | 3.701 | 13.696 | 1 | < .001 | 0.382 | 1.242 |

*Note.* ICU mortality level 'Yes' coded as class 1.

**Table 2 (abstract 001355)** In-hospital mortality (logistic regression analysis)

Coefficients

| | Estimate | Standard Error | Odds Ratio | z | Wald Test: Wald Statistic | df | p | 95% Confidence interval: Lower bound | Upper bound |
|---|---|---|---|---|---|---|---|---|---|
| (Intercept) | -3.486 | 0.373 | 0.031 | -9.354 | 87.505 | 1 | < .001 | -4.216 | -2.755 |
| Age | 0.029 | 0.005 | 1.029 | 5.829 | 33.974 | 1 | < .001 | 0.019 | 0.039 |
| APACHE score | 0.015 | 0.006 | 1.015 | 2.548 | 6.493 | 1 | 0.011 | 0.003 | 0.026 |
| Hyperkalemia at admission (Yes) | 0.260 | 0.186 | 1.297 | 1.394 | 1.942 | 1 | 0.163 | -0.106 | 0.625 |
| Septic shock at admission (Yes) | 0.117 | 0.159 | 1.125 | 0.738 | 0.544 | 1 | 0.461 | -0.195 | 0.430 |
| Ketoacidosis at admission (Yes) | -0.101 | 0.439 | 0.904 | -0.230 | 0.053 | 1 | 0.818 | -0.962 | 0.760 |
| RRT (Yes) | 0.620 | 0.203 | 1.859 | 3.053 | 9.322 | 1 | 0.002 | 0.222 | 1.018 |

*Note.* Hospital mortality level 'Yes' coded as class 1.

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**Topic:** Health Services Research and Outcome

## 001357

### Efficacy and safety of meropenem/vaborbactam for the treatment of gram negative bacterial infections according to the source of infection

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001357

**Introduction:** The prevalence of difficult to treat infections due to Gram-negative bacteria has increased over recent years. Treatment options are limited while failure of response to antibiotics is associated with high morbidity and mortality rates. Meropenem/vaborbactam is a novel antibiotic recently approved for the treatment of Gram-negative infections in adults with limited treatment options.

**Methods:** This is a single-center retrospective observational study in ICU patients who received meropenem/vaborbactam for suspected or confirmed Gram-negative infections. Patients were categorized according to the source of infection. The variables measured were the duration of treatment, the survival rate, the response to treatment with meropenem/vaborbactam and the adverse effects of meropenem/vaborbactam for the total of patients and for every group, respectively. The response to treatment with meropenem/vaborbactam was defined as clinical and/or laboratory improvement.

**Results:** In our study, 38 ICU patients were included. The patients were categorized into the four following groups: Group A = Respiratory Tract Infections (25 out of 38, 66%), Group B = Bloodstream Infections (6 out of 38, 16%), Group C = Abdominal Infections (5 out of 38, 13%) and Group D = Soft Tissue Infections (2 out of 38, 5%). The average duration of therapy for the total of 38 ICU patients was 9 days. 63% (24 out of 38) responded to treatment. The overall survival rate was 58% (22 out of 38). Regarding the subgroups, for Group A, the average duration of therapy was 9 days. 56% (14 out of 25) responded to treatment and the survival rate was 60% (15 out of 25). For Group B, the average duration of therapy was 8 days. 100% (6 out of 6) responded to treatment and the survival rate was 67% (4 out of 6). For Group C, the average duration of therapy was 14 days. 60% (3 out of 5) responded to treatment and the survival rate was 80% (4 out of 5). For Group D, the average duration of therapy was 5 days. 100% (2 out of 2) responded to treatment and the survival rate was 0% (0 out of 2). 16% (6 out of 38) from the total of patients needed renal replacement therapy due to severe sepsis or septic shock which was not associated with the administration of meropenem/vaborbactam. Only 5% (2 out

of 38) of the patients had minor adverse effects (raise in LFTs) related with the treatment with meropenem/vaborbactam. Major adverse effects were not detected.
**Conclusions:** Our results support that meropenem/vaborbactam may be an effective and safe option for difficult to treat Gram-negative infections. Further studies should be performed to determine the optimal use of this important new antibiotic in the treatment of Gram-negative infections.

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**Topic:** Sepsis

## 001360

### Meropenem/vaborbactam as an alternative therapeutic option in severe, complicated Gram negative infections in critically ill patients. A single-center experience

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**Introduction:** Increasing bacterial resistance and failure to antibiotic treatment, resulting in detrimental outcomes, has raised great concern worldwide. Meropenem/vaborbactam is a new alternative agent for severe, complicated Gram negative infections. Currently, there are limited data in clinical practice for the efficacy and safety of meropenem/vaborbactam, especially in critically ill patients.
**Methods:** We aimed to report our experience with the use of meropenem/vaborbactam in clinical practice for the treatment of Gram-negative infections in patients with insufficient response to previously administered antibiotics. All the enrolled patients were being administered broad-spectrum antibiotics (monotherapy or combination therapy) for suspected or confirmed Gram-negative infection and were switched to treatment with meropenem/vaborbactam due to no response or clinical and/or laboratory deterioration. Clinical deterioration was defined as new onset of fever, hemodynamic instability or worsening of respiratory status due to infection. Laboratory deterioration was defined by white blood cell count (WBCs) < 4000 or > 12,000, presepsin > 500 and procalcitonin (PCT) > 0.5. The measured variables were the values of WBCs, presepsin and PCT at the start of treatment with meropenem/vaborbactam, the mean duration of therapy, the response to treatment with meropenem/vaborbactam, the overall survival rate during their stay in the ICU and the 30-day mortality rate. The response to treatment was defined as clinical and/or laboratory improvement.
**Results:** In our study, 30 ICU patients were included. All the patients experienced clinical deterioration which was combined with abnormal inflammatory markers. 67% (20 out of 30) had pathological WBCs, 83% (25 out of 30) had pathological presepsin and 57% (17 out of 30) had pathological PCT at the start of treatment with meropenem/vaborbactam. The mean duration of therapy was 9 days. 67% (20 out of 30) responded to treatment with meropenem/vaborbactam. The overall survival rate was 67% (20 out of 30) and the 30-day mortality rate was also 67% (20 out of 30).
**Conclusions:** Our experience supports the use of meropenem/vaborbactam in clinical practice as a reasonable alternative for complicated, difficult to treat Gram-negative infections.

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**Topic:** Sepsis

## 001363

### The impact of the CERTAIN Clinical Decision Support Tool for structured ICU admission and rounding is sex independent—a secondary analysis of CERTAIN

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*Intensive Care Medicine Experimental* 2024, **12(suppl 1):**001363

**Introduction:** Numerous studies have highlighted the presence of sex inequity in critical care provision. The Implementation of the 'Checklist for Early Recognition and Treatment of Acute Illness and Injury' (CERTAIN) decision support tool for structured ICU admission and rounding was associated with an increased adherence to best care practices(1). It is uncertain whether implementation of CERTAIN had comparable effects in females and males.
**Objectives:** We determined whether the effects of implementation of CERTAIN would be different between the sexes. In a subgroup analysis, we also assessed the impact of implementation in females and males in high income (HIC) and low- and middle-income countries (LMIC).
**Methods:** This is a post hoc analysis of CERTAIN, a conveniently sized prospective multinational before–after quality-improvement study in 34 ICUs in 5 HIC and 10 LMIC. We compared incidence rates of omission of delivery of 10 best care practices, including deep vein thrombosis and peptic ulcer prophylaxis, head of bed elevation, daily oral care, spontaneous breathing trials, family conferences, assessment of need for central lines and urinary catheters, and prescription of antimicrobials and sedation, between sexes, before and after implementation of the decision support tool. In addition, we determined whether sex differences, if present, existed amongst HIC versus LMIC. The sexes were compared with respect to these best care practices using Poisson regression. Then, to adjust for a center effect, the incidence rate ratio was calculated with the center modeled as a random effect in a generalized linear mixed model with a log link function.
**Results:** The CERTAIN study comprised a total of 4,256 patients, with 588 females and 1,169 males before implementation of the decision support tool, and 859 females and 1,640 males after its implementation. Females were older, had a lower median body weight but were more often obese. Females more often had a history of hypothyroidism, rheumatoid arthritis, and collagen vascular disease; males more

often had a history of alcohol abuse and liver disease. Compared to patients in HIC, patients in LMIC were younger, and had a lower median SOFA score. Patients in HIC more often had a history of alcohol abuse.
Overall, there was no notable difference in care between sexes, both before nor after implementation **(**Figure 1). Females and males experienced equal benefits from the checklist implementation (Figure 2). The implementation of the checklist yielded consistent outcomes across various geo-economic settings.
**Conclusions:** The impact of a web-based clinical decision support tool for structured ICU admission and rounding on nonadherence to best care practices showed minimal variation between sexes and benefitted both female and male patients. This observation remained consistent across ICUs in various geo-economic areas and indicates that a systematic checklist is feasible in resource-limited settings.

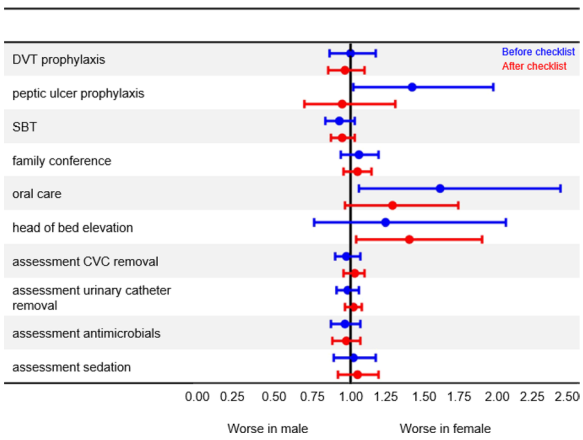


**Fig. 1 (abstract 001363)** The incidence rates of nonadherence to daily care processes between the sexes—LMIC + HIC. CVC = central venous catheter; DVT = deep vein thrombosis; HIC = high-income countries; LMIC = low- and middle-income countries
Checklist for Early Recognition and Treatment of Acute Illness and Injury (CERTAIN).
An event refers to a non-adherence to an evidence-based daily care process.
Adjusted for Center Effect Incident Rate Ratios. In this Figure, the blue whisker compares the incident rates of events between female versus male patients before the checklist and the red line compares the incident rates of events after the checklist.

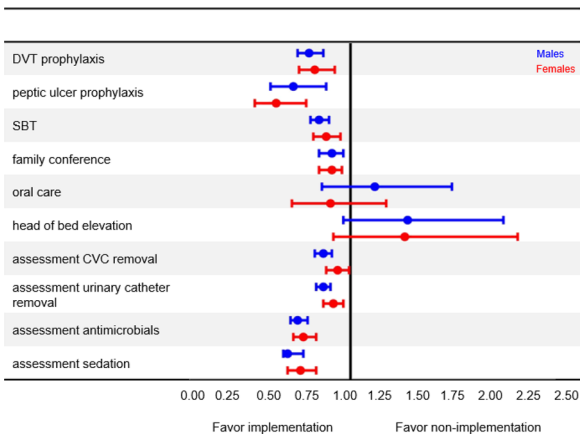


**Fig. 2 (abstract 001363)** The incidence rates of nonadherence to daily care processes before versus after the implementation. CVC = central venous catheter; DVT = deep vein thrombosis; HIC = high-income countries; LMIC = low- and middle-income countries
Checklist for Early Recognition and Treatment of Acute Illness and Injury (CERTAIN).
Adjusted for Center Effect Incident Rate Ratios. In this Figure, the blue whisker compares the incident rates of events between before versus after the checklist in male patients and the red line compares the incident rates of events in female patients.

**Topic:** Health Services Research and Outcome

## 001367

### Ventilatory response to metabolic acid–base disorders: a single equation to predict arterial PCO2 from standard base excess

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**Introduction:** Metabolic acid–base disorders trigger a secondary respiratory response to restore a physiologic pH. Several equations have been proposed to predict the compensatory PCO2 from actual bicarbonate (HCO3-): a relevant difference between the expected and the actual PCO2 might suggest a concomitant respiratory disorder. These equations have some limitations: Winters' formula, commonly adopted for metabolic acidosis (PCO2 = 1.5*HCO3- + 8), derives from only 67 children; most studies focus separately either on moderate (pH > 7.1) or severe acidosis; data on metabolic alkalosis are very limited; the proposed equations rely on HCO3-, a PCO2-dependent variable, as marker of metabolic acid–base disorders.
**Objectives:** Aim of our study was to describe the respiratory compensation to metabolic acid–base disorders in a continuum from acidosis to alkalosis. We hypothesized that a single equation, using standard base excess (SBE), a PCO2-independent marker of metabolic acid–base disorder, would be able to describe the ventilatory response.

**Methods:** English literature published up to March 2024 was reviewed. Non-sedated, spontaneously breathing humans, aged > 2 months, admitted to the hospital with a metabolic acid–base disorder, or undergoing an experimental study on the topic were enrolled. Control subjects of the selected papers were included. Individual or semi-aggregated data from couples of PCO2-HCO3- or PCO2-pH from arterial/arterialized capillary blood were collected from tables or Figures (https://automeris.io/WebPlotDigitizer.html). A non-carbonic buffer power of 16.2 mmol/L was assumed to calculate SBE.
**Results:** A total of 1619 patients (1259 acidotic, 332 alkalotic, 28 controls) were selected from 32 publications. The observed ranges of pH, HCO3-, BE, and PCO2 were 6.58 to 7.73, 1.1 to 94 mmol/L, -36.5 to 74.1 mmol/L, and 4 to 86 mmHg, respectively. A strong correlation was observed between SBE and PCO2 (Figure), both using a single quadratic (PCO2 = -0.004 * (SBE)2 + 0.8*SBE + 38.1, r2 = 0.85, $p < 0.001$) or a linear regression (PCO2 = 0.8*SBE + 37.2, r2 = 0.84, $p < 0.001$).
**Conclusions:** A single equation is able to predict accurately from SBE the expected compensatory PCO2 over the entire spectrum of metabolic acid–base derangements. The linear simplification could be a helpful bedside tool for the interpretation of complex acid–base disorders.

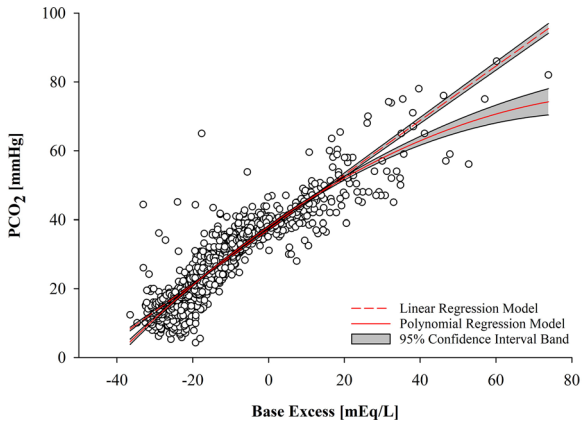


**Fig. (abstract 001367)** .

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001368

### Pain and PTSD prevalence, and health-related quality of life in ICU survivors 1, 3, 6 and 12 months after ICU discharge

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**Introduction:** Intensive Care Unit (ICU) survivors are at increased risk of developing persistent pain, post-traumatic stress disorder (PTSD), while they may also experience impaired health-related quality of life (HRQoL). However, few studies assessed pain, PTSD, and HRQoL at multiple time points after ICU discharge.
**Objectives:** To assess the prevalence of self-reported pain and PTSD symptoms, and HRQoL among ICU survivors at one, three, six and 12 months following ICU discharge.
**Methods:** This is a prospective, observational study of discharged ICU patients from a 12-bed mixed ICU. The study was conducted from November 2018 to July 2021 and survivors were followed up at four time points: 1st month (T1), 3rd month (T2), 6th month (T3), and 12th month (T4) post ICU discharge. The instruments used were the Numeric Rating Scale (NRS) [scale range: 1–10] to assess pain, the Davidson Trauma Scale (DTS) [scale range: 0–68] to assess frequency of PTSD symptoms and the 36-Item Short Form Survey version 2 (SF-36v2) to assess the eight domains of HRQoL. Variance analysis for repeated measures was used to identify changes of variables over time.
**Results:** 64 out of 87 survivors consented to participate at T1. Due to death or refusal to continue to participate to the study, 59 survivors were enrolled at T2, 42 at T3 and 33 at T4. Mean pain scores were 5.3 at T1, 3.7 at T2, 2.9 at T3, and 2.0 at T4 ($p < 0.001$). NRS > 3, indicative of moderate to severe pain, was reported from 92.2% of survivors at T1, 76.3% at T2, 61.9% at T3 and 39.4% at T4. DTS mean scores were 49.1, 42.1, 29.2 and 20.5 at T1, T2, T3 and T4, respectively ($p < 0.001$). HRQoL was improved in all domains, from T1 to T4 follow-up period ($p < 0.001$).
**Conclusions:** Despite the fact that there was a decrease in pain and PTSD symptoms prevalence over time, even at 12 months post-ICU discharge, ICU survivors still suffered from them. HRQoL was impaired after critical illness but findings showed a statistically significant improvement over the follow-up period. This study underscores the importance of ongoing monitoring and support, as well as the potential for interventions to improve ICU survivors' long-term outcomes and quality of life.

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**Topic:** Sedation, analgesia and delirium

## 001372

### Iatrogenic withdrawal syndrome (IWS) in adult intensive care: a survey of UK healthcare professionals

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**Introduction:** Intravenous (IV) sedation and opioids are administered to intensive care unit (ICU) patients for anxiety, pain, and somnolence in mechanical ventilation. However, prolonged exposure to high medication doses places patients at significant risk of IWS upon abrupt cessation or rapid tapering of medications.1–3 IWS encompasses a combination of autonomic dysregulation, central nervous system arousal, and gastro-intestinal symptoms. It is associated with adverse clinical outcomes that include prolonged mechanical ventilation, psychological distress, longer hospital and ICU stay, higher morbidity, and elevated healthcare costs.4,5 There are increasing reports of IWS in

ICU adults, but how it is recognised by healthcare professionals is less established.
**Objectives:** To determine ICU healthcare professionals' perspective on incidence, detection and research in IWS in IV sedation and opioid use in adult ICU.
**Methods:** The survey was registered as a service evaluation without the need for ethics. An online survey was piloted (Survey Monkey), revised and distributed via various professional societies of Irish and UK ICU community, addiction psychiatrists and social media. The survey was open for 16 weeks from 5 February 2023 with reminders sent for completion. Data were analysed using descriptive statistics.
**Results:** 246 responses were received from ICU healthcare professionals including nurses 32% (79/246); pharmacists 30% (75/246); medical doctors (consultant-level) 27% (66/246); medical (other) 7% (17/246); allied health professionals 2% (5/246) and other 2% (4/246). Overall, 90% (221/246) indicated that IWS was a clinically important issue for adults in ICU and 80% (198/246) felt that a validated IWS screening tool would be useful for clinical practice. 24% (59/246) reported they were familiar with strategies for prevention and/or treatment of IWS and 13% (31/246) had IWS guidelines available in their ICU. 89% (218/246) stated that there is a need to improve clinical guidance for identification, prevention and treatment of IWS in adult ICUs. With 90% (220/246) reporting that more research is needed to understand the incidence and impact of IWS in adult ICUs.
**Conclusions:** ICU professionals surveyed indicated that IWS was very common in their clinical practice and a majority reported the need for further guidance to identify and treat IWS. The absence of IWS screening tools, coupled with a lack of understanding regarding prevalence and treatment strategies, indicates a significant gap in clinical knowledge. Given the clinical importance, we strongly recommend further research and development to bridge these critical gaps and provide clinical guidelines.

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**Topic:** Sedation, analgesia and delirium

## 001373

### The role of neutrophil-derived microvesicles during the pathophysiology of postoperative pulmonary complications after major complex surgery

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**Introduction:** Unphysiological alveolar stretch, associated with mechanical ventilation, can instigate lung inflammation1 and may predispose the lungs to postoperative pulmonary complications (PPCs). This deleterious outcome occurs in up to 33% of major operations2 but the underlying mechanism is poorly understood.
There is increasing evidence supporting the role of microvesicles (MVs), which are released following cellular injury, in the propagation of various lung pathologies3,4, acting as efficient mediators of cellular communication during inflammation.
**Objectives:** We aimed to investigate the role of MVs during the pathophysiology of PPCs by assessing: 1) any correlation between intra-alveolar MVs with markers of lung inflammation, lung injury and clinical outcome, and 2) the bioactivity of in vivo derived MVs.
**Methods:** Oesophagectomy patients, who undergo prolonged periods of one-lung ventilation (OLV) were used as a human model of alveolar stretch. Serial bronchoalveolar lavage (BAL) samples were collected from both lungs at clinically relevant intra-operative time points. Gastrectomy patients undergoing prolonged two-lung ventilation (TLV) acted as controls. Ethical approval was granted (REC: 21/PR/1554).
BAL was analysed for MV subtypes using our established flow cytometry protocols and correlated with BAL cell numbers (flow cytometry), IL-6 and IL-8 (ELISA), total protein (Qubit) and perioperative clinical data.
BAL NMVs after OLV, isolated using a positive bead isolation technique, were added to an in vitro alveolar model, a co-culture of human alveolar epithelial cells (HAECs) and peripheral blood mononuclear cells. After four hours of incubation, cell adhesion molecules, markers of epithelial cell inflammation, were assessed (flow cytometry).
**Results:** Forty-two oesophagectomy and seven gastrectomy patients were recruited. OLV caused an increase in all MV subtypes in the ventilated lung but not the non-ventilated lung; this was most notable for neutrophil-derived MVs (NMVs): ventilated lung (220 v 1062 NMVs/ul, $p<0.0001$) vs non-ventilated lung (331 v 288 NMV/ul, $p=0.515$). NMVs correlated strongly with BAL protein ($r=0.817$, $p<0.0001$), IL-8 ($r=0.721$, $p<0.0001$) and IL-6 ($r=0.505$, $p=0.0085$). NMVs in the ventilated lung after OLV were significantly greater in patients who had a PPC compared to those who didn't (3667 v 488 NMV/ul, $p=0.0052$) yet neutrophils in either lung following OLV did not correlate with PPCs. Protective TLV in oesophagectomy or gastrectomy patients did not cause a significant increase in NMVs.
In vitro, NMVs caused significant HAEC ICAM upregulation compared to controls ($p=0.0492$).
**Conclusions:** We have demonstrated that unphysiological alveolar stretch associated with OLV causes profound NMV release which correlates strongly with markers of lung injury/inflammation and clinical outcomes. Importantly, NMVs produced following OLV had significant bioactivity causing HAEC inflammation in vitro, further evidence of the important role of NMVs in the pathophysiology of PPCs.

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**Topic:** Perioperative care

## 001374

### Characteristics, management, and outcomes of patients admitted to the intensive care unit with *Streptococcus pyogenes* infections: a retrospective analysis

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**Introduction:***Streptococcuspyogenes*, also known as Group A Streptococcus (GAS), is a common human pathogen responsible for a wide range of infections, from mild pharyngitis to severe invasive diseases. Infections caused by *S. pyogenes* can lead to significant morbidity and mortality, particularly when patients require admission to the intensive care unit (ICU). Understanding the clinical characteristics, management strategies, and outcomes of patients admitted to the ICU with *S. pyogenes* infections is crucial for optimizing patient care and outcomes.
**Objectives:** This study aims to analyze the clinical features, treatment modalities, and outcomes of patients admitted to the ICU with *Streptococcus pyogenes* infections.
**Methods:** We conducted a retrospective analysis of 12 patients who were admitted to the ICU with confirmed infections caused by *Streptococcus pyogenes*. Data on clinical manifestations, treatment strategies, and outcomes were systematically collected and analyzed.
**Results:** In this detailed analysis, we included a cohort of 12 patients who were admitted to the Intensive Care Unit (ICU) due to infections caused by *Streptococcus pyogenes*. The median age among the patients was 48.25 years. The majority of these patients, approximately 58.33%, were male, indicating a slight gender disparity in the incidence of these severe infections.
The clinical presentation of these patients varied, but several common symptoms were identified. These included hypotension, fever, coagulopathy, and acute renal failure. A significant proportion, 83.33%, of these patients developed severe complications, manifesting as either severe sepsis or septic shock, highlighting the critical nature of these infections.
Upon conducting microbiological evaluations, we observed a notable resistance pattern; there was a high rate of resistance to macrolides, which complicates treatment options. In terms of management strategies, immunoglobulin therapy was administered to 33% of the patients, reflecting its use as a treatment modality in severe cases.
The mortality statistics from this cohort are particularly concerning, with an overall mortality rate of 33%. A deeper dive into the mortality data revealed that in 75% of the cases where the patient deceased, there was a failure in controlling the primary infection site, suggesting a potential area for clinical improvement.
This analysis underscores the severity of *Streptococcus pyogenes* infections in ICU settings and the challenges in managing these cases, particularly with antibiotic resistance and the critical need for effective focus control to improve patient outcomes.
**Conclusions:** This study highlights the critical severity and complex management challenges associated with *Streptococcus pyogenes* infections in ICU patients. The high mortality rate, predominantly due to inadequate control of the infection site, and the significant prevalence of macrolide resistance demand urgent attention. These findings underscore the necessity for enhanced diagnostic strategies, more aggressive management approaches, and the development of new therapeutic modalities to effectively tackle the resistance patterns. Implementing these improvements is essential for reducing mortality and improving outcomes in this vulnerable patient population.

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**Topic:** Infections and prevention

## 001376

### Use of early creatinine elevation with clinical risk factors and renal anginal index in predicting the risk of acute kidney injury in critically ill

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**Introduction:** Acute kidney injury (AKI) is a common complication in critically ill with adverse outcomes. However, the absence of a biomarker in kidney injury; similar to troponin in cardiac patients often leads to delay in predicting and promptly identifying AKI. A combination of clinical risk factors and serum creatinine changes could potentially help in early identification of patients at risk of AKI. In addition, a renal anginal index (RAI) has been described; taking into account the creatinine score as well as the patient condition. These, however, have not been extensively studied in Indian population.
**Objectives:** The study evaluated the efficacy of combining smaller changes in serum creatinine with clinical risk factors in predicting the risk of AKI in critically ill Indian population. The performance of RAI was also evaluated.
**Methods:** This was a prospective comparative validity study conducted in a tertiary medical intensive care unit. Patients were divided into 3 groups—very high risk, high risk and moderate risk according to their clinical risk factors. The change in serum creatinine was assessed at 24 h; those at high risk of developing AKI were identified based on an early increase in serum creatinine of 0.1–0.4 mg/dl in 24 h. Renal anginal index (RAI) based on the creatinine and condition score was calculated at 24 h of ICU admission. The creatinine score was determined by the difference in serum creatinine in the first 24 h of ICU admission. The condition score was calculated based on presence of risk factors like requirement of ventilator or vasopressor therapy, diabetes mellitus and ICU admission. The RAI score (1) was calculated as the worst condition score multiplied by the creatinine score to give

values ranging from 1, 2, 3, 4, 6, 8, 10, 12, 24, and 40. These patients were monitored for the development of severe AKI (KDIGO stage 2/3) for the period of ICU stay up to a maximum of 7 days.
**Results:** Out of 90 patients, 44 had early creatinine elevation; of which 23 (52%) progressed to severe AKI. The remaining 46 patients who did not have creatinine elevation at 24 h did not progress to severe AKI ($p < 0.001$). The RAI (Renal Anginal index) cutoff was calculated to be 7 for predicting the risk of AKI. The receiver operating curve (ROC) of RAI had an area under the curve (AUC) of 0.958, p value < 0.001, sensitivity of 100% and specificity of 80.6%. The mean RAI for patients who did not have creatinine elevation was $4.2 \pm 2.1$, while it was $22.5 \pm 12.6$ in those who had creatinine elevation ($p < 0.001$). 13 out of the 23 patients with severe AKI required RRT. Mortality was also significantly higher in the patients who progressed to severe AKI (65% vs 32%).
**Conclusions:** Combining clinical risk factors with smaller changes in serum creatinine could accurately predict the risk of developing severe AKI in critically ill. In addition, a renal anginal index of 7 at 24 h of ICU admission could reliably predict the risk of developing AKI.

| Creatinine | Score |
|---|---|
| <0.1 mg/dl | 1 |
| ≥ 0.1 mg/dl | 2 |
| ≥ 0.3 mg/dl | 4 |
| ≥ 0.4 mg/dl | 8 |

✖

| Condition | Score |
|---|---|
| ICU admission | 1 |
| Diabetes Mellitus | 3 |
| Vasopressors/Ventilation | 5 |

Renal anginal index (Reference 1)

**Classification of Risk factors**

| | | |
|---|---|---|
| Acute | Chronic major | Chronic minor |
| Hypotension | Advanced age >70 years | Hypertension |
| High risk surgery | Diabetes Mellitus | Morbid obesity |
| Nephrotoxin exposure | Cardiovascular disease | Hyperbilirubinemia |
| Sepsis | Chronic Kidney Disease | Cerebrovascular accident |
| | | Cancer |

**Classification into hazard tiers**

Hazard tier 1 - Very High risk
*Patients with septic shock or*
*Patients receiving vasopressors and mechanical ventilation*

Hazard Tier 2 – High Risk
*1 acute risk factor +1 chronic major risk factor*
*1 acute risk factor + 2 chronic minor risk factor s*
*2 acute risk factors*

Hazard Tier 3 – Moderate Risk
*1 chronic major risk factor or 1 acute risk factor*
*Multiple chronic major and minor risk factors without acute risk factors*

Definition of Creatinine elevation in each hazard tier
Hazard tier 1 (Very High Risk) – increase of 0.1 mg/dl
Hazard tier 2 (High Risk) Increase of 0.3 mg/dl
Hazard Tier 3 (Moderate risk) – Increase of 0.4 mg/dl

*Adapted from reference 3

Clinical risk factors and hazard tiers

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**Topic:** Acute Kidney Injury and haemofiltration

## 001377

### Neutrophil-to-lymphocyte ratio's interest in predicting mortality in polytrauma patients


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**Introduction:** Neutrophil-to-lymphocyte ratio (NLR) is a marker of the inflammatory systemic response that has been studied as prognostic biomarker in different pathologies. A few studies have taken interest in its use in polytrauma patients.
**Objectives:** To study the interest of NLR in predicting mortality in polytrauma patients admitted in the intensive care unit (ICU).
**Methods:** It was a retrospective study including polytrauma patients admitted to the medical ICU of Zaghouan's regional hospital in Tunisia between January 2019 and December 2021. Demographic, clinical and evolutionary data were collected. The NLR was calculated at Day 1, Day 2 and Day 7 of care. Two groups were individualized: G1 = Survivors and G2 = Deceased. The correlation between the ratio and mortality was investigated using logistic regression.
**Results:** Fifty patients were included: 30 survivors (G1) and 20 deceased (G2). Mean age was $42.7 \pm 18.8$ years with a gender ratio of 9. Median Injury Severity Score (ISS) was 27 [17–175]. Initial injury assessment revealed cranial trauma in 92% of patients, thoracic trauma in 70%, and abdominal trauma in 44%. Orotracheal intubation was indicated in 74% of cases, catecholamine use in 50% of cases, and urgent surgical intervention in 20% of cases. Healthcare-associated infections were noted in 40% of cases. The overall in-hospital mortality rate was 40% with a median length of ICU stay of 13 days [2–64].
Comparing NLRs at admission, Day 3, and Day 7, a significant prediction of mortality was observed for Day 1 (OR = 27.5; 95% CI [1.48–509.1]; $p = 0.026$) and Day 3 (OR = 122; 95% CI [2–7360]; $p = 0.022$), but not for Day 7 ($p = 0.243$). ROC curve analysis (Figure 1) allowed deduction of mortality prediction cutoffs: RNL1 at 2.8 (sensitivity 80%, specificity 57%) and RNL3 at 6.5 (sensitivity 80%, specificity 64.3%).
**Conclusions:** The analysis of neutrophil-to-lymphocyte ratios at Day 1 and Day 3 of hospitalization allowed for the prediction of mortality in severely polytraumatized patients.

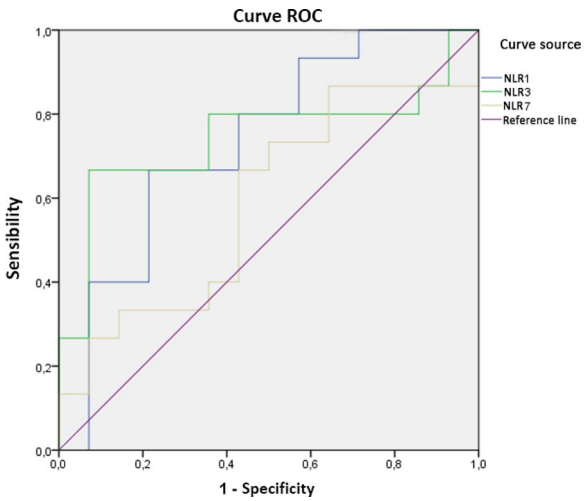


**Fig. 1 (abstract 001377)** ROC curve evaluating the sensitivity and specificity of neutrophil-to-lymphocyte ratios in predicting mortality

**Topic:** Trauma

## 001380

### Evaluation of non-invasive ventilation failure with bioelectric impedance analysis in a cohort of COVID-19 patients

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**Introduction:** Respiratory muscles may influence in the occurrence of non-invasive mechanical ventilation (NIV) failure. Bioimpedance analysis (BIA) parameters, which measure body composition (e.g., muscle body composition), have been associated with outcomes in critically ill patients.
**Objectives:** Evaluate the impact of BIA parameters on NIV failure in a cohort of patients with hypoxemic acute respiratory failure due to COVID-19.
**Methods:** This is an observational study in patients with acute respiratory failure in the intensive care units (ICU) of our hospital. We performed BIA during the first 24 h of NIV. Patient characteristics, severity scores, HACOR score, NIV parameters and gas exchange values together with BIA values were included in a database for analysis. We tested the association of BIA values, such as phase angle (PhA), with NIV failure. Univariate and multivariate analysis were performed using SPSS 25.0.
**Results:** We included 74 patients and mortality was 32.4% (24). Mean age was 61.5 ± 12.1 years, the BMI was 31 ± 7 kg·m − 2 and 78.4% (58) were men. 43 patients (58.1%) required tracheal intubation during NIV support with a mean duration of 5.2 ± 4.9 days from the start of NIV to tracheal intubation. We found no differences in the univariate analysis between the patients who required intubation and those who did not, except for a trend towards lower PhA in the intubated patients (4.6 ± 1.2 vs 5.00 ± 1.1; $P = 0.09$). This trend towards a higher incidence of NIV failure with a lower PhA was also observed in the multivariate analysis (hazard ratio: 0.345; 95% CI: 0.113–1.0.48; $P = 0.06$).
**Conclusions:** We found that BIA parameters, such as PhA, related with body composition may be associated with NIV failure. We hypothesized this may be related with baseline metabolic-nutritional status, which may be ultimately reflected by body composition.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001382

### Stroke mortality through targeting the circadian clock system. Retrospective analysis

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**Introduction:** Circadian rhythms are intrinsic timing mechanisms that allow adaptation to cyclical changes in the environment. Some studies suggest that circadian rhythms may influence the progression of a variety of diseases, such as the efficacy and toxicity of drugs used as well as the influence on mortality. Thus, disrupted circadian rhythms may increase the severity and consequences of stroke, while readjustment of circadian clock machinery may accelerate recovery from stroke. Temporal pattern of stroke events occurs in humans where both ischemic and hemorrhagic strokes have a bimodal pattern with the major and minor peak of events in the morning and evening, respectively. Morning strokes are more likely to be fatal as compared to afternoon strokes, and this high fatality is related to circadian clock-mediated morning rise in blood pressure, increased hematocrit and platelet aggregation, and hypercoagulability.
**Objectives:** Description of diurnal and nocturnal oscillations in the mortality of ICU patients hospitalized with BCVA, analysis of the peak hours of mortality, as well as highlighting the most critical intervals in order to ensure targeted therapy in order to prevent mortality.
**Methods:** This is a retrospective study carried out between 01.10.2023–30.03.2024 in the ICU, IMSP SCM "Sf.Treime". The total number of patients hospitalized with BCVA was analyzed, in particular the number of deceased patients and the peak hours of deaths were investigated. The total number of patients hospitalized in the ICU was 409 and the number of those who died in the ICU was 142 (34.71%), the average age being 64.04 ± 3.45 years, women 46.94% ($n = 192$), men 53.05% ($n = 217$).
**Results:** Mortality was found to follow a biphasic circadian pattern. The following peak hours of mortality were highlighted: 02:00–04:00 (22.53% ($n = 32$)); 06:00–08:00 (11.26% ($n = 16$)); 11:00–12:00 (15.49% ($n = 22$)); 14:00–17:00 (28.87% ($n = 41$)); 23:00–00:00 (10.56% ($n = 15$)). In deaths with an average age of 54.40 years ± 2.42 years, peaks were observed at 09:00–10:00 (4.92% ($n = 7$)) and 17:00–19:00 (6.33% ($n = 9$)). At the same time, time intervals were highlighted where no deaths were recorded, these being 00:00–01:00 and 13:00–14:00 which also outline a day–night rhythmicity.
**Conclusions:** This study documented the circadian pattern of mortality in patients with acute cerebrovascular diseases admitted to the ICU. In addition, the importance of appropriate therapy at certain hours of the day and night was noted. These evidences opening new perspectives in chronotherapy and chronoprophylaxis of acute cerebrovascular diseases. The precise role of circadian clocks in stroke and related cerebrovascular diseases needs to be addressed in future studies. In addition, investigating the molecular mechanisms that underlie the association between circadian rhythms and stroke would be an important step toward developing specific therapeutic strategies.

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**Topic:** Neurointensive care

## 001384

### Poor association between ultrasound and radiographic lung edema scores and parameters of shunt, dead space and lung mechanics in ventilated patients

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**Introduction:** Assessing pulmonary aeration in mechanically ventilated patients is crucial for optimizing ventilation and preventing complications [1]. Acute respiratory distress syndrome (ARDS) exacerbates lung function impairment, leading to shunt, dead space and altered lung mechanics [2]. The lung ultrasound score (LUS) and the Radiographic Assessment of Lung Edema (RALE) score are increasingly used to semiquantify pulmonary aeration and edema [3,4]. We aimed to examine the association between LUS and RALE scores, and metrics of shunt, dead space, and respiratory mechanics in invasively ventilated patients.
**Methods:** Secondary analysis of the 'Diagnosis of Acute Respiratory Distress Syndrome' (DARTS) prospective observational study including ICU patients expected to be invasively ventilated for at least 24 h [5]. The global LUS aeration score (range 0 to 36) and the Radiographic Assessment of Lung Edema (RALE) score (range 0 to 48) were used as scores of lung edema. Physiological metrics included the PaO2/FiO2 ratio as a surrogate of shunt, ventilatory ratio and corrected minute volume for dead space, and dynamic respiratory system compliance, driving pressure, and mechanical power as respiratory mechanics variables. The analysis was performed for all patients combined and repeated in the ARDS subgroup. Associations were tested through linear regression and the coefficient of determination (R2) was reported.
**Results:** This analysis comprised 364 DARTS patients, of which one-third suffered from ARDS, with 32% ICU-mortality. Median RALE and global LUS scores were 15 [8 to 20] and 7 [3 to 13], respectively. Both RALE and global LUS scores exhibited modest inverse associations with PaO2/FiO2, albeit the global LUS score had a stronger association as compared to RALE (R2 = 0.12 vs. R2 = 0.05, respectively). Both scores explained very little variance of ventilatory ratio, corrected minute volume, respiratory system compliance and driving pressure (R2 < 0.1 for all associations). The RALE score had a stronger association with mechanical power as compared to the global LUS score (R2 = 0.12 vs. R2 = 0.05, respectively; Figure). Limiting the analysis to the ARDS subgroup did not improve the associations.
**Conclusions:** Our study reveals a weak association between the RALE, the global LUS score and metrics of shunt, dead space, and respiratory metrics in invasively ventilated patients, emphasizing the necessity of a comprehensive lung assessment, combining radiographic and physiological measures.

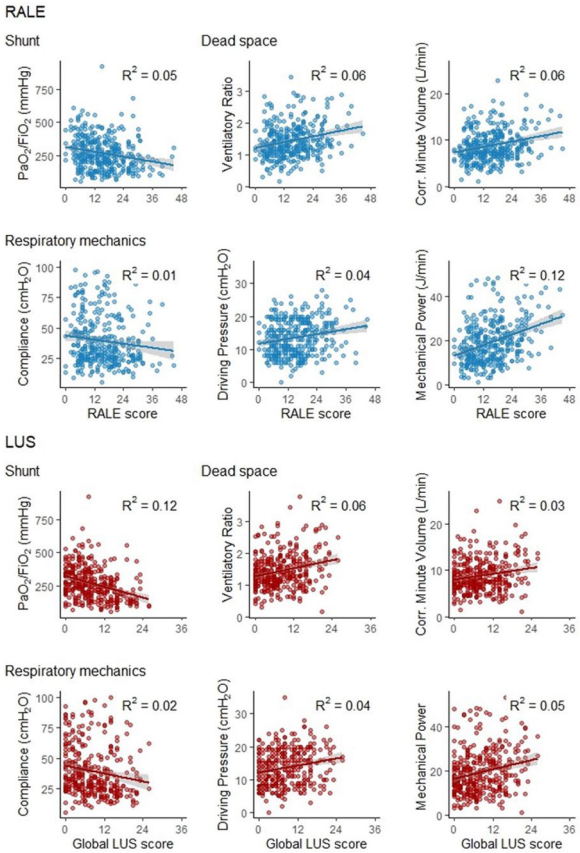


**Fig. (abstract 001384)** Association between the RALE score and global LUS score with metrics of shunt, dead space and respiratory mechanics. Scatterplots with dots independently representing the value of the imaging modality (RALE = blue; LUS = red) and their corresponding values of different measurements. The line represents linear regression with the 95% confidence interval plotted around it in grey

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**Topic:** Imaging in intensive care

## 001385

### Sepsis and septic shock mortality with capillary leak index in a northeast intensive care unit in Mexico

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**Introduction:** Capillary leak index (CLI) has shown to be effective in prediction of mortality for patients with sepsis and septic shock. Cordemans et al. (2012) set a cutoff point for 61 in no survivors with CLI, also an accumulative fluid balance greater than 2000 ml at discharge traducing capillary leak. Palacios et al. (2018) published a cutoff point for CLI and mortality at 85 with a sensitivity 89% and specificity 100% in Kaplan–Meier curve for mortality at 28 days.
**Objectives:** To evaluate capillary leak index and fluid balance to mortality in septic patients.
**Methods:** This is a prospective cohort of adult patients during January to December 2023 in the High Specialty Regional Hospital in northeast Mexico, which included adult patients with sepsis and septic shock at admission. Continuous variables are described as means and standard deviation and categorical variables as percentages; t student test and Chi square were used accordingly to evaluate differences and p value < 0.05 was considered statistically significant.
**Results:** A total of 50 patients were included in this observational study. Two groups were formed respective to the capillary leak index (< 67/ > 67), and tested for mean differences. < 67 CLI group had a mean age 44.8 years (± 18.7) vs > 67 CLI group 60.9 (± 12.7, $p = 0.001$), males 14.9% vs 23.4% ($p = 0.94$), BMI (kg(m2) 27.5 (± 4.9) vs 30.4 (± 9.2, $p = 0.23$), comorbidities, hypertension 4.3% vs 34% ($p = 0.003$), T2 diabetes mellitus 17% vs 29.8% ($p = 0.79$); vasopressor use 31.9% vs 59.6% ($p = 0.11$), serum creatinine 2.7 (± 2.9) vs 2.2 (± 2.1, $p = 0.54$), albumin 3 (± 0.7) vs 2.4 (± 0.5), C-reactive protein (mg/dl) 95.6 (± 55.5) vs 300 (± 101, $p = 0.0005$), final fluid balance at ICU discharge mean was 3918.9 mL (± 5695) vs 2191 mL (± 5731, $p = 0.31$)), mechanical ventilation use 25.% vs 38.3% ($p = 0.75$), SOFA 8 (± 4) vs 8 (± 3, $p = 0.54$), SAPS 49 (± 20) vs 50 (± 19.3, $p = 0.88$), duration of mechanical ventilation was mean 7 days (± 8.8) vs 5.4 (± 5, $p = 0.42$), renal replacement therapy 14.9% vs 12.8% ($p = 0.17$), and discharge to home 14.9% vs 38.3% ($p = 0.12$).
**Conclusions:** Our population of older adults was associated with greater capillary leak, as well as those with chronic arterial hypertension. Despite T2DM being a chronic inflammatory state, these patients do not present with greater capillary leak. Likewise, the tendency to maintain fluid restriction is noted in those patients with greater capillary leakage. When using the capillary leak index with a cutoff value of 67, there is no difference between mortality, days of mechanical ventilation or renal replacement therapy. However, just as Meyhoff (2022) demonstrated that restrictive or liberal fluid intake does not impact mortality, and therefore, there is no benefit in using large volumes of fluids. It will be necessary to use another cutoff point or inflammatory marker for greater prediction of mortality in patients with sepsis and septic shock.

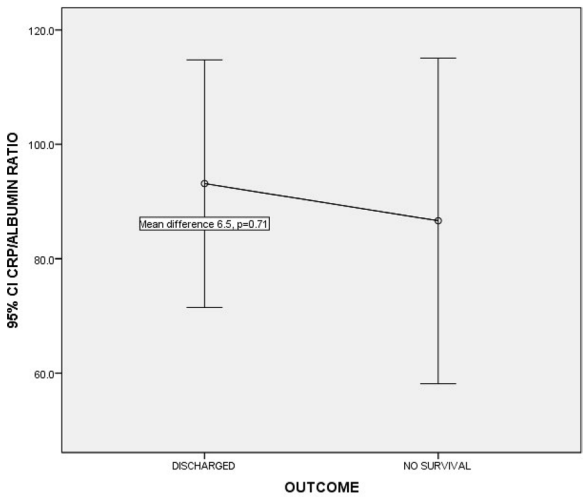


**Fig. (abstract 001385)** Error bars with discharged and no survival groups comparing mean capillary leak index

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**Topic:** Sepsis

## 001387

### Therapeutic plasma exchange is associated with improves survival in severe streptococcus related septic shock

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**Introduction:** Severe invasive infections caused by streptococcus subspecies, especially Group A (*S. pyogenes*) and *S. pneumoniae*, have emerged as an increasing cause of death and morbidity in the intensive care unit (ICU) over the past years. The release of exotoxins and superantigens into the bloodstream and subsequent cytokine release are considered as the main drivers of consecutive septic shock. Therapeutic plasma exchange (TPE) in early septic shock has demonstrated improved clinical outcomes, but its therapeutic significance in streptococcal disease in particular remains unclear.
**Objectives:** To investigate effects of TPE on major clinical outcomes in patients with streptococcus related septic shock.
**Methods:** We conducted a retrospective, multicenter observational cohort study, including adult patients with streptococcal infection-related septic shock between 2012 and 2024 at three tertiary university hospitals in Germany and Switzerland. Primary outcome was 90-day ICU mortality, key secondary outcomes included vasopressor-inotropic score (VIS) reduction at 24 h and other markers of organ dysfunction.
**Results:** These preliminary results only include one of three centers. Between 2012 and 2024, 70 patients were identified with streptococcus related septic shock. 25 patients underwent TPE, while 45 patients received standard of care (SOC). Main identified streptococcus subspecies were 30% *S. pyogenes*, 40% *S. pneumonia*, 30% other *S.* spp. At admission, patients in the TPE group exhibited considerably higher markers of organ dysfunction: SOFA-Score: 13 vs 9 points, lactate: 6.9 vs 4.3 mmol/l, VIS-Score 83 vs 60 and renal replacement therapy in 100% vs 49%, (all $p < 0.001$). In the Cox-regression model for 90-day ICU mortality, SOFA-score adjusted HR with TPE was 0.39 ($p = 0.049$) (Figure A). In the TPE group, there was a significant reduction in the VIS after 24 h compared to SOC (−35% [IQR −51; 5] vs 0% [IQR −18; 6], $p = 0.011$) (Figure B). Also, vasopressor-free days were higher with TPE (10 [IQR 0;34] vs 2 [IQR 0;6], $p = 0.02$). Within the TPE group, increasing VIS after 24 h was highly associated with ICU mortality (univariable HR: 6.04, $p = 0.02$), but this did not apply to the SOC group (Figure C).
**Conclusions:** In this preliminary analysis only including one of three centers, TPE was associated with improved clinical outcomes in streptococcus-related septic shock despite higher degree of multi-organ dysfunction at admission. Reduction in vasopressor use after 24 h was predictive of survival within the TPE group, but not the SOC group. Complete analysis of remaining centres is pending.

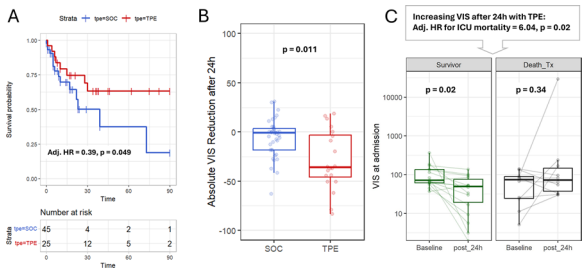


**Fig. (abstract 001387)** A) Kaplan–Meier plot showing 90-day ICU survival between TPE and SOC. B) Absolute VIS reduction after 24 h. C) Association between delta VIS and survival in the TPE group

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**Topic:** Sepsis

## 001390

### Performance of Hypotension Prediction Index in the first 12 h of postoperative cardiac surgery

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**Introduction:** Arterial hypotension has been associated with complications such as renal failure and increased mortality. The hypotension prediction index (HPI) allows the prediction of hypotension based on the analysis of the arterial blood pressure waveform (1). It has been validated for intraoperative hypotension; however, studies in critically ill patients are scarce.
**Objectives:** To evaluate the performance of HPI as a predictor of arterial hypotension in postoperative cardiac surgery patients.
**Methods:** This single-center, prospective, observational study was approved by the ethics committee. Patients aged ≥ 18 years who signed the informed consent form and were admitted to the ICU after programmed cardiac surgery were included. An arterial pressure catheter inserted into the radial artery was connected to an Acumen IQ sensor (Edwards Lifesciences, Irvine California, USA) and to a HemoSphere monitoring platform (Edwards Lifesciences, Irvine California, USA) to obtain the mean arterial pressure (MAP) and HPI (which was blinded on the monitor) every 20 s.
The first 12 h of the postoperative period was analyzed. Hypotension was defined as any period with a MAP < 65 mmHg for at least 1 min. Hypotension events separated by at least 15 min were used to evaluate HPI performance. HPI values were recorded 5, 10, and 15 min before the start of hypotension. A non-hypotensive event was defined as a 30 min continuous section data points with a MAP ≥ 75 mmHg and at least 20 min apart from any hypotensive event. The difference between MAP at 20 s (dMAP20s), 1 min (dMAP1min), and 3 min (dMAP3min) was used to compare the prediction ability.
The area under the ROC curve (AUROC) was calculated for each parameter. The optimal cutoff point was obtained as the point closest to the (0,1) point in the ROC curve. The area of MAP < 65 mmHg normalized by the observation time (TWA65mmHg) was calculated.
**Results:** 41 patients were included, with an age of 68 [62–72] years and 58% were male. Thirty-four percent underwent valvular surgery, and 51% of the patients underwent coronary by-pass. EUROSCORE II was 1.9 [0.74–3.86]. One patient died before starting data acquisition and 3 required re-intervention. For the latter, the time before and 12 h after re-intervention was analyzed. Total observation time was 29,641.33 min. Total hypotension time was 2401.67 min (8%). A total of 362 hypotensive events were recorded. 32 patients experienced at least one hypotensive event. The duration of the events was 2.33 [1.33–6] mins. TWA was 0.1 [0.01–0.4] mmHg. 96 episodes were used for the AUROC analysis. HPI AUROC was above 0.91, with a sensitivity and specificity above 80 and 88%, respectively, for the best cutoff point for the three evaluated periods (Table 1). AUROC for dMAP was approximately 0.5.
**Conclusions:** HPI predicted arterial hypotension during the first 12 h after programmed cardiac surgery and may help to act early to prevent hypotension and reduce potential complications.

**Table 1 (abstract 001390)** Area under ROC curve (AUROC), optimal cutoff, sensitivity, specificity for the evaluated parameters (HPI and MAP difference at 20 s, 1 min, 3 min and 5 min) to predict hypotension 5, 10 and 15 min before its onset.

| Variable | Time to event (min) | AUROC | Best cut-off point | Sensitivity (%) | Specificity (%) |
|---|---|---|---|---|---|
| HPI | 5 | 0,913 | 49 | 80,21 | 92,44 |
| | 10 | 0,923 | 44 | 79,57 | 88,37 |
| | 15 | 0,928 | 48 | 84,62 | 92,15 |
| dMAP 20s | 5 | 0,512 | 0 | 63,54 | 38,37 |
| | 10 | 0,52 | 0 | 65,59 | 38,37 |
| | 15 | 0,499 | 1 | 42,86 | 60,76 |
| dMAP 1min | 5 | 0,4486 | 0 | 51,04 | 39,53 |
| | 10 | 0,514 | 0 | 63,44 | 39,53 |
| | 15 | 0,496 | 0 | 59,34 | 39,53 |
| dMAP 3min | 5 | 0,42 | 0 | 39,83 | 41,14 |
| | 10 | 0,494 | 1 | 45,16 | 52,62 |
| | 15 | 0,477 | -1 | 72,53 | 29,65 |
| dMAP 5min | 5 | 0,434 | 0 | 51,04 | 42,15 |
| | 10 | 0,509 | 1 | 48,39 | 55,81 |
| | 15 | 0,477 | 1 | 42,86 | 55,81 |

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2. None

**Topic:** Cardiovascular issues in ICU

## 001391

### Analysis of Legionnaires' disease patients admitted to intensive or intermediate care units for three years at a peripheral hospital: on account of a cluster

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**Introduction:** Legionnaires' disease is a form of severe pneumonia caused by a Gram-negative aerobic intracellular bacteria. Between October 1st and November 30th 2023, Portugal registered a sudden increase of notified Legionnaires' disease cases throughout the country. A cluster was identified on the northern coast region with multiple cases, most requiring hospitalization at the peripheral hospital of the region. We took this epidemiological situation as an opportunity to review and analyze all Legionnaires' disease patients with severe disease admitted to the Hospital de Santa Luzia Intensive Medicine Department—intensive (ICU) or intermediate (IMCU) care units—in the last 3 years.
**Objectives:** To report the epidemiology, clinical features, treatment strategies and outcomes of patients admitted with Legionnaires' disease to the Intensive Medicine Department.
**Methods:** Data of patients with microbiologically documented Legionnaires' disease admitted to the ICU or IMCU was retrospectively collected between January 1st 2020 and December 31st 2023.
**Results:** In total, 10 patients with Legionnaires' disease were admitted with severe disease to the department. Of the 2023 cluster (17 patients with a positive test at our hospital), 4 (23.5%) were admitted to the IMCU and 3 (17.6%) to the ICU—41.2% admission rate. The remaining cases occurred in 2020 ($n=1$, 10%) and 2021 ($n=2$, 20%). Patients' mean age was 63 years old (Standard Deviation (SD) 19.4) and 80% ($n=8$) were males. Mean APACHE II, SAPS II and admission SOFA scores were 10.7 (SD 2.31), 32.2 (SD 11.58) and 5.1 (SD 2.42), respectively. Diagnose was made in all cases with a positive urinary antigen and in two cases with a positive PCR analysis too. Radiological lung changes at admission were noticed in all patients. Length of stay at the ICU was on average 11 days (SD 5.0) and at the IMCU 6.9 days (SD 6.26). At least one classic risk factor for Legionnaires' disease (such as smoking, pulmonary structural disease, diabetes disease or immunosuppression) was presented by 60% ($n=6$) of patients. The main cause of admission was respiratory failure ($n=9$, 90%) but 60% ($n=6$) of patients also presented multi-organ failure and 50% ($n=5$) presented acute kidney injury. No patient evolved to septic shock. Invasive mechanical ventilation was necessary in 2 cases (20%, mean duration 11 days, SD 4.3) and non-invasive ventilation or high-flow nasal cannula was used in 7 (70%) patients. Regarding antibiotic choice, azithromycin was used in 60% ($n=6$) of patients. A PCR decrease by half or more was noted 48 h after antibiotic treatment initiation in 7 (70%) patients. Survival rate was 100% ($n=10$).
**Conclusions:** Legionnaires' disease is an uncommon cause of admission to our ICU and IMCU with only 10 cases registered for 3 years. A cluster of Legionnaires' disease was identified in our region of Portugal in November 2023 with a 41.2% admission rate to the Intensive Medicine Department.

**Topic:** Infections and prevention

## 001392

### Evaluation of cardiac power as a predictor of outcome in patients with septic shock

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***Intensive Care Medicine Experimental*** 2024, **12(suppl 1):**001392

**Introduction:** Septic shock is a severe complication of sepsis with high mortality, characterized by circulatory and metabolic instability. Although various hemodynamic parameters have been used for its management, cardiac power (CP) has emerged as a potential predictor of clinical outcomes.
**Objectives:** To assess the utility of cardiac power as a predictor of mortality in patients with septic shock in an Intensive Care Unit (ICU).
**Methods:** A prospective, observational, longitudinal study was conducted at the ABC Medical Center from March 2023 to January 2024. Adults over 18 years of age diagnosed with septic shock were included, excluding those with cardiogenic shock or acute myocardial infarction at admission. CP was measured using non-invasive techniques, and its association with mortality and ICU stay duration was analyzed.
**Results:** The study included 23 patients, of which 40% had a CP lower than 0.6 W. A significant correlation was found between low CP and higher mortality ($p<0.05$). In addition, patients with a low CP had a longer ICU stay compared to those with a higher CP.
**Conclusions:** Cardiac power is an effective indicator for predicting mortality and could be useful for guiding therapeutic interventions in patients with septic shock. These findings suggest that CP monitoring could be incorporated as part of the standard management in the ICU for patients with this condition.

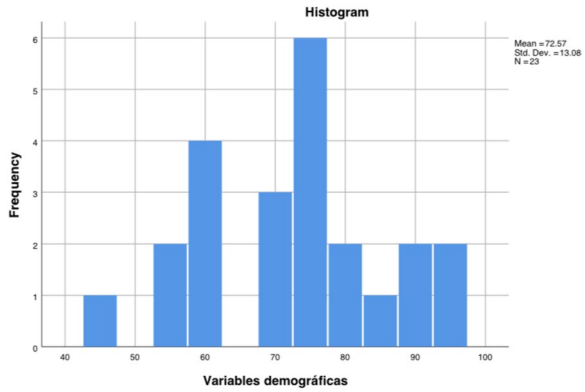


**Fig. 1 (abstract 001392)** .

**Statistics**

| | | DiasUCI | PoderCardiaco |
|---|---|---|---|
| N | Valid | 23 | 23 |
| | Missing | 0 | 0 |
| Mean | | 6.43 | .7700 |
| Median | | 3.00 | .6500 |
| Mode | | 1 | .51[a] |
| Std. Deviation | | 9.273 | .34798 |

a. Multiple modes exist. The smallest value is shown

**Fig. 2 (abstract 001392)** .

**DiasUCI**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 1 | 8 | 34.8 | 34.8 | 34.8 |
| | 2 | 2 | 8.7 | 8.7 | 43.5 |
| | 3 | 2 | 8.7 | 8.7 | 52.2 |
| | 4 | 2 | 8.7 | 8.7 | 60.9 |
| | 5 | 3 | 13.0 | 13.0 | 73.9 |
| | 9 | 2 | 8.7 | 8.7 | 82.6 |
| | 11 | 1 | 4.3 | 4.3 | 87.0 |
| | 12 | 1 | 4.3 | 4.3 | 91.3 |
| | 26 | 1 | 4.3 | 4.3 | 95.7 |
| | 40 | 1 | 4.3 | 4.3 | 100.0 |
| | Total | 23 | 100.0 | 100.0 | |

DiasUCI

**Fig. 3 (abstract 001392)** .

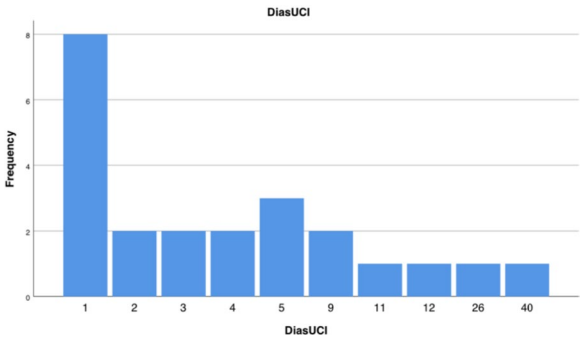


**Fig. 4 (abstract 001392)** .

**PoderCardiaco**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | .36 | 1 | 4.3 | 4.3 | 4.3 |
| | .39 | 1 | 4.3 | 4.3 | 8.7 |
| | .40 | 1 | 4.3 | 4.3 | 13.0 |
| | .47 | 1 | 4.3 | 4.3 | 17.4 |
| | .50 | 1 | 4.3 | 4.3 | 21.7 |
| | .51 | 2 | 8.7 | 8.7 | 30.4 |
| | .57 | 1 | 4.3 | 4.3 | 34.8 |
| | .60 | 2 | 8.7 | 8.7 | 43.5 |
| | .64 | 1 | 4.3 | 4.3 | 47.8 |
| | .65 | 1 | 4.3 | 4.3 | 52.2 |
| | .67 | 1 | 4.3 | 4.3 | 56.5 |
| | .71 | 1 | 4.3 | 4.3 | 60.9 |
| | .80 | 2 | 8.7 | 8.7 | 69.6 |
| | .97 | 1 | 4.3 | 4.3 | 73.9 |
| | 1.00 | 1 | 4.3 | 4.3 | 78.3 |
| | 1.09 | 1 | 4.3 | 4.3 | 82.6 |
| | 1.20 | 2 | 8.7 | 8.7 | 91.3 |
| | 1.40 | 1 | 4.3 | 4.3 | 95.7 |
| | 1.67 | 1 | 4.3 | 4.3 | 100.0 |
| | Total | 23 | 100.0 | 100.0 | |

**Fig. 5 (abstract 001392)** .

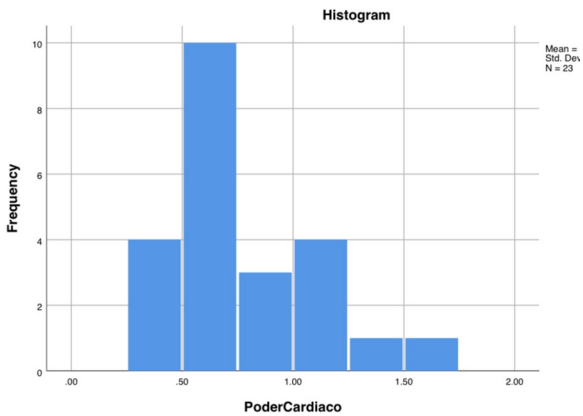


**Fig. 6 (abstract 001392)** .

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**Topic:** Cardiovascular issues in ICU

## 001393

### Blunt chest trauma in a non-trauma center: a three-year study

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**Introduction:** Blunt chest trauma (BCT) stands as a significant cause of trauma admissions globally, often requiring mechanical ventilation and exhibiting notable morbidity and mortality rates.
**Objectives:** To report BCT data within a non-trauma center and analyze variable associations with mortality.
**Methods:** A single-center retrospective cohort study of all adult patients admitted with BCT to the intensive or intermediate care unit of a non-trauma center was conducted between October 1st 2020 and October 31st 2023. Statistical analysis was done using Chi square and Mann–Whitney U tests.
**Results:** In total, 99 patients were admitted for BCT with 77.8% ($n=77$) being male and 22.2% ($n=22$) female, averaging 64.22 (SD = 17.5) years of age. Median duration of stay was 4 (IQR 5) days. Isolated chest trauma occurred in 31.3% ($n=31$) of cases. Severity scores at admission were SAPS II (Mdn = 24, IQR = 19), APACHE II (Mdn = 10, IQR = 6), SOFA (Mdn = 3; IQR = 3) and Injury Severity Score (ISS) (Mdn = 13, IQR = 13). Complications included lung contusion ($n=37$, 37.4%), pneumothorax ($n=34$, 34.3%), hemothorax ($n=42$, 42.4%) and flail chest ($n=15$, 15.2%). Non-invasive ventilation (NIV) was used in 33.3% ($n=33$) of patients and invasive ventilation in 12.1% ($n=12$). Notably, 26.7% ($n=4$) of flail chest patients and 23.5% ($n=8$) with pneumothorax only required NIV. Pain management with regional anesthesia was performed in 34.3% ($n=34$) of cases, with 17.7% ($n=6$) still requiring a strong systemic opioid. Patients with no regional anesthesia received opioids in 33.9% ($n=22$) of cases. Hospital-acquired infections rate was 41.4% ($n=41$), predominantly respiratory infection (80.5%, $n=33$). In-hospital mortality rate was 10.1% ($n=10$).
Chi-square test of independence showed significant association between mortality and need for NIV ($\chi2(1)=6.73$, $p=0.009$), invasive ventilation ($\chi2(1)=14.77$, $p<0.001$), use of strong systemic opioids ($\chi2(1)=5.52$, $p=0.019$) and hospital-acquired infection ($\chi2(1)=6.83$, $p=0.009$). No statistically significant association between mortality and sex ($\chi2(1)=0.39$, $p=0.544$), presence of flail chest ($\chi2(1)=0.23$, $p=0.634$), pulmonary contusion ($\chi2(1)=0.26$, $p=0.009$), hemothorax ($\chi2(1)=0.70$, $p=0.404$), pneumothorax ($\chi2(1)=1.02$, $p=0.316$), need for chest tube ($\chi2(1)=0.297$, $p=0.588$) and use of regional anesthesia ($\chi2(1)=2.923$, $p=0.089$) was found.
Mann–Whitney test showed that patients with greater SOFA ($Z=-3.81$, $p<0.001$), APACHE II ($Z=-2.79$, $p=0.005$) and SAPS II ($Z=-3.88$, $p<0.001$) scores had significantly greater mortality. No significant difference in mortality between age groups ($Z=-1.17$, $p=0.241$), duration of stay ($Z=-0.51$, $p<0.61$), number of fractured ribs ($Z=-0.99$, $p=0.32$) and ISS score ($Z=-0.391$, $p=0.695$) was found.
**Conclusions:** We report a relatively low use rate of NIV and invasive ventilation. In-hospital mortality was on the lower spectrum of the literature reported rate. Strong systemic opioid use, need for mechanical ventilation and nosocomial infection were associated with mortality.

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**Topic:** Trauma

## 001394

### Risk factors associated with acute kidney injury in critically ill patients in the intensive care unit

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001394

**Introduction:** Acute Kidney Injury (AKI) refers to the sudden loss of renal function determined by an increase in serum creatinine levels and/or a reduction in urine volume, limited to a duration of 7 days. The main factors for the development of AKI in intensive care units are sepsis, hypovolemia, cardiovascular diseases, age > 60 years, diabetes mellitus, and arterial hypertension. The presence of renal pathology represents an increased burden of morbidity and mortality, increased costs due to longer hospital stays, and especially in cases where it leads to Chronic Kidney Disease. There is limited information in Mexico and generally in Latin America; however, the importance of early detection is undeniable.
**Objectives:** To identify risk factors associated with acute kidney injury in patients admitted to the intensive care unit.
**Methods:** Case–control studies in patients admitted to intensive care without acute kidney injury were conducted. Two groups were integrated: patients with acute kidney injury (cases) and patients without acute kidney injury (controls) within 24 h of admission to the service. The diagnosis of AKI was established with an increase in baseline creatinine greater than 0.3 mg/dL. The sample size was 30 cases and 38 controls. Statistical analysis included averages, percentages, *t*-test for independent groups, chi-square test, odds ratio, confidence

interval for odds ratio, ROC curve, sensitivity, specificity, multiple logistic regression model, and calculation of the probability of the event occurrence.
**Results:** The logistic regression model showed that when the Sequential Organ Failure Assessment (SOFA) score at admission is greater than 3.5 and the admission creatinine is greater than 0.85, the probability of presenting acute kidney injury at 24 h is 60.1%. If the baseline SOFA score is less than 3.5 and the baseline creatinine is less than 0.85, the probability of presenting acute kidney injury at 24 h is 16.5%. There were no significant differences in the rest of the variables (sex, age, comorbidities, vasopressor therapy, invasive mechanical ventilation, or urine output/hour at admission).
**Conclusions:** There are various factors that may predispose critically ill patients to AKI such as coronary artery disease, chronic liver disease, use of nephrotoxic drugs, sepsis, vasopressor therapy, etc. In our study, consistent with other studies, the variables of statistical significance were SOFA score and baseline creatinine, mentioning a cutoff point of 3.5 and 0.85 mg/dL respectively, which together, give a risk of more than 50% for the development of AKI, thus helping to recognize and implement interventions to reduce morbidity and mortality.

**Table 1 (abstract 001394)** Comparison of sex, age, and comorbidities in patients with and without acute kidney injury 24 h after admission to the intensive care unit.

| Age (years) | Acute Kidney Injury (n=30) | No Acute Kidney Injury (n=38) | T test | p |
|---|---|---|---|---|
| Mean | 66.53 | 15.95 | 0.38 | 0.702 |
| Standard Deviation | 68.16 | 18.29 | | |
| **Sex** | | | **Chi - square** | **p** |
| Male | 63.3% | 60.5 | 0.05 | 0.813 |
| **Diabetes Mellitus** | | | | |
| Yes | 16.7% | 7.9% | 1.24 | 0.265 |
| **Systemic Arterial Hypertension** | | | | |
| Yes | 33.3% | 36.8% | 0.09 | 0.764 |
| **Chronic Obstructive Pulmonary Disease** | | | | |
| Yes | 6.7% | 7.9% | 0.03 | 0.847 |
| **Liver Disease** | | | | |
| Yes | 6.9% | 0.0% | 2.70 | 0.100 |
| **Vasopressor** | | | | |
| Yes | 70.0% | 57.9% | 1.05 | 0.304 |
| **Mechanical Ventilation** | | | | |
| Yes | 36.7% | 42.1% | 0.20 | 0.649 |
| **Urine Output** | | | | |
| Less than or equal to 70 | 53.6 | 48.6 | 0.15 | 0.694 |
| Greater than 70 | 46.4 | 51.4 | | |

**Table 2 (abstract 001394)** Area under the curve for basal Sequential Organ Failure Assessment (SOFA) score, basal creatinine, and acute kidney injury at 24 h.

| SOFA area under curve | IC 95% | | p |
|---|---|---|---|
| | Lower Bound | Upper Bound | |
| 0.640 | 0.508 | 0.772 | 0.049 |
| Creatinine area under curve | IC 95% | | p |
| | Lower Bound | Upper Bound | |
| 0.650 | 0.516 | 0.783 | 0.035 |

**Table 3 (abstract 001394)** Probability of acute kidney injury at 24 h after admission to the intensive care unit, calculated from baseline SOFA and baseline creatinine.

| Probability of acute kidney injury at 24 hours | Baseline SOFA score 3.5 | Basal Creatinine 0.85 |
|---|---|---|
| 16.5% | lower | lower |
| 34.3% | higher | lower |
| 36.3% | lower | higher |
| 60.1% | higher | higher |

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**Topic:** Acute Kidney Injury and haemofiltration

## 001395

### HIV-infected patients admitted to the ICU during and after COVID-19 pandemic


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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001395


**Introduction:** The widespread use of antiretroviral therapy in the treatment of HIV-infected patients leads to a significant reduction in their morbidity and mortality, although ICU admission remains frequent.
**Objectives:** We aim to characterize the epidemiology and outcomes of HIV-infected patients admitted to the ICU, during and after the COVID-19 pandemic, to explore its possible impact on the follow-up and treatment of these patients.
**Methods:** A single-center, retrospective, observational study of critically ill HIV-infected patients was performed between 1st March 2020 and 1st March 2024. Patients were divided into COVID or post-COVID era, according to their admission in the first or second 24 months of the study period, when the follow-up of the majority of outpatients was performed virtually or presentially by default, respectively. Statistical analysis was performed by IBM SPSS Statistics v. 29.
**Results:** A total of 3282 patients were admitted to the UCI during the study period. Among these, 69 patients were HIV-infected, with a median age of 56 years, 638% were male and 667% caucasian. HIV infection was newly diagnosed in 174% of the patients. The majority of admissions were for non-AIDS-defining conditions (884%). Respiratory illness (348%), sepsis and septic shock (275%), and neurological disorders (145%) were the main conditions that lead HIV-infected patients to the ICU. During ICU stay, 638% of the patients needed vasopressors and/or inotropes, 652% mechanical ventilation and 246% renal replacement therapy. Comparing patients admitted during the COVID ($n=30$) and post-COVID era ($n=39$), median APACHE II was 19 vs 18, median SAPS II 53 vs 42, AIDS-defining infection at ICU admission was 26.7% vs 30.8%, CD4 level 461 vs 435 cells/uL, viral load 162 vs 90 RNA copies/ml, respectively (all $p$-values > 0.05). ICU mortality in the post-COVID era was higher than in the COVID era (308 vs 16.7%) but did not reach statistical significance.
**Conclusions:** Respiratory illness remains the main indication for ICU admission in HIV-positive patients. ICU mortality of HIV patients remain high but did not change between COVID and post-COVID era.

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**Topic:** Systemic diseases

## 001396

## Modified renal angina as a predictor of acute kidney injury in critically ill patients in the intensive care unit

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001396

**Introduction:** Acute kidney injury (AKI) is defined by a sudden loss of excretory renal function, its management in critical care settings is challenging, with a poor prognosis. The Renal Angina Index (RAI) is a tool that incorporates clinical parameters within the first day of admission, grouped into two categories: risk and injury. It has been validated in the pediatric population to aid in the risk stratification of AKI within 3 days of admission to the intensive care unit, with notably higher performance than single changes in serum creatinine for the incidence of acute kidney injury. In a subanalysis of clinical studies, modifications were made to the risk category for its applicability. The diagnostic performance of this index in the adult population has not been as accurate.
**Objectives:** To demonstrate that the modified renal angina index is useful for predicting the occurrence of AKI in critically ill patients.
**Methods:** Retrospective, observational, longitudinal, and single-center study. It was conducted on patients admitted to the intensive care unit without acute kidney injury, with at least 24 h of stay, baseline creatinine was taken and 24 h later, patients with AKI, chronic kidney disease, treatment with renal replacement therapy, and gestational status were excluded. Modified Renal Angina Index (mRAI) was calculated, AKI was established with an increase in baseline creatinine greater than 0.3 mg/dL for stage 1 defined by the Kidney Disease: Improving Global Outcomes (KDIGO) creatinine criteria. Statistical analysis included an ROC curve to determine the highest sensitivity and specificity, chi-square test, and odds ratio.
**Results:** RAIm showed good performance with the occurrence of AKI with an AUC of 0.88 (95% CI: 0.80 to 0.97). In the group with mRAI greater than 7, the prevalence of acute kidney injury was 75.5%, and in the group with mRAI of 7 or less, the prevalence of acute kidney injury was 15.4% ($p = 0.001$). For every 17 patients with a renal angina index greater than 7 who have acute kidney injury, there is 1 patient with a renal angina index of 7 or less who also has acute kidney injury.
**Conclusions:** In our study, we found that the RAIm greater than 7, as reported in the literature, is a predictor of AKI, from stage 1, being a useful, simple, applicable and economical index, allowing us to anticipate fatal outcomes and complications in the intensive care unit.

**Table 1 (abstract 001396)** Area under the curve for modified renal angina index and acute kidney injury at 24 h.

| Area under the curve | IC 95% | | p |
|---|---|---|---|
| | Lower | Upper | |
| 0.880 | 0.803 | 0.975 | 0.001 |

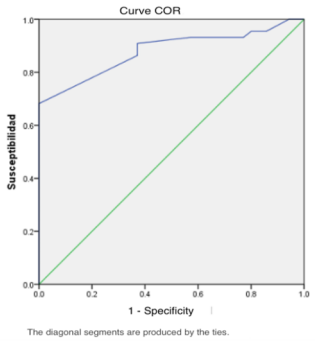


**Table 2 (abstract 001396)** Sensitivity, specificity, and cutoff point for Modified Renal Angina Index in predicting acute kidney injury at 24 h.

| Renal Angina Index Cutoff Point | Sensitivity | Specificity |
|---|---|---|
| 0.0000 | 1.000 | 0.000 |
| 1.5000 | 1.000 | 0.057 |
| 2.5000 | .955 | 0.143 |
| 3.5000 | .955 | 0.200 |
| 4.5000 | .932 | 0.229 |
| 5.5000 | .932 | 0.429 |
| 7.0000 | .909 | 0.629 |
| 9.0000 | .864 | 0.629 |
| 11.0000 | .682 | 1.000 |
| 16.0000 | .659 | 1.000 |
| 22.0000 | .409 | 1.000 |
| 32.0000 | .273 | 1.000 |
| 41.0000 | 0.000 | 1.000 |

**Table 3 (abstract 001396)** Modified Renal Angina Index as a Predictor of Acute Kidney Injury at 24 Hours of Intensive Care Unit Admission.

| Acute Renal Injury | Renal Angina Index greater than 7 (n=26) | No Renal Angina Index of 7 or less (n=53) | Chi2 | p | OR | IC 95% | |
|---|---|---|---|---|---|---|---|
| | Porcentage | | | | | Lower | Upper |
| Yes | 75.5 | 15.4 | 25.52 | 0.001 | 16.92 | 4.91 | 58.21 |
| No | 24.5 | 84.6 | | | | | |

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**Topic:** Acute Kidney Injury and haemofiltration

## 001397

### Casual relationship and mediators between immune traits and ARDS: a mendelian randomization study

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001397

**Introduction:** Observational evidence supports the correlations between immune traits and acute respiratory distress syndrome (ARDS) [1–3]. A recent mendelian randomization (MR) Study found the causal relationship between two immune cell subtypes and ARDS [4]. However, causal associations of numerous immune traits with ARDS remained unknown. Furthermore, metabolic reprogramming of immune cells was found to be correlated with dysregulated inflammation response [5], indicating that serum metabolites may mediate between immune traits and ARDS. In this study, we applied two-step MR analyses to examine causality and mediators between 731 immune traits and ARDS risk.
**Methods:** A total of 731 immune traits, including 118 absolute cell counts, 192 relative counts, 389 median fluorescence intensity (MFI) of surface antigens and 32 morphological parameters, were recruited. This study utilized genome-wide association studies (GWAS) on 731 immune traits as exposure and an ARDS GWAS from the Finngen database as the outcome [6]. GWAS on 1400 serum metabolites were also used as a potential mediator [7]. In this study, a two-step Mendelian randomization method is used to calculate the mediation effect. The inverse variance weighted (IVW), MR-Egger and weighted median were performed for comprehensive assessment of the causality. Sensitivity analyses were conducted with Cochrane's Q test, MR-Egger intercept, MR-PRESSO and leave-one-out analysis. In addition, replication MR and Steiger test were also implemented to verify the causation.
**Results:** Our study identified that 10 genetically determined immune traits were causally associated with ARDS risk. High expression of CD8 on Effector Memory CD8+T cell (OR=1.58, 95% CI: 1.13–2.21, $p=0.008$), CD25 on IgD+CD38- naive B cell (OR=1.75, 95% CI: 1.14–2.68, $p=0.011$), and CD25 on IgD+CD38+B cell (OR=1.85, 95% CI: 1.14–3.02, $p=0.013$) were most significantly associated with a higher risk of ARDS. CD20 on IgD+CD24− B cell (OR=0.60, 95% CI: 0.40–0.92, $p=0.020$), CD20 on naive-mature B cell (OR=0.62, 95% CI: 0.41–0.93, $p=0.022$), CD20 on B cell (OR=0.61, 95% CI: 0.40–0.93, $p=0.023$), CD20 on IgD+B cell (OR=0.65, 95% CI: 0.44–0.96, $p=0.029$), CD25 on IgD+CD24− B cell (OR=1.62, 95% CI: 1.05–2.51, $p=0.031$), CD45RA+CD28− CD8+T cell %T cell (OR=1.00, 95% CI: 1.00–1.00, $p=0.033$), and CD20 on IgD+CD38dim B cell (OR=0.71 95% CI: 0.52–0.98, $p=0.037$) also had potential casual relationship with ARDS. Mediation analysis revealed that the Hypotaurine to cysteine ratio mediated the causal relationship between CD8 on Effector Memory CD8+T cell and ARDS, and the proportion of mediating effect was 38.8%. 5-hydroxylysine levels mediated the causal relationship between CD25 on IgD+CD24− B cell and ARDS, and the proportion of mediating effect was 11.8%.
**Conclusions:** This research unveils the intricate network between immune traits and ARDS, thus providing novel perspectives into the development mechanism of ARDS and potential therapeutic targets for further research.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001400

### In situ simulation in critical care: impact on staff's self-perception and satisfaction

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001400

**Introduction:** In situ simulation (ISS) is a key training strategy in critical care settings. This study aimed to evaluate the impact of an ISS program on critical care staff's self-perception of their skills and their satisfaction with the training received.
**Methods:** A quantitative post-intervention study was conducted to assess the self-perception and satisfaction of critical care unit staff following the implementation of an ISS program. Data were collected using self-administered questionnaires, including the SET-M and Likert scales.
**Results:** The study included 61 participants with a median age of 32 years, a male-to-female ratio of 1:2, and a median experience of 8 years (IQR 5–12.25). During the first semester, each respondent participated in an average of 1.7 simulations, and 77% had prior simulation experience. Overall satisfaction with the program was high, with a global evaluation of 9.45/10. The impact on self-perception, assessed using applicable items from the SET-M scale, showed an average of 2.7/3 across dimensions, indicating strong agreement with the favorable impact of ISS.
**Conclusions:** ISS is not only feasible but also highly valued by critical care staff. The program's impact on staff's self-perception and satisfaction reflects a very positive overall evaluation, suggesting that ISS is associated with perceived improvements in performance. These findings add a new dimension to the analysis of ISS in critical care settings, highlighting its potential benefits for staff development and confidence.

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3. None.

**Topic:** Health Services Research and Outcome

## 001401

### Emotions on the front line: how in situ simulation reveals the experiences of critical care professionals

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001401

**Introduction:** Healthcare professionals working with critically ill patients face various emotional stressors that can impact their well-being and patient care. In situ simulation (ISS) is a training tool that can potentially strengthen emotional management skills. This study aimed to interpret the emotions of healthcare professionals working in critical care services and participating in ISS scenarios to develop strategies for enhancing their emotional management.
**Methods:** A qualitative descriptive phenomenological study was conducted. Data were collected through semi-structured interviews with healthcare professionals working in critical care units who had participated in ISS during the past two years. Interviews were recorded and analyzed using Colaizzi's method.
**Results:** Two main themes emerged from the data: emotions in the intensive care unit (ICU) and emotions in clinical simulation. Within the ICU theme, participants reported experiencing both negative emotions (fear, sadness, guilt, nervousness, and anxiety) and positive emotions (gratification, tranquility, and adrenaline rush). Empathy and emotional fatigue were identified as recurring concepts. Participants also discussed strategies for managing emotions and crisis situations. Within the clinical simulation theme, participants expressed negative emotions (uncertainty, anger, and nervousness) and positive emotions (tranquility and confidence). They recognized the benefits of simulation, such as increased professional security, error identification, team training, and improved organization.
**Conclusions:** Emotions play a crucial role in the professional performance of healthcare workers caring for critically ill patients. ISS can be an effective tool for strengthening emotional management skills. Incorporating strategies to address the emotional well-being of healthcare professionals, such as debriefing sessions focused on emotions and simulations targeting soft skills like effective communication, can potentially enhance their emotional resilience and patient care.

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3. None.

**Topic:** Health Services Research and Outcome

## 001403

### Association between admission cholesterol levels and mortality in patients with sepsis and septic shock: a retrospective cohort study

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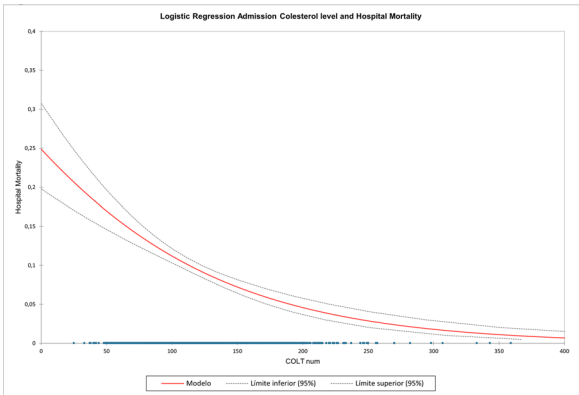
***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001403

**Introduction:** Sepsis and septic shock are life-threatening conditions associated with significant morbidity and mortality. Recent studies have suggested a potential link between cholesterol levels and outcomes in septic patients. This study aimed to investigate the association between admission cholesterol levels and mortality in patients with sepsis and septic shock.
**Methods:** A retrospective cohort study was conducted on patients with sepsis and septic shock admitted to Son Llatzer Hospital in Palma, Mallorca, Spain, between 2006 and 2022. The Sepsis-2 definition was primarily used for patient classification. Differences in mean cholesterol values among sepsis, severe sepsis, and septic shock groups were analyzed using ANOVA. Logistic binomial regression was performed to assess the relationship between admission cholesterol levels and mortality.
**Results:** 5780 Admission cholesterol samples from septic patients were analyzed. Levels were significantly lower in patients with septic shock compared to those with sepsis and severe sepsis ($110.489 \pm 2.306$ mg/dL vs. $128.804 \pm 3.270$ mg/dL and $124.795 \pm 1.200$ mg/dL, respectively; $p < 0.001$). Logistic regression analysis revealed a significant association between lower admission total cholesterol levels and increased mortality (odds ratio: 0.990; 95% CI: 0.988–0.993; $p < 0.0001$).
**Conclusions:** In this retrospective cohort study, lower admission cholesterol levels were significantly associated with septic shock and increased mortality in patients with sepsis and septic shock. These findings suggest that admission cholesterol levels may serve as an additional, and usually available, prognostic marker to be considered in septic patients. Further research is needed to elucidate the underlying mechanisms and potential therapeutic implications of this association.




**(abstract 001403)** Logistic regression of admission cholesterol level and in-hospital mortality in septic patients

**Reference(s)**
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2. None.

**Topic:** Sepsis

## 001404

### Does the sequence of training exposure impacts student satisfaction and learning? Insights from a respiratory failure undergraduate theoretical-practical course

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001404

**Introduction:** Today, intensive care medicine has expanded to the undergraduate curriculum, providing a true opportunity for medical students to be involved in the care of critical scenarios and to understand from a practical point of view complex physiological concepts [1]. Our department provides undergraduate teaching on the fundamentals of organ failure, including acute respiratory failure (ARF). COVID-19 pandemic forced us to shift to a simulation-based scenario of ARF in the context of remote classes. We used a mechanical ventilator software simulator for this experience. Since 2022, we returned to in vivo training, including real-life demonstrations of ARF in ICU. We decided to maintain both experiences, simulation-based cases, and real-life exposure. Moreover, there is paucity of evidence on which educational strategy should be first introduced, either simulation or clinical scenario, to enhance user satisfaction and learning outcomes.

**Objectives:** Our main aim was to evaluate the educational impact of exposure sequence (simulation first vs clinical first) on students' learning outcomes and satisfaction.
**Methods:** We performed a randomized crossed-over educational controlled study. Briefly, all medical students admitted for the human physiology regular course of the 2022 cohort were randomly assigned to the sequence simulation—ICU visit (Group 1) or ICU visit—simulation (Group 2). In both scenarios, we reviewed concepts of normal respiratory physiology and ARF measuring and interpreting FiO2, pO2, pCO2, PaO2:FiO2, Vd/Vt, A-aO2 gradient, plateau pressure, PEEP, driving pressure, lung compliance, air resistance and identifying the main hypoxemia mechanism. The students tabulated their measures and interpretation using an electronic survey (google form). Both forms (simulation and ICU visit) were identical. We evaluate the adequacy of responses, the time spent to fill the form, and satisfaction (5-point scale). Data was analyzed using unpaired T Student test and are presented as mean DS.
**Results:** During November 2022, we randomized 114 undergraduate medical students to both exposure sequences. Male 60%, 20 years old. Group 2 (ICU first) obtained a discrete but significantly better performance with a 23.65 score (31 maximal) vs 21.56 score Group 1 (Simulator first) $p = 0.047$ (Fig. 1A). In addition, Group 2 required less time to complete their form (84.5 vs 105 min, $p = 0.04$; Fig. 1B). Consistent with these results Group 2 had a better satisfaction experience measured by a survey where they opined that methods, tests, information, and overall satisfaction were better using the sequence ICU first (Fig. 2A–D).
**Conclusions:** Undergraduate students had higher satisfaction and a better learning experience when they were initially assigned to ICU exposure rather than simulation first. Although these results rejected our hypothesis, we believe that simulation fatigue [2] and the opportunity to interact with both patients and healthcare teams impacted students' satisfaction and learning.

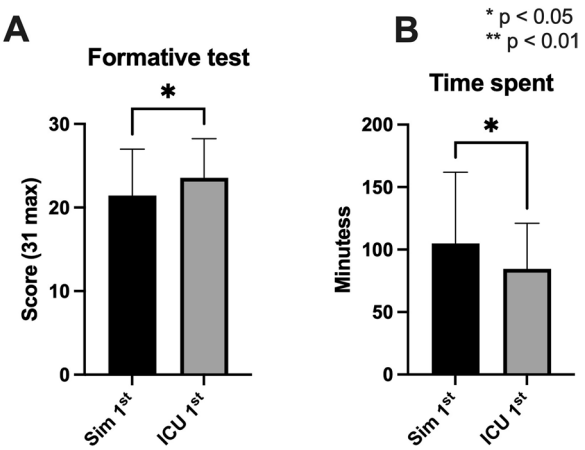


**Fig. 1 (abstract 001404)** Students randomly assigned to teaching at the ICU first obtained better grades and required less time to answer the tests than teaching based on a mechanical ventilator software simulator (Sim) first

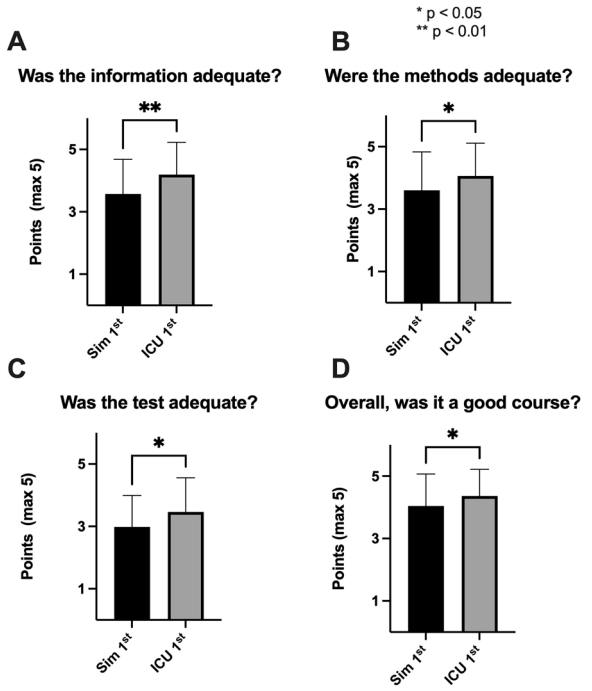


**Fig. 2 (abstract 001404)** Students randomly assigned to teaching at the ICU first experienced greater satisfaction than teaching based on a mechanical ventilator software simulator (Sim) first

**Reference(s)**

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3. None.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001407

## Using baseline pulse pressure variation predicts an achievement of negative fluid balance in 6 h after diuretic injection in septic shock patients

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001407

**Introduction:** Fluid resuscitation is a principal treatment in shock patients, however, it causes organ dysfunctions. To achieve a negative fluid balance (NFB), it aims to reduce organ edema, however, hypotension might occur resulting in tissue hypoperfusion and premature cessation of NFB.
**Objectives:** To evaluate whether baseline hemodynamic variables, pulse pressure variation (PPV), stroke volume variation (SVV) and change after the passive leg raising test (PLR) were related to an achievement of NFB without hypotension.
**Methods:** Recovery shock patients (MAP ≥ 65 mmHg without an increase of vasopressor or fluid bolus ≥ 6 h) who planned to undergo an achievement of NFB by diuretic were included. A PLR was performed before the diuretic injection. Hemodynamic variables were recorded before and immediately after PLR and changes in these variables during PLR were calculated as percentages. Cardiac output (CO) was obtained by pulse contour analysis. Positive fluid responsiveness (+veFR) was classified by ΔCO > 10% after PLR. All patients were divided by an achievement of NFB > 500 ml in 6 h after diuretic injection without hypotension (MAP < 65 mmHg or an increase in norepinephrine dose (NE)) (success vs unsuccess). Receiver operating characteristic (ROC) curves were performed and the area under the curves (AUCs) were calculated to predict whether the achievement of NFB would be successful.
**Results:** A total of 31 septic shock patients were included. The SOFA scores at inclusion time were 4 (2–5). All patients required NE at a dosage of 0.1 (0.1–0.3) mcg/kg/min. Fluid accumulation before inclusion was 2.3 (1.3–3.4) L. The time from shock diagnosis to inclusion time was 72 (48–120) hours. Of the 31 patients, 20 were in the success group and 11 patients of these were +FRve. There were no differences in baseline hemodynamic variables and changes after PLR between patients in the success and those in the unsuccess groups (Table 1). Baseline PPV and SVV were higher in patients in the success group than for those in the unsuccess group (Table 1). Baseline PPV had the highest AUC for predicting a successful NFB with cut-off values ≤ 7 (sensitivity 80%, specificity 81%) (Fig. 1).

**Table 1 (abstract 001407)** Baseline hemodynamic variable at inclusion in success and unsuccess group

| | All patients (*n* = 31) | Success group (*n* = 20) | Unsuccess group (*n* = 11) | *p*-values |
|---|---|---|---|---|
| SOFA | 4 (2–5) | 4 (1–5) | 5 (4–6) | 0.02 |
| MAP (mmHg) | 85 (77–91) | 85 (80–92) | 78 (73–86) | 0.07 |
| Norepinephrine Dose (mcg/kg/min) (*n* = 31) | 0.1 (0.1–0.3) | 0.1 (0.1–0.3) | 0.2 (0.1–0.5) | 0.3 |
| CO (L/min) | 4.1 (3.4–5.3) | 4.5 (3.8–5.4) | 3.6 (3.1–4.5) | 0.06 |

| | All patients (*n* = 31) | Success group (*n* = 20) | Unsuccess group (*n* = 11) | *p*-values |
|---|---|---|---|---|
| PPV (%) | 7 (5–12) | 6 (4–7) | 12 (8–25) | < 0.01 |
| SVV (%) | 8 (6–11) | 7 (6–9) | 10 (8–18) | 0.02 |
| Lactate (mmol/L) | 1.3 (0.9–1.9) | 1.3 (0.9–1.9) | 1.5 (0.9–1.8) | 0.8 |
| No. of + ve FR (%) | 13 (42%) | 9 (45%) | 4 (36%) | 0.4 |
| ΔCOPLR (%) | 5.6 (2.4–15.1) | 6.2 (2.6–14.2) | 5.6 (0–15.5) | 0.9 |
| ΔPPVPLR (%) | 14 (0–33.33) | 17 (0–33.3) | 8 (− 9.5–22.5) | 0.3 |
| NFB ( 6 h after diuretic injection) (L) | − 0.8 (− 0.5–− 1.2) | − 1.0 (− 0.7–− 1.3) | − 0.4 (− 0.2–− 0.5) | < 0.01 |

**Conclusions:** Baseline PPV and SVV are related to success in NFB in shock patients.

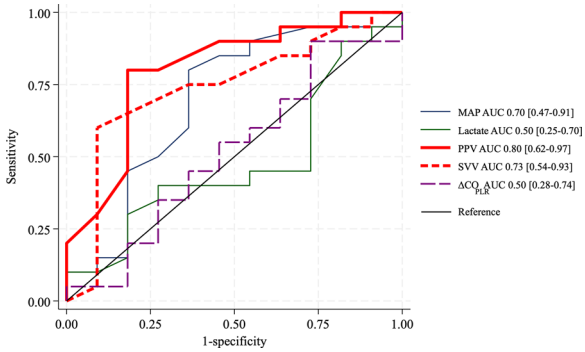


**Fig. 1 (abstract 001407)** Variables to predict a success in an achievement in NFB > 500 ml in 6 h

**Topic:** Cardiovascular issues in ICU

### 001408

**Impact of corticosteroid therapy in immunocompromised patients admitted to intensive care for severe COVID-19 pneumonia: a multicentre retrospective observational study**

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001408

**Introduction:** The administration of corticosteroids in the acute phase of severe COVID-19 pneumonia decreases the risk of mortality, among others in critically ill patients. However, the effectiveness of this treatment has never been studied in previously immunocompromised patients.
**Objectives:** The objective of this study is to assess the impact of early administration of steroids in immunocompromised patients admitted to the ICU for severe COVID-19 pneumonia.
**Methods:** This is a retrospective multicenter study, including immunocompromised patients admitted for severe COVID-19 pneumonia, between 01.08.2020 and 31.08.2022, in one of the ICU participating in the multicenter Outcomerea database, or in the ICU of Créteil, Nantes, Strasbourg and Montpellier, in France.
The clinical and biological characteristics of the patients were collected at admission and during the ICU stay. Patients were classified according to their type of immunosuppression, namely cellular, humoral, corticoid, and monocytic.
The outcome criteria were mortality at day 60 and the occurrence of nosocomial infection in ICU at day 60. Single- and multivariate survival analyses were performed.
The study was approved by the SRLF ethics committee.
**Results:** 362 patients were included, 310 of whom were receiving corticosteroids. Patients in the corticosteroid group had more cardiovascular comorbidities, were less severe (SAPS II: 38 [30; 47] versus 43.5 [33; 56.5], $p < 0.01$), had more nosocomial infections (24.2 vs 1.9%, $p < 0.01$), a longer ICO length of stay (11 [6; 19] vs 7 [4; 14], $p < 0.01$), but a similar death rate at day 60. Corticosteroid administration was not associated with an increased risk of death either in the entire cohort or by immunosuppression subgroups. Corticosteroids were associated with an increased risk of nosocomial infections (subHR = 1.98, CI 1.28; 3.05).
**Conclusions:** The protective effect on the death of corticosteroids is not found in immunocompromised patients. Corticosteroids were associated with an increased risk of nosocomial infections. These results require confirmation.

**Topic:** Infections and prevention

### 001409

**A randomized crossover trial to determine the influence of prone positioning with abdominal suspension or a flat abdomen on peak airway pressure in mechanically ventilated non-obese adults**

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001409

**Introduction:** Constrained by the limited resources and the high patient load in the early days of COVID-19 some intensive care units adopted prone positioning keeping the abdomen flush with the surface (flat prone) in mechanically ventilated patients with ARDS. Theoretically, higher peak airway pressures are expected in this position, due to restricted diaphragm motion, compared to the standard practice of suspending the abdomen (suspended prone) using thoracic and pelvic elevators/bolsters. Currently, no empirical evidence quantifies the difference in peak airway pressures or compliance between the flat prone and suspended prone positions, neither in patients with ARDS nor in healthy lungs.
**Objectives:** To determine the difference in peak airway pressures between flat prone and suspended prone in mechanically ventilated patients with healthy lungs.
**Methods:** Twenty-four adults without clinically apparent respiratory disease, presenting for percutaneous nephrolithotomy (PNL) were recruited. This population was selected as the standard positioning in PNL is flat prone in our institute. After informed consent general anaesthesia was administered using fentanyl, propofol and atracurium followed by endotracheal intubation with 6 ml/kg body weight of tidal volume, 12 breaths/min and positive end-expiratory pressure of 5 cmH2O in Volume controlled ventillation. The subjects were randomly allocated (1:1, concealed) to either sequence SF—suspended prone (period 1) followed by flat prone (period 2) or to sequence FS—flat prone (period 1) followed by suspended prone (period 2). Variables were measured at the 5th minute following each position change ensuring a train of four count of zero. Five minutes after intubation

the subject was placed in prone 1 (period 1), supine position for 5 min (washout period) and then in prone 2 (period 2). Peak pressures and compliance were analysed using a linear mixed effects model accounting for repeated measurements (repeated measures ANOVA) with terms included for sequence (FS vs SF), period (2 vs 1) and treatment (flat vs suspended prone).

**Results:** All 24 subjects were included in the analysis. Comparing the flat prone position to the suspended prone the difference in peak pressure was 0.08 cmH2O (95% CI, − 0.67 to 0.83, $p = 0.82$) and compliance was 0.17 ml/cmH2O (95% CI, − 2.20 to 2.54, $p = 0.89$). There were no significant period or sequence effects. There was no significant imbalance in baseline parameters or differences in the oxygen saturation, end-tidal carbon dioxide, exhaled tidal volume, blood pressure and heart rate at any time point. There were no perioperative adverse events (hypoxemia, barotrauma or surgical).

**Conclusions:** In mechanically ventilated non-obese adults with normal respiratory function, the peak airway pressure and lung compliance appear to be unaffected by whether the abdomen is suspended or flush with the surface in the prone position. This finding might, however, be different in patients with ARDS.

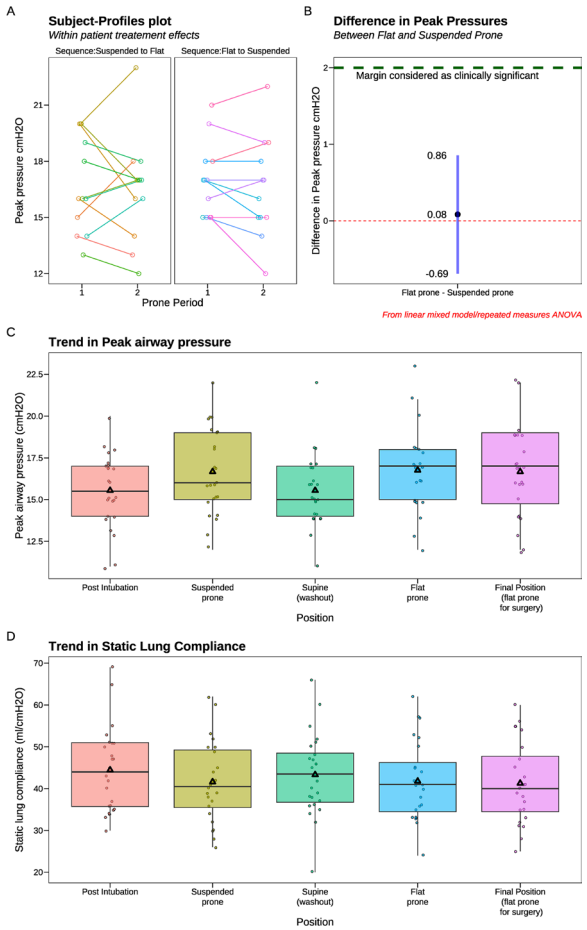


**Figure (abstract 001409)** (A) Subject profiles plot showing individual peak pressures by sequence and period; (B) Difference in peak pressure between suspended and flat prone positions; (C) Trend in peak airway pressures; (D) Trend in static lung conpliance; (C and D -includes all patients and are agnostic of sequence of positioning; triangles represent mean):

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001411

## Whole blood transcriptomics to predict cognitive impairment in ICU survivors

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**Introduction:** Critically ill survivors may develop cognitive impairment affecting one or more domains. (1) Underlying molecular mechanisms remain unclear and may be related to the acute response to injury. Early characterization of this biological response could help to identify patients at high risk of neurocognitive sequelae (2).

**Objectives:** To identify subgroups of patients at high risk of developing postICU neurocognitive sequelae using whole blood transcriptomics at ICU admission.

**Methods:** Critically ill COVID-19 patients admitted to the ICU were prospectively recruited. Patients with neurocognitive history or psychiatric diagnosis were excluded. Survivors were cognitively assessed at 3 (3mo) and 12 (12mo) months after ICU discharge using the Repeatable Battery for the Assessment of Neuropsychological Status, (RBANS, normal mean 100 ± 15) (3), Trail Making Test, Stroop test and Dual-task

test. Z-scores were used to determine the cognitive deficit in each domain. Whole blood transcriptomes were obtained at ICU admission. Latent class analysis (LCA) was performed to identify subgroups with different multidimensional cognitive scoring. Differences in clinical data and gene expression between groups and time points were assessed. Gene Set Enrichment Analysis (GSEA) was used to explore related pathways. All analyses were performed with R.

**Results:** 104 ICU survivors (63 [56–71] year-old, 26% female) were recruited. 41 patients completed 3mo follow-up and 73, 12mo follow-up. RBANS scored 86 (80–99) at 3mo and 92 (82–100) at 12mo ($p=0.36$). Using the classical approach (4), global cognitive impairment (GCI) was diagnosed in 36.58% of the patients at 3mo, and in 35.48% of the patients at 12mo. LCA identified two classes (Fig. 1A): Class 1 showed lower scores than Class 2 in all RBANS domains and in the global score at 3mo and at 12mo (Table 1) and in TMT and dual-task test. GCI was more frequently diagnosed in Class 1 at 3mo (51.85% vs 7.14%, $p=0.01$) and at 12mo (64.29% vs 11.76%, $p<0.001$). Class 1 exhibited significantly higher IL-6 serum levels (94 [22–262.25] vs 24.5 [13.5–131.25], $p=0.02$) and lower peripheral leucocyte count (7260 [5675–9950] vs 9430 [6350–11770], $p=0.04$), at ICU admission. There were no other significant differences between classes across clinical variables. Differential gene expression analysis between classes revealed 34 downregulated and 3 upregulated genes (adjusted $p$-value < 0.05) ( Fig. 1B). Pathways related to activation of the innate immune response, and mTOR signalling were found in GSEA.

**Table 1 (abstract 001411)** Comparison of clinical characteristics between classes within the study cohort. Values shown as absolute count (percentage) or median (interquartile range)

| Variable | Class 1 *n* = 67 (64.42) | Class 2 *n* = 37 (35.57) | *p*-value |
|---|---|---|---|
| Age (years) | 66 (58–74.5) | 61 (55–69) | 0.087 |
| Sex (male) | 53 (79.10) | 24 (64.86) | 0.16 |
| Intubated at admission | 49 (73.13) | 25 (67.57) | 0.652 |
| Total RBANS 3mo | 83 (77.5–90.5) | 100.5 (95.25–106) | < 0.001 |
| Total RBANS 12mo | 83 (77–87.5) | 100 (96.25–105.75) | < 0.001 |
| Immediate Memory 3mo | 78 (71–84) | 97 (88.5–104.5) | < 0.001 |
| Immediate Memory 12mo | 76 (65–83) | 100 (90–103) | < 0.001 |
| Visuospatial/Constructional 3mo | 107 (101.5–117.25) | 116 (109–126) | 0.013 0.013 |
| Visuospatial/ Constructional 12mo | 105 (92–116) | 110.5 (100–121) | |

**Conclusions:** Transcriptomic profiling in whole blood samples at ICU admission may help to identify patients at high risk of postICU cognitive sequelae. Activation of innate immune response and dysregulation of the mTOR pathway could be involved in the development of cognitive impairment in critically ill survivors.

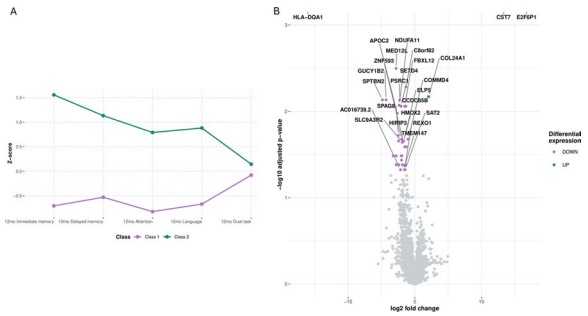


**Fig. 1 (abstract 001411)** A. Volcano plot with differentially expressed genes (adjusted $p$-value < 0.05) between latent classes. B. Profile plot of two patient classes identified according to cognitive domains evaluated at 12mo follow-up, using a latent mixture analysis. Values show means in each variable used for classification for each class (after normalization, Z-scores)

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**Topic:** Systemic diseases

## 001412

### Mortality and associated factors in haematological patients admitted to the ICU with acute respiratory failure diagnosis

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**Introduction:** Acute respiratory failure is one of the main causes of admission to the ICU in hematological patients and is associated with high mortality.

**Objectives:** To describe the characteristics of hematological patients admitted to the ICU of a tertiary center with a diagnosis of respiratory failure, their mortality and associated factors.

**Methods:** Retrospective study (2009–2020) including hematological patients admitted to the ICU for respiratory failure. Demographic and clinical data were obtained from medical records. Quantitative variables: mean ± SD or median (IQR25-IQR75); categorical variables: absolute value (%). Statistical analysis: Fisher's exact test for categorical variables and Mann–Whitney test for continuous variables.
**Results:** During the study period, 85 hematological patients were admitted for respiratory failure. Mean age: 55 (46–64) years; 55 (64.7%) males. Mean APACHE II score: 15 (4–30) points. Principal hematological diagnosis: acute leukemia; 50.6% ($n=43$) followed by lymphoma: 21.2% ($n=18$); plasma cell dyscrasia; 9.4% ($n=8$); chronic lymphocytic leukemia: 8.2% ($n=7$) and aplastic anemia: 7.1% ($n=6$). 67% ($n=57$) were hematopoietic stem cell transplant recipients (89% allogeneic). 62.4% of patients ($n=53$) required mechanical ventilation within the first 24 h. Median P/F ratio on admission: 110 (87–110). 56.5% patients ($n=48$) required norepinephrine and 17.7% ($n=15$) renal replacement therapy. Microbiological isolation was performed in 43.5% of patients. ICU mortality was 37.7% (32) and at 6 months after ICU admission 63.1% (56). Acute leukaemia diagnosis (95% vs. 35%, $p$ 0.04); APACHE II score < 15 and > 15 (33% vs. 95%, $p$ 0.02), and mechanical ventilation within the first 24 h (100% vs. 4%, $p$ 0.00) were associated with increased mortality. No significant differences between allogeneic transplant recipients (64%) and non-transplant recipients (54%) were found. Hemodynamic failure (73% vs 50% $p$ 0.50), renal failure at ICU admission (55% vs 87% $p$ 0.55) and positive microbiological isolation (56% vs.68% $p$ 0.82) were not associated with mortality.
**Conclusions:** In our series, acute leukemia diagnosis and early mechanical ventilation were the factors associated with mortality in hematological patients admitted to ICU for respiratory failure.

**Topic:** Haematologic-oncologic issues in the ICU

### 001413

### The impact of circadian rhythms on the mortality of patients with liver cirrhosis. Retrospective analysis

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001413

**Introduction:** Peripheral clocks in the liver have fundamental roles in maintaining liver homeostasis, including the regulation of energy metabolism and the expression of enzymes controlling the absorption and metabolism of xenobiotics. Clock dysfunction accelerates the development of liver diseases such as fatty liver diseases, cirrhosis, hepatitis and liver cancer, and these disorders also disrupt clock function. The liver clock is a robust oscillator and is at the centre of the cross-talk between the circadian timing system and metabolism. Abnormalities in such cross-talk play a role in the pathogenesis of fatty liver and the vicious circle underpinning its progression. Disruption of the liver clock, despite its prominent role in nutrient processing, does not affect the rhythmicity of clocks in other peripheral tissues. Yet, unexpectedly, liver-clock disruption strongly modulates the transcriptional rhythmicity of peripheral tissues, primarily during daytime feeding.
**Objectives:** Description of diurnal and nocturnal oscillations in the mortality of ICU patients hospitalized with liver cirrhosis, analysis of the peak hours of mortality at the same time to emphasize the most critical intervals to ensure appropriate therapy to prevent mortality.
**Methods:** A retrospective study was conducted (January–December 2023, ICU, IMSP SCM "Sf.Treime") on a group of 70 patients who died with decompensated liver cirrhosis in the ICU, with an average age of 63.04 ± 2.35 years, of which women 45.79% ($n=32$) and men 54.20% ($n=38$).
**Results:** Following the analysis, it was observed that mortality followed a biphasic circadian pattern. The peak of mortality was highlighted in the following peak hours: 00:00–01:00. 19:56% ($n=9$), 04:00–05:00 10.86% ($n=5$), 12:00–13:00 13.04% ($n=6$), 16:00–17:00 17.39% ($n=8$), 20:00–22:00 19.56% ($n=9$). At the same time, it was observed the peak time when more young people die with an average age of 41.35 ± 2.67 years, these being 17:00–19:00 8.69% ($n=4$). Moreover, time intervals where no deaths were recorded were 03:00–04:00, 10:00–12:00, 23:00–00:00.
**Conclusions:** In this study, the circadian pattern of mortality in intensive care patients was documented. Again, our study emphasized the importance of preventing in-hospital mortality by introducing appropriate medical care at a certain time of day. A better understanding of such abnormalities may help improve the management of decompensated cirrhosis.

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

### 001414

### Course of diaphragm shear modulus and thickness during the early and acute stage of critically ill septic shock patients under mechanical ventilation—a preliminary analysis

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001414

**Introduction:** Diaphragm dysfunction and atrophy may occur in patients under Invasive Mechanical Ventilation (IMV) [1, 2], and can impact prognosis and clinical outcomes [3, 4]. Sepsis, a major risk factor, contributes to both diaphragm dysfunction [3, 5], and systemic muscle wasting [6]. Diaphragm Ultrasound (DUS) offers non-invasive assessment and has demonstrated significant utility and accuracy in detecting diaphragm dysfunction across various clinical scenario [7, 8]. Recent advancements in DUS include Shear-Wave Elastography (SWE), measuring Diaphragm Shear Modulus (SMdi) to assess tissue stiffness. This integration with biomechanics enhances diaphragm tissue evaluation. This becomes particularly relevant within the framework of the notion of diaphragm "myotrauma" [9].
**Objectives:** Our primary aim is to observe end-expiratory SMdi and Diaphragm Thickness (Tdi) over consecutive days in early-stage septic shock patients under IMV, particularly within the first five days after Intensive Care Unit (ICU) admission. We also aim to investigate the relationship between these DUS markers over time and their dependence on fluid balance and Positive End-Expiratory Pressure (PEEP) levels.

**Methods:** Preliminary analysis of a prospective observational study (Ethics Committee 2020–00452, NCT04550143) [10], in a mixed ICU. Eligibility was assessed within 24 h after ICU admission. Inclusion criteria: adult patients with septic shock, SOFA score ≥ 8, blood lactate > 2 mmol/L, expected > 48 h of IMV and > 5 days ICU stay. Data analysis included daily assessment of right-sided DUS at end-expiration, from ICU admission until liberation from IMV or day 5. Tdi (cm) was observed with ultrasound B-Mode and calculated between two parallel hyperechogenic layers, observed between 8 and 10th intercostal space. At the same region, SMdi was assessed with a targeted acquisition frequency of 2 Hz. Breath-by-breath analysis was performed offline and three images for each Tdi and SMdi were recorded. The mean value for both DUS markers was taken into analysis. The data are expressed as mean (standard deviation), median (interquartile range), frequencies and correlation coefficient (95% confidence interval). Paired sample *t*-tests used for day-to-day differences. The average correlation between SMdi and Tdi over time was estimated by computing correlation coefficients across time for each participant. The previous was replicated to test the association between DUS with fluid balance and PEEP.

**Results:** Nineteen septic shock patients were analyzed, thirteen reaching day 5 under IMV. Characteristics: 57.9% male, mean age 61.5 years (13.85), mean BMI 28.2 kg/m$^2$ (5.28). Median SAPS II, APACHE II, and SOFA scores at ICU admission: 72 (68–77), 35 (28–36), and 11 (9–11). Main infection sources: abdominal (57.9%) and respiratory (36.8%). Median time from ICU admission to first ultrasound: 1015 min (355.953). As depicted in Fig. 1, Tdi decreased significantly from day 1 to day 2 (mean − 9.3% (15.47), $p < 0.019$; $n = 19$); Tdi continued to decline until day 5, albeit with a less pronounced slope. SMdi increased over time, notably at day 4 (+ 40.1% (51.84), $p < 0.033$; $n = 17$). Over time, SMdi demonstrated no significant association with Tdi (− 0.363, − 0.642 to 0.003; $n = 17$), although the significance threshold was nearly reached. Fluid balance exhibited a moderate positive association with SMdi (0.410, 0.330 to 0.484; $n = 17$), while with Tdi (− 0.122, − 0.456 to 0.241; $n = 18$) no significant association was observed. Similarly, no significant association of PEEP levels with either DUS marker was found.

**Conclusions:** In this study, septic shock patients on IMV showed early significant atrophy nearing the clinically relevant 10% threshold in Tdi. In contrast, SMdi, reflecting tissue biomechanical changes, increased over days peaking later than Tdi. The absence of SMdi-Tdi correlation suggests distinct muscle characteristic assessment, emphasizing complementarity. Structural muscle changes assessed by SMdi appear to be influenced by fluid balance.

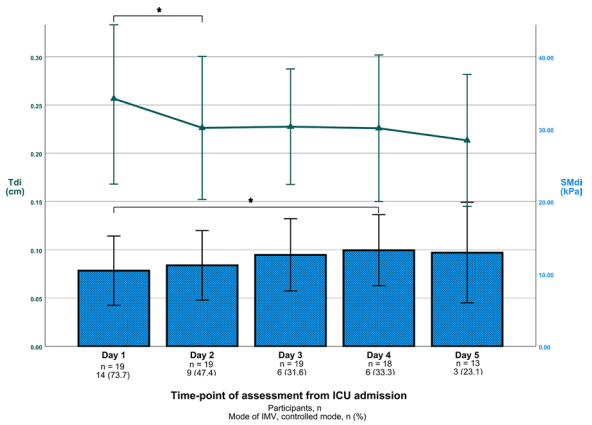


**Fig. 1 (abstract 001414)** Graphical representation of the temporal changes in diaphragm thickness (Tdi) and shear modulus (SMdi) over the five-day follow-up period among mechanically ventilated patients with septic shock in the intensive care unit (ICU). Diaphragm thickness (Tdi) is presented as a line chart, indicating a consistent decrease throughout the observation period. Notably, a more pronounced atrophy is observed between day 1 and day 2 of the assessment. In contrast, shear modulus (SMdi) is depicted as a bar chart, showing a progressive increase over time, with a notable surge particularly evident on day 4 of the assessment. Data are plotted as mean values and standard deviation (SD) represented by error bars. Statistical significance (*$p < 0.05$) is provided concerning day 1 of assessment

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001415

### Causal deep learning for identification of steroid responders in sepsis

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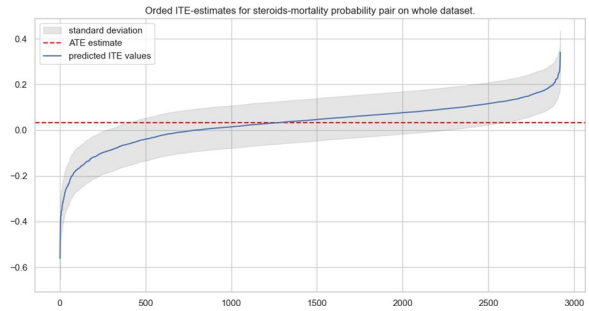
***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001415

**Introduction:** Sepsis patients often require organ support in the Intensive Care Unit (ICU), illustrating the clinical burden of the disease. Early and appropriate treatment is crucial for alleviating these issues. However, clinical trials are inconclusive about the usage of high-dose steroids. Using deep learning within a causality framework, we aimed to identify a subpopulation of sepsis patients that respond to high-dose steroids with improved survival rates.
**Methods:** Data for model development was extracted from the AmsterdamUMCdb database. 19 predictors from the first 24 h of admission were extracted. Initiation of high-dose steroids within 72 h of admission was defined as the intervention. The outcome was the probability of 28-day mortality. A treatment agnostic representation network (TARNet) was trained to estimate the individual treatment effect (ITE). A cutoff of 10% was used to classify steroid responders.
**Results:** 2930 admissions of AmsterdamUMCdb were eligible according to the Sepsis-3 criteria. 1378 were assigned to the intervention group and 1542 to the control group. Internal validation of the predictions of the observed outcomes showed an AUC of 0.79. An AUC of 0.70 was achieved with external validation using MIMIC-IV. Based on the estimated reduction of predicted mortality, a distinction was made between steroid responders ($n = 245$), non-responders ($n = 2098$), and those predicted to be harmed by steroids ($n = 577$). Steroid responders were characterized by a more significant metabolic acidosis.
**Conclusions:** Clinical profiles of steroid responders and 'harmers' were identified using a causal deep-learning model with large and highly granular ICU databases. Prospective evaluation and implementation testing in different healthcare settings is therefore a worthwhile approach for future investigations.




**(abstract 001415)** Ordered ITE estimates for steroids-mortality probability pair on the whole dataset. The x-axis represents the 2930 admissions from the data set. The y-axis represents the ITE, showing the ITE per patient for high-dose steroids. The Averaged Treatment Effect (ATE) is defined as the mean of all ITEs

**Topic:** Sepsis

## 001416

### Network connectivity alternations on resting-state functional magnetic resonance imaging in acute severe traumatic brain injury patients and its correlation with the functional outcome at one-year: a prospective observational cohort study

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001416

**Introduction:** Traumatic brain injury (TBI) not only causes localized damage but also disrupts the complex network of connections within the brain. (1) These disruptions can have profound consequences for cognitive function and recovery. Graph theory provides a powerful mathematical framework for analyzing brain networks. (2) Metrics derived from graph theory quantify properties like network integration and segregation.
**Objectives:** To examine brain network topology on functional MRI in severe TBI patients.
**Methods:** In this prospective cohort study patients with isolated severe TBI (sTBI) admitted to neuro-intensive care units, between 2018 to 2022, were recruited. In sTBI patients, we used functional MRI and graph theory to examine brain network topology. We compared patients who survived ("Alive") vs. those who did not ("Dead") and correlated network measures with the Glasgow Outcome Scale (GOS) at one year.
**Results:** A total of 32 patients were recruited during the study period, of which 29 subjects were included in the final analysis whereas three subjects were excluded due to movement. Graph theory analysis revealed significant differences between Alive and Dead groups in clustering coefficient, path length, small-worldness, local and global efficiency, participation coefficient, and modularity across various network densities (Fig. 1). Nodal clustering coefficient in most brain regions correlated positively with GOS scores, indicating a potential link between integrated local networks and better outcomes (Table 1). Notably, the thalamus showed a negative correlation with GOS.
**Conclusions:** Our findings demonstrate the utility of graph theory in characterizing TBI-related network changes. Variations in local network efficiency and integration may relate to patient outcomes, providing potential targets for future investigation and intervention.

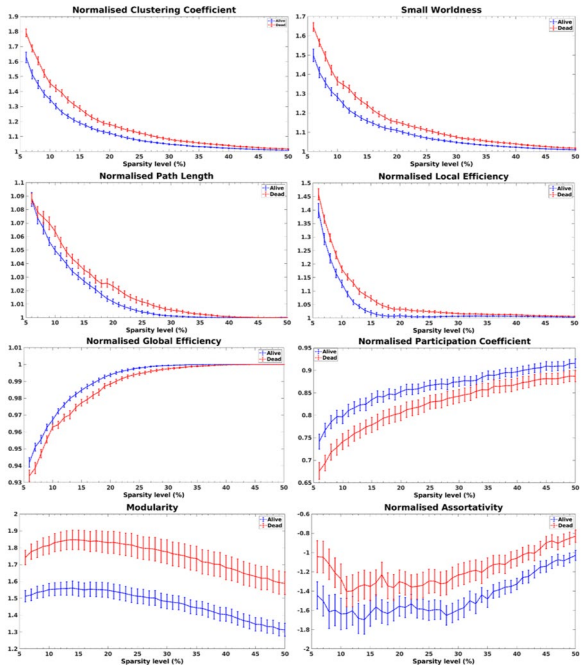


**Fig. 1 (abstract 001416)** Clustering coefficient (CC) of various parameters between dead vs alive patients

**Table 1 (abstract 001416)** Correlation between the Glasgow Outcome Scale (GOS) and the nodal clustering coefficient across various brain regions.

| Coordinates | | | ROI | Corr |
|---|---|---|---|---|
| 32 | -61 | -31 | inf cerebellum | 0.429 |
| 18 | -81 | -33 | inf cerebellum | 0.419 |
| 42 | -46 | 21 | sup temporal | 0.389 |
| 51 | -30 | 5 | temporal | 0.425 |
| 43 | -43 | 8 | temporal | 0.385 |
| 11 | -12 | 6 | thalamus | -0.560 |
| -46 | 10 | 14 | vFC | 0.443 |
| -59 | -25 | -15 | inf temporal | 0.468 |
| -41 | -40 | 42 | IPL | 0.420 |
| -18 | -50 | 1 | occipital | 0.383 |
| 13 | -91 | 2 | post occipital | 0.405 |
| -41 | -31 | 48 | post parietal | 0.413 |

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3. National Institute of Mental Health and Neuro Sciences (NIMHNAS), for providing intra-mural funding for the conduct of the study.

**Topic:** Imaging in intensive care

## 001417

### Attitudes towards identification and treatment of spontaneous hypoglycemia in ICU patients

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001417

**Introduction:** Prevention and treatment of hypoglycemia is an important part of glucose control in the critically ill. Our ICU has been using a computerized glucose control decision support system (GRIP) over the past 20 years. Together with GRIP, the nurse determines the next insulin infusion rate and the timing of the next glucose measurement [1]. In case of a glucose level < 3.5 mmol/L, GRIP also requests to notify a physician. The incidence of insulin-associated hypoglycemia (IAH) with GRIP in our population is low, and more than a third of hypoglycemias are "spontaneous" hypoglycemia (SH) [2], i.e. not associated with insulin use. SH is strongly associated with (acute) liver failure [3] and requires continuous concentrated glucose infusion without a bolus, as stated in international guidelines [4] as well as our local protocol. Multi-organ failure in the critically ill typically does not start with diagnosed liver failure. Accordingly, SH developing during progressive organ failure may not be recognized as a sign of liver failure and thus not appropriately acted upon.
**Objectives:** Characterize documented clinical actions in case of hypoglycemia (IAH or SH) and examine awareness in ICU nurses and ICU physicians with respect to SH and its treatment.
**Methods:** A retrospective data analysis was performed on 2 × 50 adult patients who experienced IAH and SH respectively, between January 2018 and May 2021. We examined if the interpretation was correct and if appropriate action was taken in the case of IAH or SH. An anonymous survey was also performed among ICU nurses and ICU physicians with regard to their appreciation of hypoglycemia.
**Results:** Two patients were excluded because their hypoglycemia originated outside the ICU, leaving 50 patients with IAH and 48 with SH. The hospital mortality was 40% (AIHI) and 71% (SH), respectively ($P = 0.003$). In 51% of hypoglycemias the local protocol was followed, indicating correct treatment and registration in the patient file. In 29 patients (60%) a glucose bolus infusion was given, while not advised by the protocol, while in 12 patients (25%) with SH no continuous glucose infusion was started, although this was advised by the protocol. Hypoglycemia was recorded in the electronic patient notes in 46% by physicians and 37% by nurses and a differential diagnosis was only recorded in 27%.
The response rate to the survey was 31% (57 nurses and 30 physicians). Virtually all (97%) recognized insulin as a potential cause of hypoglycemia, while 75% (64) also considered other causes. When SH is diagnosed, only 61% of the physicians would initiate a continuous glucose infusion. Given these results, we initiated an additional information campaign in our department with respect to IAH and SH.
**Conclusions:** Spontaneous hypoglycemia in ICU patients indicates a severe condition. We observed a tendency to approach spontaneous hypoglycemia similar to insulin-associated hypoglycemia, both in diagnosis and in treatment. This might be related to the prominent role of computer control in glucose regulation in our department. However, in other institutions there may be also insufficient awareness that a continuous concentrated glucose infusion, and not a bolus is the appropriate action in spontaneous hypoglycemia.

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001418

### Chracteristics and prognosis of patients with major haemorrhage in a second level hospital

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001418

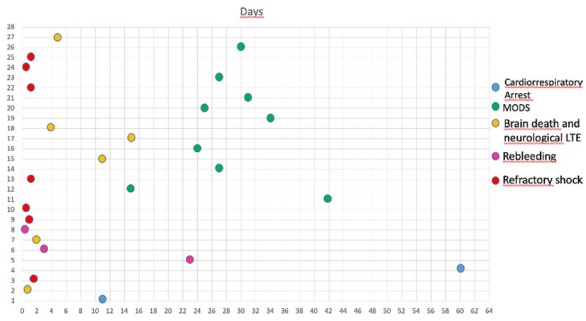
**Introduction:** Patients who require activation of the massive hemorrhage protocol (MHP) for hemorrhagic shock have a high mortality. Knowing the characteristics of our patients could allow us to improve care.
**Methods:** Retrospective descriptive study that includes 69 patients transfused under MHP of mixed cause in the Guadalajara Hospital from 2022 to 2024. We filtered the activation of the MHP for transfusion of 3 or more red blood cell units in the first hour. Epidemiological, clinical, and analytical variables related to the transfusion and follow-up until discharge from the hospital or death, failing that, are collected. Quantitative variables are presented by their median and

interquartile range and qualitative variables as proportions in absolute number and percentage. Differences between survivors and deceased were analyzed by statistical analysis with the Chi-square tests for qualitative variables or the Student *t* test for quantitative variables. The required significance threshold was 0.05.

**Results:** A total of 69 patients were included with a diagnosis of severe trauma ($n=21$), digestive bleeding ($n=10$), coagulopathy of medical origin ($n=7$), gastrointestinal surgery ($n=16$), vascular surgery ($n=10$) and urogynecological surgery ($n=5$). The average age is $63\pm17$ years, with 63% men in the sample. In the univariable analysis of quantitative variables of survivors and deaths patients, the systolic blood pressure was 90 mmHg Vs 77.5 mmHg ($p=0{,}039$), pH 7.29 Vs 7.18 ($p=0.016$) and lactic 3.4 Vs 6.4 ($p=0.006$), were statistically significant. Regarding the blood products transfused, there were no significant differences between them. A total of 30 h in mechanical ventilation and 8.5 h of length of hospital stay in which no analysis was performed to avoid survivorship bias. A multivariable analysis was performed using the statistically significant variables (pH, SBP and lactic acid), with an association for systolic blood pressure (OR = 1.037, CI 95%: 1.007–1.068) and lactic (OR = 1,161; CI 95%: 1017–1325). In the survival analysis using the Kaplan–Meier curve, we observe a mortality of 40, 57% ($n=28$) at 30 days. Different causes of mortality were identified: in the first hours–days, refractory shock and rebleeding, to die of multiple organ failure in the following weeks (picture 1).

| | **Survivors** ***n*** **= 41 (59.4%)** | **Deaths** ***n*** **= 28 (40.6%)** | ***p*** |
|---|---|---|---|
| Age (years) | 66.7 (49.6–74.5) | 67.7 (52.8–79.3) | 0.249 |
| Men (%) | 23 (56.1) | 21 (75.0) | 0.109 |
| Antiaggregation (%) | 9 (22.0) | 3 (10.7) | 0.227 |
| Anticoagulation (%) | 6 (14.6) | 5 (17.9) | 0.720 |
| SAP | 90.0 (81.0–105.0) | 77.5 (60.0–90.0) | 0.001 |
| Rate | 110.0 (81.0–117.5) | 115.0 (88.5–121.5) | 0.559 |
| pH | 7.29 (7.21–7.36) | 7.18 (6.97–7.31) | 0.016 |
| Lactic (mEq/L) | 3.4 (1.8–5.5) | 6.4 (3.7–11.6) | 0.006 |
| Hb (gr/dL) | 9.4 (6.5–11.0) | 9.0 (7.1–10.8) | 0.569 |
| INR | 1.4 (1.2–1.7) | 1.4 (1.3–1.8) | 0.571 |
| Platelets | 184 (137–236) | 148 (98–259) | 0.613 |
| Ionic calcium | 1.2 (1.09–1.23) | 1.01 (0.97–1.08) | 0.002 |
| RBC (units)<br>(mL) | 5.0 (3.5–6.0)<br>1000 (700–1200) | 6.0 (4.0–8.0)<br>1100.0 (800.0–1600.0) | 0.054 |
| FFP (units)<br>ml | 3.0 (0.0–4.0)<br>600.0 (600.0–1150.0) | 3 (3.0–4.8)<br>600.0 (600.0–1100.0) | 0.196 |
| Tranexamic acid (%) | 17 (41.5) | 15 (53.6) | 0.322 |

**Conclusions:** Patients requiring activation of the MHP with hemorrhagic shock have a high mortality rate (40.57%), and dying of multiple organ failure. In our series, different variables as pH, lactic, systolic blood pressure or on-call activation of MHP; are related to mortality. Systolic blood pressure and lactic acid could be used to predict the risk of death.




**(abstract 001418)** Causes of death by day

**Topic:** Transfusion and haemostasis disorders

## 001419

### Morbidity and mortality of patients with ischemic stroke who require admission to Intensive Care Units

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001419

**Introduction:** The creation of specific ischemic stroke units in hospitals has changed the clinical characteristics and morbimortality of those patients who require admission to Intensive Care Units (ICU).

**Objectives:** The aim of this study was to describe the clinical characteristics of patients with ischemic stroke who require admission to the Intensive Care Units (ICU) of a third-level hospital with a specific Stroke Neurological Unit.

**Methods:** Retrospective, observational study performed in ischemic stroke patients admitted to the ICU of H.G.U Gregorio Marañón between 2022 and 2023 years. We collected epidemiological data, comorbidities, stroke risk factors, severity scores (APACHE II, GCS and NIHSS: National Institute of Health stroke scale), cerebral artery affected, specifics treatment used, organic support measures used, complications during ICU stay and outcome assessed using the modified Rankin scale (mRS).

Descriptive analysis was expressed as means with standard deviation for normally distributed quantitative variables, medians with interquartile range (IQR), for non-normally distributed variables, and percentages for categorical data.

**Results:** Fifty-seven patients were included, 53% were male, mean age was 68 yrs (59–78). Charlson Comorbidity Index 1 pts (0–3), any risk factor for stroke 84% with median 2 (1–4), highlighting: arterial hypertension 60%, dyslipidaemia 45%, smoker 37%, diabetes mellitus 35%, heart disease 30%, obesity 19%, previous stroke 19% and atrial fibrillation 17%. Severity scores: APACHE II $20\pm6$ pts, GCS $10\pm3$ pts, NIHSS $13\pm7$ pts. The anterior cerebral arterial circulation was the most frequently affected (62%) and both circulations will be affected in 7% of cases. The frequency of vessel involvement was: middle cerebral artery (68%, left side 43%), internal carotid artery (26%, left side 21%), posterior cerebral artery (21%, left side 12%), basilar artery (18%) and vertebral artery (14%). The treatment applied was fibrinolysis in 20% of cases and thrombectomy in 60%, performing both treatments in the same patient in 16% of cases, with a median time of 90 min (60–120). During ICU stay, the infectious processes were the most frequent complication complications (11% ventilator-associated pneumonia, 7% aspiration pneumonia, 5% catheter-related bacteraemia), followed by intra-cerebral bleeding (18%) ARDS (4%) and ventricular dysfunction (2%). 70% of patients needed mechanical ventilation, with an average time of 2 days (0–5), and 16% of patients underwent tracheostomy for respiratory support removal. The mean ICU stay was 4 days (2–10), with 36% mortality. The mean in-hospital stay was 10 days (4–18),

with 41% mortality. Regarding the neurological outcome, 65% of patients obtained an unfavorable prognosis (mRS 4–6), that is, dying or severely affected in terms of capacity.
**Conclusions:** There was a significant mortality and a large number of complications in patients with ischemic stroke who require admission to ICU. In addition to mortality, most patients have an unfavorable prognosis assessed using the modified Rankin scale.

**Topic:** Neurointensive care

**001420**
**Theophylline intoxication: clinico-biological characteristics and correlation between clinical signs and plasma levels**
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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001420

**Introduction:** The xanthine family includes the drug theophylline, which is utilized for its bronchodilator properties. However, its prescription is decreasing due to its extremely limited therapeutic spectrum. Accidental or deliberate theophylline intoxication is uncommon but can have significant consequences in certain situations.
**Objectives:** The aim of our study was to study the correlation between clinical manifestations and plasma levels of theophylline intoxication.
**Methods:** All patients admitted to the intensive care unit for acute theophylline poisoning over an eleven-year period (2013–2023) were included in this retrospective analysis. In patients admitted for theophylline intoxication, the relationship between plasma dose and clinical symptoms was examined using Pearson correlation. In our hospital's toxicology lab, theophylline was measured (Standard Value = 4–12 mg/l).
**Results:** A total of 103 individuals were admitted due to theophylline intoxication during the study period. The patients were primarily female and ranged in age from 17 to 28 years old, with a median age of 20. Asthma was present in 19 instances (18.4%) and chronic obstructive lung disease in 9 cases (8.7%) of the respiratory history. Ninety-three instances (93%) had voluntary intoxication, and the median interval between intake and admission was five hours [3–9]. There were 92 instances (89.3%) with digestive symptoms, 90 patients (87.4%) with tachycardia, 21 patients (20.4%) with tremors, 10 patients (9.7%) with agitation, 4 patients (3.9%) with seizures, and 7 patients (6.8%) with shock. 51 patients (59.3%) had metabolic acidosis, with a mean bicarbonate level of $16.1 \pm 3.45$ mmol/L. Lactatemia was $4.25 \pm 2.41$ mmol/L on average. 84 patients (82.4%) had hypokalaemia at admission, and 37 cases (36.3%) had electrical symptoms. 38 mg/L was the median theophyllin level [28.7–60].
Thirteen patients (12.6%) experienced severe intoxication, defined as > 100 mg/L, while forty patients (38.9%) had mild intoxication, defined as between 20 and 40 mg/L.
In 60 cases, the usage of beta blockers was recommended (58.5%).
Shock risk was correlated with severe intoxication ($p = 0.000$; OR = 2.16), with a 95% confidence interval (CI = [1.2; 3.9]).
Theophyllinemia and heart rate were shown to be closely correlated ($p = 0.000$), and there was also a correlation between theophyllinemia and bicarbonate levels and kalemia ($p$ values of 0.009 and 0.001, respectively).
In our study group, there were no recorded deaths.
**Conclusions:** The degree of theophylline intoxication is correlated with tachycardia, hypokalaemia, and metabolic acidosis.

**Topic:** Poisoning/Toxicology/Pharmacology

**001422**
**Healthcare professionals' knowledge and practice of and attitudes towards pharmacovigilance in Alexandria, Egypt: a cross-sectional survey**
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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 00122

**Introduction:** Pharmacovigilance as a concept is still new to healthcare professionals (HCPs) in Arabian countries. Morbidity and mortality related to adverse drug reactions (ADRs) are health problems that affect both adults and children worldwide, greatly impacting patients' health and the costs of healthcare services. Good pharmacovigilance programs can quickly recognize both risks and factors that reduce or prevent harm.
**Objectives:** Our objective was to compare HCPs' knowledge and practice of and attitudes toward pharmacovigilance in Alexandria, Egypt.
**Methods:** A cross-sectional survey comprising 20 questions was completed by 547 pharmacists and physicians in three different health sectors between August 2017 and March 2018. Data were analyzed using SPSS version 20. Bivariate analysis was conducted using the Chi-squared test and multivariate logistic regression. The main outcome was measuring HCPs' knowledge and practice of and attitudes towards pharmacovigilance.
**Results:** In total, 232 (42.4%) physicians and 315 (57.6%) pharmacists completed the survey. The odds of having a high level of knowledge of and a positive attitude towards pharmacovigilance were nearly six times higher among pharmacists than among physicians (odds ratio [OR] 6.60 [95% confidence interval {CI} 2.31–18.85] and OR 5.66 [95% CI 2.26–14.15], respectively). The odds of high levels of pharmacovigilance practice for pharmacists were more than twice as high as those for physicians (OR 2.62 [95% CI 1.35–5.05]). Major barriers to reporting ADRs were lack of time (71%) and difficulty deciding whether or not an ADR occurred (48%).
**Conclusions:** In Egypt, physicians had less knowledge and less positive attitudes towards pharmacovigilance than pharmacists. This limited knowledge among physicians could be affecting the practice of ADR reporting. Health authorities in Egypt should initiate educational interventions and a practical training program primarily targeting physicians to enhance a culture of pharmacovigilance and drug safety in the country.

**Topic:** Health Services Research and Outcome

**001423**
**Risk factors for unfavorable prognosis in patients with ischemic stroke who require intensive care unit admission**
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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001423

**Introduction:** Ischemic stroke is a common neurological emergency that is associated with high rates of morbi-mortality. With the appearance of reperfusion treatments and specific stroke units, the ICU admission of these patients has decreased.
**Objectives:** The purpose of this study was to identify risk factors for an unfavourable prognosis in patients with ischemic stroke who require admission to the ICU.
**Methods:** Retrospective, observational study performed on patients admitted to the ICU of H.G.U Gregorio Marañón with ischemic stroke between 2022 and 2023 years. We collected epidemiological and clinical data, scoring systems (APACHE II, GCS and NIHSS: National Institute

of Health stroke score), cerebral artery affected, specific treatment used (fibrinolysis and/or thrombectomy), organic support measures used and complications during ICU stay. The prognosis was valued by the modified Ranking scale (mRS) (unfavorable prognosis 4–6 pts, that is, moderate-severe disability, severe disability and death).
Descriptive data were described as means with standard deviation for normally distributed continuous variables, medians with interquartile range (IQR) for non-normally distributed variables, and percentages for categorical data. The continuous variables were categorised according to the maximum discrimination point by the AUROC curve. A univariate and multivariate analysis was performed using logistic regression to determine the factors related to unfavourable prognosis.
**Results:** Fifty-seven patients were included, 53% male. Age 68 yrs (59–78). Charlson Comorbidity Index 1 pts (0–3), any risk factor for stroke 84% with a median 2 (1–4). Severity scores: APACHE II 20 ± 6 pts, GCS 9 ± 4 pts, NIHSS 13 ± 7 pts. The anterior cerebral arterial circulation was the most frequently affected (62%) and the middle cerebral artery was the vessel mostly occluded (68%). A specific treatment was applied in 82% of patients (thrombectomy 60%, fibrinolysis 20% and both 16%), with a median time of 90 min (60–120). The 70% of patients needed mechanical ventilation and 48% had any complications during ICU stay, highlighting: ventilator-associated pneumonia (11%) and cerebral bleeding (18%). Length of ICU stay was 4 days (2–10) and in-hospital stay 10 days (4–18). 65% of patients had unfavourable prognosis (mRS 4–6), including 41% of mortality.
In the univariate analysis, the results were: Age > 65 yrs (OR 2.33; 95% CI 0.74–7.27), ischemic stroke risk factors (OR 1.17; 95% CI 0.26–5.31), Charlson Index > 2 pts (OR 1.05; 95% CI 0.34–3.21), NIHHS > 16 pts (OR 2.34; 95% CI 0.59–9.20), APACHE > 22 pts (OR 3.73; 95% CI 1.10–12.65), GCS < 10 pts (OR 4.45; 95% CI 1.34–14.83), affected anterior circulation (OR 1.55; 95% CI 0.47–5.12), any specific treatment (OR 0.68; 95% CI 0.21–2.24), mechanical ventilation (OR 9,01; 95% CI 2.48–33.11) and ICU complications (OR 6.35; 95% CI 1.73–23.25).
Using multiple logistic regression, including the previous variables, the independent risk factor for unfavorable prognosis were: Age > 65 yrs (OR 8.06; 95% CI 1.02–63.59), mechanical ventilation (OR 7.66; 95% CI 1.14–51.28) and ICU complications (OR 10.38; 95% CI 1.57–68.71).
**Conclusions:** In our experience, a high percentage of patients with ischemic stroke who required ICU admission had an unfavorable prognosis. The independently factors associated with poor prognosis were age, mechanical ventilation and ICU complications.

**Topic:** Health Services Research and Outcome

### 001424

**Risk factors for the occurrence of acute stroke that required critical care unit admission in Egyptian population (RASEP study)**

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001424

**Introduction:** Stroke is a devastating and costly disease. That is the second leading cause of death worldwide and the first leading cause of long-term disability, making the prevention of stroke a global health priority. Stroke is preventable to a large extent due to modifiable risk factors. Although risk factors are well known, recent studies showed regional variations in the prevalence of risk factors.
**Objectives:** The aim of the study was to evaluate the risk factors for the occurrence of acute stroke, either hemorrhagic or ischemic, that required admission at critical care units among the Egyptian population at Alexandria Hospitals.
**Methods:** In this retrospective observational study, 1202 participants were recruited from critical care units, comprising 535 (44.5%) cases of acute stroke, 282 (23.5%) cases of hemorrhagic stroke, and 385 controls of different diagnoses. Data from all the patients were collected retrospectively by revising the medical record and patients' available medical data and then administered through a structured online questionnaire.
**Results:** Out of the studied cases, 817 cases of stroke were distributed: 60% of cases were males, 43% of cases were above 65 years old, 24% have family history of stroke, 83% were hypertensive, 60% were diabetic, 62% have ischemic heart disease, 51% have dyslipidemia, 60% were smokers, 35% have atrial fibrillation, 12% have renal disease, 18% have hepatic disease, 4% have vasculitis, 40% were obese, and 10% have psychiatric problems.
**Conclusions:** Hypertension is the most independent factor for the occurrence of stroke followed by atrial fibrillation and then smoking among the Egyptian population.

**Topic:** Neurointensive care

### 001425

**In-hospital mortality trends in critically ill pediatric hemato-oncology patients: a Korean population-based study**

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001425

**Introduction:** While remaining as a leading cause of death among the pediatric population, national data regarding the trends in mortality among critically ill pediatric hemato-oncologic patients are lacking.
**Methods:** We analyzed the incidence and mortality trends of children younger than 15 years admitted to an intensive care unit (ICU) with a diagnosis of hemato-oncologic disease from 2009 to 2020 using the Korean National Health Insurance database. Trends in incidence and mortality of subgroups according to diagnosis (hematologic disease vs oncologic disease), admission department (medical vs surgical), use of mechanical ventilation, and use of vasopressors were evaluated. Multivariable logistic regression analyses were performed to estimate the odds ratio of in-hospital mortality according to admission year.
**Results:** Among 263,911 pediatric hemato-oncologic admissions, 6866 ICU admissions were identified. The overall in-hospital mortality of ICU admissions was 10.3%. There was a significant decrease in mortality from 12.6 in 2012 to 8.9% in 2020 (P-for trend < 0.01). In-hospital mortality decreased by 5.8% yearly in adjusted analysis ($P < 0.01$). The improvement in in-hospital mortality was more prominent among patients admitted to the medical department ($P$-for trend < 0.01, mortality decrease from 23.9 to 13.4%) and patients requiring organ support including mechanical ventilation ($P$-for trend < 0.01, mortality decrease from 32.6 to 19.0%) and vasopressors ($P$-for trend < 0.01, mortality decreased from 30.4 to 14.2%).
**Conclusions:** Mortality of critically ill hemato-oncologic children improved during the study period, and the improving trend was prominent in children with high treatment requirements.

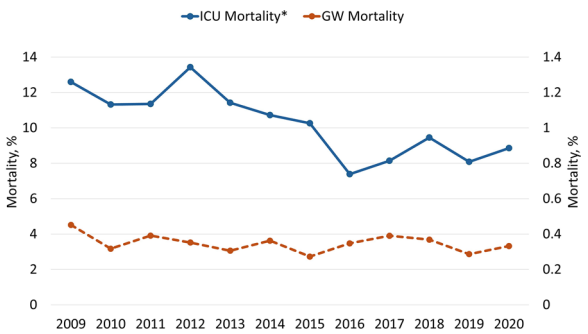


**Fig. 1 (abstract 001425)** Trends of in-hospital mortality among hematology-oncology patients. ICU = intensive care unit; GW = general ward. * Indicates P-for trend < 0.01

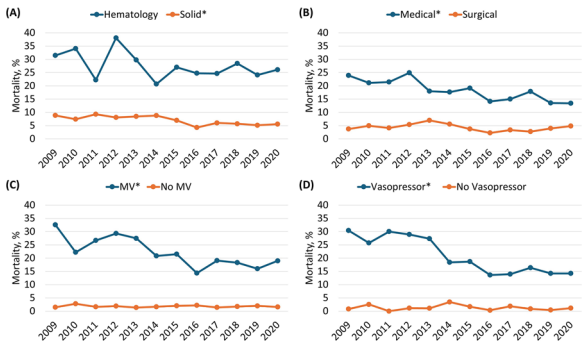


**Fig. 2 (abstract 001425)** Trend of in-hospital mortality of critically ill pediatric hemato-oncology patients in subgroups. In-hospital mortality trends in (A) hematology or solid, (B) medical or surgical admission, (C) admissions with or without mechanical ventilation, and (D) admissions with or without vasopressors. MV = mechanical ventilation. *Indicates *P*-for trend < 0.01

**Topic:** Haematologic-oncologic issues in the ICU

## 001426

### Prognostic impact of vasopressin utilization according to the dose of noradrenaline at its onset in septic shock

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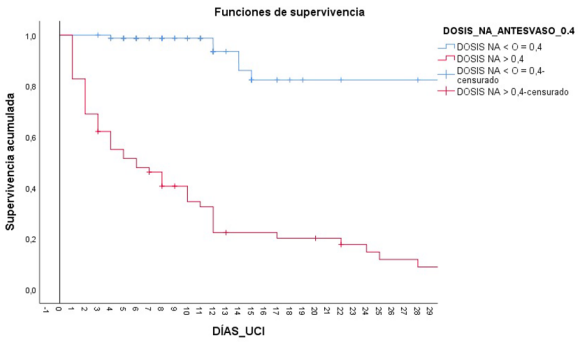
***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001426

**Introduction:** Septic shock is associated with endothelial dysfunction leading to arterial and venous dilation, alterations in regional blood flow distribution, and microcirculatory disturbances. Fluids and vasopressors are the key elements of the hemodynamic support. Vasopressin is recommended by 2021 Surviving Septic Shock guidelines1 as second-line vasopressor for patients presenting hypotension refractory to norepinephrine. The proposed cut-off defining refractory hypotension ranges from 0.25 to 0.5 mcg/kg/min but there is no clear indication on the timing of introduction.
**Objectives:** To analyze the optimal timing for the introduction of the second vasopressor in septic shock and evaluate its prognostic impact according to the doses of noradrenaline (NAD).
**Methods:** Observational, retrospective study conducted on patients admitted to the ICU of H.G.U Gregorio Marañón between January 2022 and December 2023. According to the established protocol, all patients received vasopressin (VAP) infusion when their dose of noradrenaline (NAD) exceeded 0.25 ug/kg/min. Epidemiological data, comorbidities, severity, clinical characteristics, organ support, and outcomes were collected.
Descriptive analysis is expressed as mean (SD) or median (IQR) for quantitative variables and percentages for qualitative ones. The impact on mortality of the NAD dose at which VAP was initiated was analyzed by simple logistic regression, and the dose with the best discrimination was determined by the area under the curve (ROC). Multivariate analysis by Cox regression adjusted for potential confounding factors was performed to determine its association with mortality. Survival analysis adjusted for the NAD dose at which VAP was initiated was conducted.
**Results:** 140 patients were included, 53% males. Age: 61 ± 15 years. Charlson Index: 2 (1–4). APACHE II: 23 ± 7, SOFA: 9 ± 3. Infectious focus: respiratory 54%, abdominal 21%, urinary 9%. The sepsis bundle was fulfilled within the first hour in 64% of patients. Antibiotic accuracy was achieved in 65%. Analytical data: pH in ICU 7.31 (7.26–7.41), lactate in ICU 5 ± 4. 75% required invasive mechanical ventilation (IMV) with a duration of 5 days (1–11). Time to NAD start from septic shock diagnosis: 3 h (2–6), time to VAP start from septic shock diagnosis: 8 h (6–11), NAD dose at VAP initiation: 0.5 ± 0.3 ug/kg/min. A 14% complication rate was observed in the series, with atrial fibrillation being the most frequent (8%). ICU days: 9 (5–14), hospitalization days: 14 (8–23). ICU mortality at 28 days: 39%.
In univariate analysis, the NAD dose at VAP initiation was associated with mortality (OR 0.02; 95% CI 0.01–0.04). The NAD dose at VAP initiation was able to discriminate prognosis (Area under the curve 0.929; 95% CI 0.88–0.97), with 0.40 ug/kg/min being the dose that best-discriminated mortality. By Cox regression, adjusted for age, comorbidity, severity, time to start vasopressors, lactate, sepsis bundle, and antibiotic accuracy, a dose of < 0.4 mcg/kg/min behaved as an independent mortality factor (OR 0.11; 95% CI 0.04–0.27).
**Conclusions:** In our experience, initiating vasopressin when intermediate doses of noradrenaline are reached could improve the prognosis of patients with septic shock.




**(abstract 001426)** Kaplan–Meier

**Topic:** Cardiovascular issues in ICU

## 001427

### Total liquid ventilation improved short-term outcomes during life-threatening Acute Respiratory Distress Syndrome in large animals

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001427

**Introduction:** Acute Respiratory Distress Syndrome (ARDS) is currently treated by mechanical ventilation and in the most severe cases by extra-corporeal membrane oxygenation. As an alternative, total liquid ventilation (TLV) has been proposed to reduce ventilator-induced lung injury, ventilation-perfusion mismatch, lung atelectasis and lung debris accumulation. Until now, its effect on ARDS was evaluated in small animals, except for one sheep study (1). In the latter, total lung liquid volumes were not continuously monitored and initial lung filling was done with a high volume of breathable liquid (> 30 ml/kg). Here, we hypothesized that a new device for TLV can provide benefits while limiting pulmonary liquid volumes in large animals.
**Objectives:** Our goal was to demonstrate the feasibility of TLV in a swine model of life-threatening ARDS using a new device enabling TLV at lower lung volume by preventing airway collapse during expiration and continuous regulation of lung liquid volume.
**Methods:** Twelve swine (33 ± 2 kg) were anesthetized and instrumented for pulmonary and hemodynamic monitoring. ARDS was induced by one or two administrations of oleic acid (0.1 mg/kg) until the achievement of a PaO2/FiO2 < 100 mmHg. Animals were then allocated to protective gas ventilation (tidal volume [Vt] of 6 ml/kg, 100% FiO2, positive end-expiratory pressure = 5 cmH2O; Control group) or TLV with perfluorooctylbromide using a dedicated prototype (LV4B, Orixha®; Figure A-B) controlling tidal and end-expiratory liquid volumes (LqVt and EELqV, respectively). Respiratory rate, LqVt and EELqV were set within 4–6 cycles/min, 8–14 ml/kg or 12–30 ml/kg, respectively. After a maximum of 60 min following group allocation ("treatment phase in Figure C), surviving animals were euthanized for necropsy.
**Results:** Ten animals achieved inclusion criteria (PaO2/FiO2 < 100 mmHg) and were allocated to Control or TLV groups ($n = 5$ in both groups). They initially presented similar oxygenation, hemodynamics and respiratory mechanics alterations. After group allocation, 3/5 animals deceased prematurely in the Control group (60%), due to sustained hypoxemia (PaO2 < 50 mmHg) before the end of the 60 min of follow-up under protective ventilation (Figure C). Conversely, zero animals died prematurely during this treatment phase in the TLV group. These animals presented a trend toward better oxygenation than the surviving Controls (e.g., 50 ± 6 vs. 113 ± 63 mmHg of PaO2 in Control vs TLV at $t = 30$ min of follow-up, respectively). Blood CO2, pH, lactates or pulmonary and systemic hemodynamics were similar between groups in survivors. In the TLV group, LqVt, EELqV and respiratory rate averaged 12.6 ± 1.0 ml/kg, 22.9 ± 6.4 ml/kg, and 5.3 ± 1.0 breath/min at the end of the procedure, respectively. Histopathological examination of the lungs of all animals demonstrated a lower extent of inflammatory and congestion lesions in TLV vs Control ($n = 5$ group; Figure D).
**Conclusions:** TLV with this new device improved short-term survival and reduced lung injury in a swine model of life-threatening ARDS. This supports the need for further investigations with longer treatment duration.

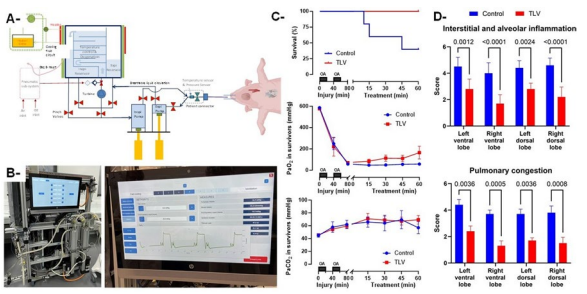


**Fig. (abstract 001427)** A—Schematic illustration of the liquid ventilator; B—Pictures of the device; C—Survival, PaO2 (FiO2 = 100% during gas ventilation) and PaCO2 during oleic acid administration (OA, injury phase) and subsequent treatment with protective ventilation (Control) vs total liquid ventilation (TLV group); D—Histological scores of congestion and inflammation at the end of the follow-up in Control and TLV groups

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2. Grant LIVE-RESP, ANR-21-CE19-0033, Agence Nationale pour la Recherche

**Topic:** Acute respiratory failure and mechanical ventilation

## 001428

### Impact of vasopressin on renal function in patients with septic shock

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001428

**Introduction:** In 2015, it was estimated that there were more than 230,000 cases of septic shock with more than 40,000 deaths in the United States each year.1 In addition to treating the underlying infection, the mainstay of cardiovascular resuscitation in septic shock is intravenous fluids and vasopressor treatment. Norepinephrine is the recommended first-line vasopressor2 but, since a relative vasopressin deficiency in septic shock was described, there has been growing interest in the use of vasopressin as an adjunctive agent.3 Preclinical and small clinical studies have suggested that vasopressin may be better able to maintain glomerular filtration rate and improve creatinine clearance compared with norepinephrine.
**Objectives:** To analyze if the dose of noradrenaline (NAD) at which vasopressin (VAP) is initiated has an impact on renal function.
**Methods:** Observational, retrospective study on the impact on renal function in patients with septic shock treated with VAP as a second vasopressor drug associated with NAD in the ICU of H.G.U Gregorio Marañón, between January 2022 and December 2023. Epidemiological data, comorbidities, severity, clinical characteristics, organ support, and outcomes were collected.
Descriptive analysis is expressed as mean (SD) or median (IQR) for quantitative variables and percentages for qualitative ones. Univariate analysis was performed using Chi-square (RR) for qualitative variables and simple logistic regression (OR) for quantitative ones. Multiple logistic regression, adjusted for severity, to determine factors independently related to mortality.
**Results:** 140 patients, 57% male. Age 61 ± 15 years. Charlson Index 2 (1–4). APACHE II 23 ± 7, SOFA 9 ± 3. Medical pathology 95%, the most common infectious focus being respiratory (54%).
The sepsis bundle was completed within the first hour in 64% of patients. Antibiotic accuracy was achieved in 65%. Analytical data: pH in ICU 7.31 (7.26–7.41), lactate in ICU 5 ± 4. 75% required invasive mechanical ventilation with a duration of 5 days (1–11). Time to start NAD from septic shock diagnosis: 3 h (2–6), time to start VAP from septic shock diagnosis: 8 h (6–11), NAD dose at VAP initiation: 0.5 ± 0.3 ug/kg/min. Severe cardiac dysfunction was present in 14%.
Volume resuscitation: volume in the initial 24 h 4500 (3500–6000).
Diuresis and balances: first 24 h diuresis 1040ml (530–1482), positive balance in the first 24 h 94%, negative balance at 48 h only in 41%.
Preload optimization: preload was established to be optimized in 76% of patients before starting VAP.
Renal failure at 24 h from sepsis diagnosis: no ARF 25%, KDIGO I 31%, KDIGO II 19%, KDIGO III 25%, need for renal replacement therapy: 41%
ICU days 9 (5–14), hospitalization days 14 (8–23). ICU mortality at 28 days: 39%.
In univariate analysis, NAD dose < 0.4 mcg/kg/min at VAP initiation was associated with decreased renal failure in the ICU (OR 0.14; 95% CI 0.05–0.32), with developing ARF in the first 24 h of ICU (OR 0.12; 95%

CI 0.06–0.29), and with the need for renal replacement therapy (OR 0.14; 95% CI 0.05–0.27).
**Conclusions:** The use of Vasopressin when noradrenaline is at intermediate doses appears to decrease the incidence of acute renal failure in patients with septic shock.
**(abstract 001428) Multivariate Analysis.**

| Variable | OR |
|---|---|
| Age | OR 0,72 (0,97 – 1,04) |
| Charlson | OR 0,95 (0,78 – 1,29) |
| APACHE II | OR 0,56 (0,94 – 1,11) |
| Optimal preload | OR 0,92 (0,26 – 3,24) |
| SOFA at ICU admission | OR 0,72 (0,98 – 1,68) |
| Time from NAD start since shock diagnosis | OR 0,97 (0,85 – 1,10) |
| Time from VAP start since shock diagnosis | OR 0,99 (0,91 – 1,07) |
| **NAD <0.4 (ug/kg/min) at VAP start** | **OR 0,25 (0,74 – 0,82)** |

**Topic:** Acute Kidney Injury and haemofiltration

## 001429

### Prophylactic use of methylene blue (MB) in patients at high risk of vasoplegic syndrome after cardiopulmonary bypass

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001429

**Introduction:** Vasoplegic or vasogenic shock syndrome is a common event after cardiopulmonary bypass surgery, characterized by low arterial pressure, unresponsive vascular collapse to high doses of vasopressors, and biochemical signals of cellular oxygen debt. Pathophysiology is related to the dysfunction of vascular smooth muscle cell contraction, activation of the complement cascade and the expression of pro-inflammatory mediators, adrenoreceptor desensitization, nitric oxide (NO) synthesis increase, cellular membrane hyperpolarization, dysfunction of the renin-angiotensin system, endothelial glycocalyx lesion and possible vasopressin synthesis decrease. Methylene blue (MB) actively inhibits NO synthase and the enzyme guanylate cyclase, preventing the accumulation of cGMP, and thus decreasing the vessels' sensitivity to cGMP-dependent vasodilators and restoring normal vascular tone. Most reports state that the MB is given after the vasoplegic syndrome is installed. We hypothesize that the prophylactic use of MB at the start of the bypass could decrease the number of vasopressor drugs, length of ICU stays, and secondary outcomes in patients with higher Euro scores and susceptibility to vasoplegia.
**Objectives:** We aimed to conduct a randomized, controlled clinical trial (110 patients) of high-risk for developing vasoplegic syndrome after bypass undergoing cardiac during routine valvar surgery.
**Methods:** The patients were randomized to control (normal saline) or MB (1 mg/kg/hour starting at the beginning of bypass lasting seven consecutive hours, totaling seven mg/k).
The size sample was calculated to reduce by 25% the vasopressors consumption over time at the $p$ level (5%) and statistical power of 80% (total number 110 patients). To this point, we have randomized 52 patients (26 control group and 26 MB group. Patients were selected from the routine valvar procedure surgeries with bypass. The inclusion criteria were EURO scores between 4 and 18. Exclusion criteria were patients chronically taking SSRIs, serotonin-norepinephrine reuptake inhibitors, or clomipramine, a tricyclic antidepressant.
We followed the patients in the ICU for seven days, recording information about the average daily doses of vasoactive agents, renal function, ICU length of stay, extubating time, and hospital death.
**Results:** We selected norepinephrine as a principal vasopressor agent to keep mean arterial pressure > 65 mmHg. The interim results indicated a reduction in the average dosage of norepinephrine on the 4th postoperative day in the MB group ($0.083 \pm 0.080$ vs. $0.483 \pm 0.438$ mcg/kg/min, $P = 0.022$), which is consistent with a lower level of consumption of this drug. In Fig. 1 and 2, it is possible to see the percentage of patients over time and a reduction of vasopressors in the days following the surgery.

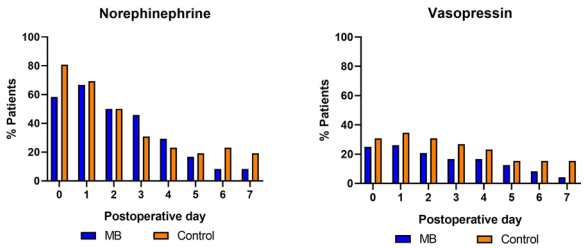


**Fig. 1 (abstract 001429)** Percentage of patients using vasopressors. MB: Methylene blue group; Control: Saline group

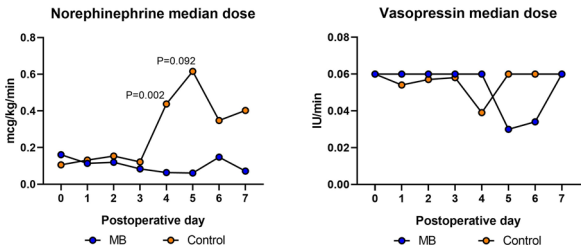


**Fig. 2 (abstract 001429)** Vasopressor drugs requirement. MB: Methylene blue group; Control: Saline group
**Conclusions:** The preliminary results show early MB in cardiac surgery patients decreased vasopressor requirements.

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2. Levin MA, Lin HM, Castillo JG, Adams DH, Reich DL, Fischer GW. Early on–cardiopulmonary bypass hypotension and other associators with vasoplegic syndrome. Circulation. 2009;120:1664–1671.
3. Grant from CNPq (n. 306934/2021–3)

**Topic:** Cardiovascular issues in ICU

## 001430

### Assessing safety of extubation in patients receiving continuous vasopressors: an emulated target trial

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**Introduction:** International guidelines and weaning protocols often suggest only extubating critically ill patients receiving minimal or no vasopressors at the time of extubation. However, this practice could lead to prolonged and potentially harmful use of mechanical ventilation (MV) [1]. Retrospective analyses suggest that patients receiving low vasopressor doses might be safely extubated in a mixed medical-surgical population, but no randomized controlled trial (RCT) has been conducted [2–4]. Before conducting an RCT, that could cause patient harm, the target trial framework to analyze retrospective data can help provide insights into the causal question of whether extubating patients still receiving vasopressors at the time of extubation is safe [5,6].
**Objectives:** To investigate the average treatment effect (ATE) of a treatment strategy of extubation on vasopressors compared with a treatment strategy of discontinuing vasopressors before extubation on the risk of death by day 28 in critically ill adult medical patients.
**Methods:** An emulated target trial was conducted and included patients admitted to the ICUs of Beth Israel Deaconess Medical Center, a tertiary-level academic hospital in Boston, Massachusetts, USA. The trial included medical patients receiving controlled MV for more than 12 h, vasopressors at any point during MV, full-code status and undergoing weaning of MV before extubation, defined as having a period of assisted ventilation. The intervention strategy was defined as extubation while patients were still receiving any dose of vasopressors, whereas the control strategy was defined as vasopressors being discontinued prior to extubation (Fig. 1). The primary outcome was death by day 28 and the secondary outcome was reintubation. The primary analysis was conducted on the full population and a subgroup analysis was performed among patients receiving low-dose vasopressors ($\leq$0.1 µg/kg/min of norepinephrine-equivalent dose [7]. The causal forest, a machine learning algorithm, was used to model treatment allocation and outcomes [8]. Demographic characteristics, comorbidities, hemodynamic and respiratory parameters, vital signs, and arterial blood gas values were controlled for as confounders. The ATE of the intervention versus control strategy was estimated using the doubly robust estimator augmented inverse probability of treatment weighting (AIPW). This study was approved by the Institutional Review Board of Beth Israel Deaconess Medical Center (protocol number:2023P000649) and the requirement for informed consent was waived.
**Results:** In the present emulated trial, we included 3737 medical patients, of whom 709 (19%) received vasopressors at the time of extubation. The included patients presented a high risk of extubation failure [9], with a median age of 66 years (interquartile range [IQR]: 56–76), 44% rate of congestive heart failure, and 37% rate of chronic respiratory disease. The median last dose of vasopressor before the weaning phase of ventilation was 0.08 (IQR: 0.04–0.15) µg/kg/min for the intervention strategy and 0.03 (IQR: 0.02–0.07) µg/kg/min for the control strategy. The median duration of mechanical ventilation before the weaning phase was 36 h (IQR: 21–69). The median duration of mechanical ventilation for the weaning phase was 59 h (IQR: 20–143). In the intervention strategy, 163 (23%) patients had a total duration of MV of 7 days or more versus 1135 (37%) in the control strategy. Regarding the primary analysis, the risk of death by day 28 was higher in the intervention strategy, with an estimated excess number of deaths of 7.1 (95% Confidence Interval [CI] 2.9 to 11.3) per 100 patients compared with the control strategy (Fig. 2). The estimated number of excess reintubations was 2.3 (95% CI − 1.6 to 6.5) per 100 patients. The results were similar in the low-dose vasopressor subpopulation.
**Conclusions:** This study suggests that extubation in critically ill adult medical patients ventilated for at least 12 h and still receiving vasopressors may not be safe, also if vasopressors are administered at low doses. These findings highlight the need for further research to optimize the timing of vasopressor discontinuation at the time of extubation [10].

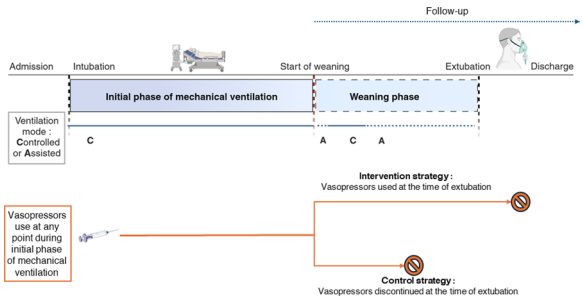


**Fig. 1 (abstract 001430)** Definition of the initial and weaning phases of mechanical ventilation and the two strategies
Each mode of ventilation was assessed and categorized as a controlled (C) mode of ventilation or an assisted (A) mode of ventilation according to the type of ventilation.
The start of the weaning phase of mechanical ventilation was defined as the time of the first period of assisted ventilation.
The initial phase of mechanical ventilation is the first continuous controlled ventilation period.
Respiratory parameters and clinical variables for confounder adjustment were extracted closest before the start of the weaning phase.

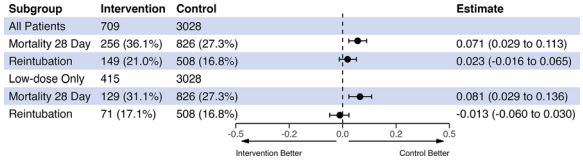


**Fig. 2 (abstract 001430)** Effect size plot of risk differences for 28-day mortality and reintubation
All patients: full population.
Low dose only: subpopulation with patients without vasopressors at the time of weaning and only low dose ($\leq$0.1 µg/kg/mn) not high dose vasopressors at the time of weaning.

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2. Maxime Fosset has been funded through a grant provided by the MUSE (Montpellier University School of Excellence Young Investigators PhD award 2022) foundation. This work was publicly funded through ANR (the French National Research Agency) under the "Investissements d'avenir" programme with the reference ANR-16-IDEX-0006»).
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**Topic:** Acute respiratory failure and mechanical ventilation

## 001431

### Evaluating the impact of ventilation strategies on ICP and PRx in a porcine model

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001431

**Introduction:** The concurrent management of pulmonary complications and acute brain injury (ABI) poses substantial clinical challenges. Lung protective ventilation (LPV) strategies, such as using high positive end-expiratory pressure (PEEP) and low tidal volumes, in conjunction with prone positioning, can adversely affect intracranial pressure (ICP) and cerebrovascular reactivity (PRx) (1).
**Objectives:** This study investigates the impact of PEEP on ICP and PRx in a porcine model with healthy lungs and normal ICP in the prone and supine positions.
**Methods:** Twelve anesthetized male Norwegian domestic landrace pigs, each weighing approximately 25 kg, were used to assess the effects of mechanical ventilation on cerebral hemodynamics. The pigs were randomized to start in either supine or prone positions, with the order reversed during the study. We adjusted PEEP levels every 20 min across 5, 10, 15, and 20 cmH2O (Fig. 1). ICM+® software (University of Cambridge Enterprise, Cambridge, UK) was used for data collection, signal processing, and data summaries. We correlated PEEP levels with changes in mean ICP and PRx (Pearson correlation coefficient) and evaluated the influence of positioning on the response to PEEP (linear mixed effect). We did an exploratory analysis of covariables related to the ICP increase.
**Results:** Observed increases in mean ICP at PEEP settings of 10, 15, and 20 cmH2O (over a baseline of 5) were 1.0 (±0.9), 2.0 (±1.7), and 3.1 (±1.6) mmHg, respectively. There was a positive correlation between PEEP levels and ICP changes ($r=0.25$, $p<0.001$). Positioning did not influence the response to PEEP. No significant changes in mean PRx were noted with increased PEEP. Further explorative analysis showed a significant but very weak correlation between ICP changes and both pCO2 ($r=0.08$, $p<0.05$) and lung compliance ($r=0.07$, $p<0.05$).
**Conclusions:** The results indicate that increasing PEEP levels affect ICP but does not impair cerebral autoregulation in pigs with healthy lungs and normal ICP. These findings are consistent with data from our human intervention study (BrainVent NCT03278769) (2), which also indicated slight ICP elevations with increased PEEP in brain injury patients. However, additional studies are necessary to further delineate the interaction between PEEP and ICP, particularly in the context of ARDS or intracranial hypertension.

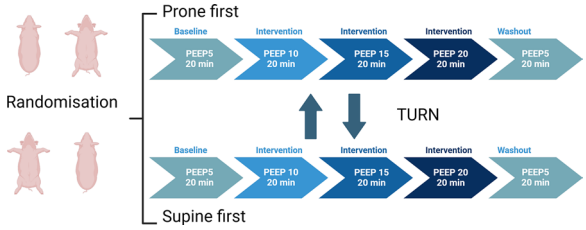


**Fig. 1 (abstract 001431)** Study design: crossover design and intervention settings
Randomization scheme and periods with PEEP levels and time.

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3. Funded by Helse Nord (Northern Norway Regional Health Authority).

**Topic:** Neurointensive care

## 001433

### Respiratory trajectory subphenotypes and differences in response to PEEP/FiO2 ventilation strategy in COVID-19 ARDS

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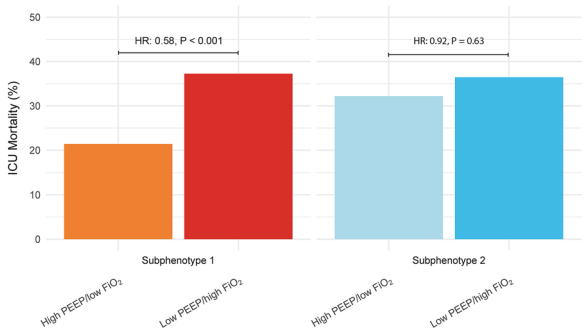
***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001433

**Introduction:** Positive end-expiratory pressure (PEEP) strategy remains a challenge in patients with acute respiratory distress syndrome (ARDS), and current guidelines make conflicting recommendations [1, 2]. Heterogeneity in the response to PEEP is an increasingly recognized factor in ARDS [3, 4]. In COVID-19-related ARDS, subphenotypes have been identified with different respiratory trajectories, although their clinical implications and their relation to the PEEP strategy remain understudied [5].
**Objectives:** We aimed to evaluate the influence of respiratory trajectory subphenotype allocation on the relationship between PEEP strategy and mortality. We hypothesized that the respiratory trajectory subphenotypes moderate the association between a high PEEP/low FiO2 ventilation strategy and mortality.
**Methods:** Retrospective analysis of a national database comprising data of invasively ventilated COVID-19 patients during the first two waves of the pandemic in the Netherlands (ClinicalTrials.gov: NCT05954351). Patients were categorized based on the ARDS Network tables into two groups; those in whom a high PEEP/low FiO2 strategy was most frequently employed in the first three days of mechanical ventilation, and those in whom it was not. To predict previously described subphenotypes, a prediction model was created using data from as early as possible up to three days of mechanical ventilation. Primary outcome was the interaction between the PEEP group and respiratory trajectory subphenotype on ICU mortality.
**Results:** Of the 1464 patients included in this analysis, 379 (25.9%) patients were categorized as high PEEP/low FiO2 and 1103 (75.3%) as low PEEP/high FiO2. A prediction model consisting of respiratory data of the first two days of ICU admission (AUROC 0.88) assigned 945 (65%) patients to respiratory trajectory subphenotype 1 and 519 (35%) patients to respiratory trajectory subphenotype 2. Subphenotype 2

was characterized by a higher mechanical power, minute volume and ventilatory ratio. The association between a high PEEP/low FiO2 ventilation strategy and ICU mortality was moderated by the respiratory trajectory subphenotype (interaction term: $P=0.033$). A high PEEP/low FiO2 ventilation was associated with lower ICU mortality only in subphenotype 1 (HR: 0.58, $P<0.001$) but not in subphenotype 2 (HR: 0.92, $P=0.63$).
**Conclusions:** High PEEP/low FiO2 ventilation was associated with better outcomes in only one of the respiratory trajectory subphenotypes, suggesting that their early identification could enhance the development of future respiratory treatment strategies.




**(abstract 001433)** Bar plot displaying mean ICU mortality in different PEEP/FiO2 strategies and assigned respiratory trajectory subphenotypes. HR = Hazard Ratio, P = P-value, ICU = Intensive Care Unit, PEEP = Positive End-Expiratory Pressure, FiO2 = Fraction of Inspired Oxygen

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6. This research was supported by 'ZorgOnderzoek Medische Wetenschappen' (ZonMw) (grant number 10430102110008).

**Topic:** Acute respiratory failure and mechanical ventilation

## 001434

### Serum amino acid concentration as ICU mortality predictor for patients undergoing CRRT

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001434

**Introduction:** Acute kidney injury patients on continuous renal replacement therapy (CRRT) are subjected to alterations in protein metabolism and loss of amino acids, which in turn are associated with worse clinical outcomes and mortality.
**Objectives:** The aim of this study is to determine which markers of protein and amino acid homeostasis during CRRT can be predictors of 30 days intensive care unit (ICU) mortality.
**Methods:** This was a prospective observational study on critical care patients on the 1st day of CRRT. Protein reserve was evaluated by using bioelectrical impedance derived fat-free (muscle) mass (FFMI), amino acid concentration was measured in serum by calorimetric assay (mmol/L) and loss of amino acids was calculated by measuring amino acids in effluent fluid and estimating the amount for 24 h (g/24 h). ICU mortality was defined as all cause 30 days mortality. Regression analysis was conducted to determine the predictors.
**Results:** The study was conducted between 2021 March and 2022 October. 60 high-mortality risk patients (APACHE II of $22.98 \pm 7.87$, 97% on vasopressors, 100% on mechanical ventilation) were included during the period of the study. The rate of 30 days ICU mortality was 50% ($n=30$). There was no significant difference in FFMI ($23.38 \pm 4.25$ vs $21.95 \pm 3.08$ $p=0.158$) and amino acid loss ($16.65 \pm 10.77$ vs $12.19 \pm 7.79$ $p=0.075$) between survivors and non-survivors. However, there was a difference in serum amino acid concentration ($2.40 \pm 1.06$ vs $1.87 \pm 0.90$ $p=0.040$). Regression analysis further revealed a correlation between these two markers, with a favorable effect of increasing amino acid concentration (OR = (−)0.569 CI95%: (−)0.324 to (−)0.989 $p=0.046$).
**Conclusions:** The results of the study imply an association between the lower amino acid concentration and higher ICU mortality for patients undergoing CRRT. Further investigation is needed to evaluate amino acid concentration value in clinical decision-making.

**Reference(s)**

1. This research was funded by Lithuanian research council as part of "Biosensor Platform for Fast, Cheap and Accurate Quantification of Amino Acids in Patients Undergoing Renal Replacement Therapy (DIALSENS)" (No. 01.2.2-LMT-K-718-01-0019).

**Topic:** Acute Kidney Injury and haemofiltration

## 001435

### Respiratory variation of sublingual capillary red blood cell velocity during retransfusion

J.D. Romano[1], V. Edul[2], G. Ferrara[3], H.S. Canales[3], E. Martins[3], C. Canullan[3], G.E. Murias[4], M.O. Pozo[4], J.F. Caminos Eguillor[3], M.G. Buscetti[3], A. Dubin[5]
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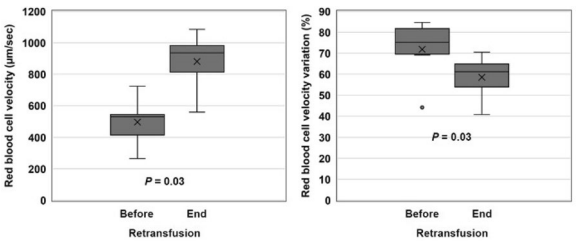
***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001435

**Introduction:** Arterial pulsatile flow in the aorta is progressively dampened, transforming into continuous non-pulsatile flow at the capillary level. Nevertheless, red blood cell (RBC) velocity is dependent on systemic flow. Our hypothesis was that the respiratory changes in

the systemic flow induced by mechanical ventilation also result in variations of sublingual RBC velocity.
**Methods:** This is a sub-analysis of a previously published study (1). We studied six anesthetized and mechanically ventilated sheep. We measured sublingual RBC velocity by means of space/time diagrams (SDF-videomicroscopy and AVA 3.2 software). The respiratory variation of RBC velocity was calculated as (maximal RBC velocity-minimal RBC velocity)/ (maximal RBC velocity + minimal RBC velocity)/2) × 100. After the hemorrhagic shock, blood was retransfused in ~ 3 min. Microcirculatory measurements were performed in the same capillaries, before and at the end of retransfusion.
**Results:** The RBC velocity was increased and its respiratory variation was reduced after retransfusion (Fig. 1).
**Conclusions:** In sublingual capillaries with continuous flow, there is a variation in RBC velocity that might be dependent on the changes in systemic flow throughout the respiratory cycle. The reduced respiratory variations of RBC velocity after retransfusion probably reflects the improvement in intravascular volume and the decrease in fluid responsiveness.




**(abstract 001435)** Respiratory variations of RBC velocity before and at the end of retransfusion

**Reference(s)**

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**Topic:** Cardiovascular issues in ICU

## 001436

### Fibronbronchoscopy in thoracic trauma, the experience of a third-level hospital in Colombia

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001436

**Introduction:** The incidence of pneumonia in ICU patients has been widely discussed, however, there are few studies discussing the occurrence of pneumonia in patients with chest trauma. Worldwide cohorts have evaluated age, sex, aspiration, and duration of ventilation (MV) as predictors of pneumonia occurrence, but there may be other factors affecting this relationship. On the other hand, the evaluation of the benefits of oxygenation and ventilatory mechanics of fibrobronchoscopy in patients with thoracic trauma has also not been adequately described.
**Objectives:** Main objective: To describe the patients taken to fibrobronchoscopy (FB) for any cause at San Rafael Hospital and in particular to analyze the subgroup of patients with chest trauma.
Secondary objective: to identify the potential benefit of fibrobronchoscopy in patients with blunt chest trauma.
Secondary objective: To identify the subgroup of patients who are candidates for fibrobronchoscopy according to the severity of trauma and probability of finding clots.
**Methods:** Type of study: descriptive observational, retrospective. Subjects over 18 years of age who underwent FB between 2021 and 2023 at the San Rafael Hospital in Tunja. Variables: sociodemographic, clinical, fibrobronchoscopic findings, ICU pneumonia and mortality. Statistics: quantitative variables were described by means and standard deviation, and qualitative variables by frequencies and percentages. Differences between groups were evaluated using the chi-square test for qualitative variables and for quantitative variables the Shapiro–Wilk distribution was evaluated, followed by the Student's *t*-test or Mann–Whitney *U*-test. Simple and multivariate logistic regression was performed and their respective ORS were calculated. An area under the curve analysis was performed to predict the occurrence of clots depending on the severity of the trauma.
**Results:** FB was performed in 237 patients. The mean age was 53 years and 66.24% were men, of these 28.69% ($n = 68$) had blunt chest trauma. There was an association of blunt chest trauma with the occurrence of clots [OR 7.98 (95% CI; 4.06 15.80)], atelectasis [OR 3.30 (95% CI: 1.29 10.01)], resolution of hypoxemia [OR 5.45 (95% CI; 2.71 11.41)] and prolonged ventilation [OR 2.42 (95% CI; 1.314.48)] in patients who underwent FB. Of the 237 patients taken to FB, pneumonia was diagnosed in 32.07% and this finding was associated with purulent respiratory tract secretions [OR 5.25 (95% CI; 2.79 9.94)], atelectasis [OR 3.25 (95% CI; 1.349.05)] and prolonged ventilation [OR 2.08 (95% CI; 1.15 3.76)]. Chest-specific ISS score of 9 or higher has a sensitivity of 97.87% and specificity of 42.86% (LR + 1.71, LR0.04) to predict the occurrence of clots, likewise clot removal could be a protective factor against the occurrence of pneumonia [OR 0.49 (95% CI; 0.25 0.93)] (Table 1).
**Conclusions:** FB could present a diagnostic and therapeutic tool in reducing bronchial obstruction and impact hypoxemia and prevention of pneumonia in patients with blunt chest trauma. Studies with greater statistical power and a more robust methodological design are required to estimate the impact of BF in these patients.

**Table 1 (abstract 001436)** OR of variables adjusted for the presence of chest trauma and mortality.

| Variable | Blunt chest trauma OR (CI 95%) | Death OR (CI 95%) | Pneumonia OR (CI 95%) |
|---|---|---|---|
| Age > 65 | 0.10 (0.35 – 0.26) | 4.19 (2.26 – 7.88) | 0.60 (0.31 – 1.1) |
| Men | 6.6 (2.78 – 18.06) | 0.67 (0.37 – 1.20) | 1.66 (0.87 – 3.21) |
| Blunt Chest Trauma | ( - ) | 0.29 (0.15 – 0.54) | 0.76 (0.38 – 1.46) |
| Clots // Clot removal | 7.98 (4.06 – 15.80) | 0.8 (0.45 – 1.41) | 0.49 (0.25 – 0.93) |
| Atelectasis | 3.30 (1.29 – 10.01) | 1.26 (0.63 – 2.51) | 3.25 (1.34 – 9.05) |
| Infectious pneumonitis | 1.14 (0.62 – 2.09) | 0.87 (0.49 – 1.50) | 5.25 (2.79 – 9.94) |
| Later Pneumonia | 0.76 (0.38 – 1.46) | 0.69 (0.38 – 1.24) | ( - ) |
| Hypoxemia | 0.39 (0.21 – 0.77) | 1.58 (0.84 – 2.95) | 1.5 (0.75 – 3.08) |
| Resolution of hypoxemia | 5.45 (2.71 – 11.41) | 0.36 (0.20 – 0.64) | 0.87 (0.48 – 1.56) |
| Prolonged Ventilation | 1.64 (0.88 – 3.09) | 0.64 (0.37 – 1.12) | 1.41 (0.78 – 2.57) |
| Prolonged Stay in ICU | 1.82 (0.95 – 3.56) | 0.43 (0.24 – 0.77) | 1.23 (0.67 – 2.28) |
| FB > 48 horas | 0.67 (0.36 – 1.25) | 0.74 (0.43 – 1.29) | 1.26 (0.70 – 2.26) |
| Prolonged Ventilation post-FB | 2.42 (1.31 – 4.48) | 0.47 (0.27 – 0.83) | 2.08 (1.15 – 3.76) |
| Death | 0.29 (0.15 – 0.54) | ( - ) | 0.69 (0.38 – 1.24) |

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001437

### Retrospective application of NICE COVID-19 rapid guideline: critical care in adults [NG159], utilising the clinical frailty scale as part of a holistic assessment of a cohort of patients admitted to critical care during the COVID-19 pandemic

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**Introduction:** Public health emergencies including the COVID-19 pandemic place significant strain on healthcare systems. The early stages of the COVID-19 pandemic resulted in significant and sustained demand for critical care services in the UK which had the potential to exceed even surge capacity [1] [2]. At such times priorities around resource allocation are questioned and reviewed. Whilst overt and explicit triage tools were never adopted in the UK, early iterations of the NICE (National Institute for Health and Care Excellence) COVID-19 rapid guideline: critical care in adults [NG159] [3], utilised the clinical frailty scale (CFS) [4] as a central tenet of a wider 'holistic assessment' of the potential benefit of critical care organ supports an individual patient may expect. Patient age was not part of this guidance. A CFS score of $\geq 5$ was narrated to be indicative of increased frailty where there may be uncertainty about the benefits of critical care organ support. Notwithstanding, this guidance encouraged patient centred, shared decision-making in fidelity with legal and professional norms [3,5].

**Objectives:** The objective of our study was to retrospectively and overtly apply the early NG159 algorithm including the CFS trigger of 5 to a cohort of patients admitted to the ICU's of three London teaching hospitals between March 2020 and February 2021 during the COVID-19 pandemic and consequently identify the potential impact of this hypothetical application.

**Methods:** A retrospective analysis of 243 patients, aged $\geq 66$ years at the time of admission to critical care units (including surge areas) in one or more of the three hospitals that form part of the Imperial College Healthcare NHS Trust, London, between March 2020 and February 2021. Three doctors independently reviewed the electronic notes (to include multidisciplinary notes) held on hospital systems of all 243 patients between April and July 2023. Working separately and blinded to each other's findings, utilising the available information at the time of ICU admission, co-morbidities and a CFS score was recorded along with an impression as to whether or not it was felt the patient would benefit from admission to critical care (triaged into or out of critical care) utilising the principles of NG159. Where a patient had a CFS recorded either on hospital or ICU admission this would be used. Otherwise, reviewers were encouraged to form a holistic view of the CFS and the potential benefit of critical care (triage status). Patients were hypothetically triaged out of ICU care if a reviewer found their CFS to be $\geq 5$ and on holistic review to 'not benefit' from critical care organ support. Patients who were triaged out by two or more reviewers had their notes reviewed by a senior doctor in confirmation of the triage status. In February 2024, all 243 patients were followed up via our local electronic portals' access to the NHS Spine to establish mortality data (at $\geq 3$ years).

**Results:** 765 patients were admitted to the ICU's during this period. 243 were aged $\geq 66$ years old and were included in the analysis. A total of 20 patients were triaged out by at least two reviewers. After consideration of the mean CFS score ($\geq 5$) and a final senior review of the patient notes and co-morbidities, a total of 12 patients were hypothetically triaged out. Of these 12 patients, 3/12 (25%) were alive for at least 3 years (as of February 2024). A total of 101 (101/243) patients were found to be alive in February 2024, thus a retrospective hypothetical application of the early NG159 guidance centred around the clinical frailty scale in those $\geq 66$ years old suggests 3/101 (2.97%) of those survivors who were alive at 3 years or more post admission may not have been admitted to critical care for organ support.

**Conclusions:** Accepting the numerous limitations of this study, we identified 3 patients who may have been denied admission to critical care had the early NICE guidance NG159 utilising the CFS been arbitarily applied to critical care admission criteria at our institutions during the COVID-19 pandemic surges. These results illustrate the potential for pitfalls and the need for caution in the arbitrary application of triage tools, particularly in situations where demand exceeds capacity and the need for collaborative clinical judgement to promote patient-centred care. It should be stated that neither the UK government or Imperial College Healthcare NHS Trust adopted any form of triage policy or tool to inform decisions on admission to critical care [6]. Furthermore whilst the early NG159 guidance appeared to primi facie promote the use of the CFS, it was caveated with the need to act in fidelity with professional judgement and the best interest of the individual.

| | Total admissions to ICU | Total admissions aged ≥66 years old |
|---|---|---|
| | 765 | 243 |
| Male | [521] | 172 |
| Female | [244] | 71 |
| Age (years) | Range [18-89] | Range [66-89] |
| | Mean [58.88] | Mean [72.48] |

**(abstract 001437)** Characteristics of patients admitted to ICU with COVID-19

| ≥66 years old | Dead or Alive at 3 years (February 2024) | | | |
|---|---|---|---|---|
| | Alive | Dead | Unknown | Total |
| | 101 | 128 | 14 | 243 |
| Mean CFS(of three reviewers) | 2.67 | 2.91 | 2.23 | |
| CFS(Mean) ≥5 & triaged 'out' | 3 | 9 | | |
| CFS(Mean) <5 & triaged 'in' | 98 | 119 | 14 | |

**(abstract 001437)** Mortality status at least 3 years after admission to ICU demonstrating 3/12 (25%) of patients triaged out are 'alive'

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**Topic:** Health Services Research and Outcome

## 001438

## ICU staff radiation exposure during [18F]FDG PET/CT procedures in critically ill patients


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**Introduction:** The accessibility of [18F]FDG PET/CT scans for critically ill patients has significantly improved with the introduction of long axial field of view PET/CT scanners. (1, 2) This leads to new diagnostic opportunities, and an increase of scans performed in ICU patients. (3) ICU patients emit radiation, starting directly after the administration of [18F]FDG. Since these patients require constant monitoring and frequent care, maintaining a sufficient physical distance between the staff and the patient is challenging. For the procedure a strict scan protocol was developed including staff radiation safety based on the 'as low as reasonably achievable' (ALARA) principle. This principle implies that staff radiation exposure should stay as low as possible without compromising patient care.
**Objectives:** To measure the radiation dose received by ICU personnel, during a [18F]FDG PET/CT procedure.
**Methods:** The taff radiation dose was measured during all [18F]FDG PET/CT procedures performed within our center for 1.5 years. A [18F]FDG PET/CT procedure was defined as tracer administration at the ICU department, transport to the scan facility, and the remaining decay time of [18F]FDG (4 h equalling 2 half-life times) after returning to the ICU. During the procedure, staff were advised to limit patient contact and to stay at a reasonable distance from the patient. To facilitate this, a checklist was provided encompassing transport preparation and patient care. Procedures had to be evenly divided between colleagues, only necessary staff was allowed to participate.
A electronic personal dosimeter (EPD) was provided to the participating nurse en physician to measure the received radiation doses. The EPD was carried ventral on top of the clothing at thoracic hight. The EPD was transferred between staff when shifts ended. Four hours after administration of [18F]FDG, readings were taken from the EPD.
**Results:** In total 18 [18F]FDG PET/CT procedures were performed in 16 patients. Three procedures were excluded due to incorrect use of the EPD, resulting in 15 procedures in 13 patients.
The mean (±SD) administered dose was 155 MBq [18F]FDG. The radiation dose received by nurses and physicians was, respectively, 15 µSv (SD±7) and 8 µSv (SD±4). For one physician the received dose was relatively high (20 µSv). This physician was present during the CT-scan as a precaution because of the presence of a cardiac assist device. The legal upper limit for additional radiation dose for ICU personnel in the Netherlands is 1 mSv.
**Conclusions:** The received radiation dose for ICU nurses and physicians during a [18F]FDG PET/CT procedure was acceptable and well below the recommended limits for hospital staff.


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**Topic:** Imaging in intensive care

## 001439

### Benefit of optic nerve sheath diameter ultrasonography in the detection of increased intracranial pressure

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001439

**Introduction:** Optic nerve sheath ultrasound is a bedside practice that can be used to assess increased intracranial pressure in patients with brain injuries. It is considered to be rapid, safe and easy.
**Objectives:** To identify whether ultrasonographic measurements of optic nerve sheath diameter (ONSD) could detect increased intracranial pressure and predict the prognosis of patients with acute severe brain injury on admission.
**Methods:** This was a prospective, observational study carried out between November 2023 and March 2024 in the intensive care unit (ICU) of Zaghouan's regional hospital. We included patients with severe acute brain injury, over 18 years of age, who required sedation and mechanical ventilation on admission to the ICU. A brain CT scan and an ONSUS were performed on admission in all patients.
The ONSD was measured with a high-frequency linear probe using a commercially available echocardiograph machine (Vivid T8).
Mean of measurements in both sagittal and transverse sections of each eye was used for statistical analysis. Two groups were identified and compared according to the presence or absence of intracranial hypertension on the initial brain CT scan.
**Results:** A total of 23 patients were involved. Of these patients, 20 were male, with a mean age of $44.5 \pm 13.5$ years. Mean admission severity scores of APACHE II and SAPS II were, respectively, $17.3 \pm 7.4$ and $39.4 \pm 14.6$. Acute brain injury was, respectively, secondary to traumatic lesion (14), meningoencephalitis (3), intracerebral hemorrhage (4), ischemic cerebral stroke (1) and status epilepticus (1). The mean initial Glasgow score was $7 \pm 2.4$. Seizure was noted in six patients and anisocoria in two patients.
The mean diameter of the optic nerve sheath for the total number of patients studied was 6.2 mm (range 4.6–7.8) with a standard deviation (SD) of 0.9 mm. Fourteen patients had radiological findings of intracranial hypertension on brain CT scan. When comparing the two groups, a statistically significant relationship was demonstrated between ONSD and the presence of radiological intracranial hypertension with a $p = 0.02$. Dilation of the optic nerve sheath beyond 0.59 cm accurately predicted the presence of intracranial hypertension on brain CT scans, with a sensitivity of 85% and specificity of 67% (AUC = 0.79). Neurosurgery was indicated in four cases. The median length of stay was 18 days [4–91]. Nine patients succumbed to their condition. However, no correlation was found between optic nerve sheath diameter (ONSD) and the final patient outcome.
**Conclusions:** Through the following study, we concluded that the measure of ONSD seemed to be a good approach to detect non-invasively increased intracranial hypertension in critically ill patients with acute brain injury.

**Topic:** Neurointensive care

## 001440

### Impact of an Allied Health Professional and Pharmacist-led rehabilitation ward round on vitamin D (colecalciferol) optimisation

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001440

**Introduction:** In 2021 an initiative was undertaken to introduce, in critical care at University Hospital Southampton (UHS), a weekly Allied-Health Professional (AHP) and pharmacist-led, multidisciplinary team (MDT) rehabilitation round for long-term Intensive Care Unit (ICU) patients; long-term defined as ICU stay $\geq 14$ days. It became apparent early in the initiation of the MDT round that vitamin D deficiency was common. Vitamin D deficiency is reported in 40–70% of patients with critical illness1. Deficiency may exist prior to admission (78% of patients present to ICU malnourished)2 or because of critically ill associated dysregulation of vitamin D metabolism. Vitamin D deficiency has been shown to increase ICU length of stay (LOS) and increase morbidity and mortality1.
**Objectives:** The aim of this study is to report the impact of the MDT ward round on vitamin D optimisation.
**Methods:** The MDT ward round was registered as a quality improvement project (QI/0242). Nutrient screening, including vitamin D was undertaken on the MDT ward round. Where deficiency was identified, evidence-based vitamin D supplementation was prescribed by the pharmacist; the presence of deficiency and intention to treat was documented in the patient's clinical notes.
**Results:** Between March 2023 to 2024, 26 patients were referred to the MDT rehabilitation ward round. Baseline vitamin D levels (Table 1) were requested, by the pharmacist, for 17 of 26 patients. Only 1 of 17 (5%) had an optimal vitamin D level at baseline, 4 were adequate, 5 were insufficient and 7 were deficient. 12 (71%) were immediately prescribed vitamin D supplementation. Doses for the identified 7 deficient patients were unless contraindicated, 300,000 units intramuscularly once only (STAT) and 10,000 units weekly (enterally/orally) maintenance. The 5 insufficient patients received replacement doses (enterally/orally) of ~ 20,000 units once weekly.
**Conclusions:** Optimisation of vitamin D (identifying deficiency and prescribing supplementation) was required in three-quarters of patients (Fig. 1) reviewed on the MDT ward round. Future work by the MDT will focus on the clinical impact and subsequent patient counselling of this important optimisation.

**Table 1 (abstract 001440)** Mortality status at least 3 years after admission to ICU demonstrating 3/12 (25%) of patients triaged out are 'alive'.

**Baseline Vitamin D level and status**

| Level (nmol/L) | <25 | 25-50 | 50-75 | >75 |
|---|---|---|---|---|
| Status | Deficient | Insufficient | Adequate | Optimal |
| Patients (n=17) | 7 | 5 | 4 | 1 |
| Percentage (%) | 41 | 29 | 24 | 6 |

**Baseline vitamin D levels for long-term ICU patients**

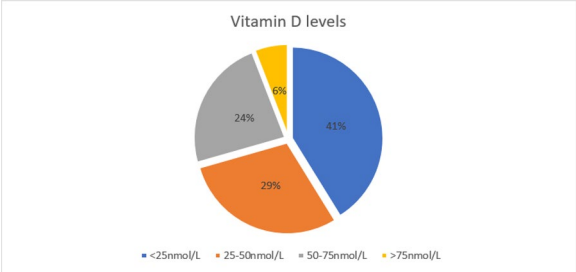


**Fig. 1 (abstract 001440)** Vitamin D status for long-term ICU patients

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3. Dr McKenzie has a Southampton Research Leaders Grant and NIHR funding.

**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001441

## The recruitment-to-inflation ratio reflects the impact of peep on dynamic lung strain—a CT scan study in a model of ARDS

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**Introduction:** In acute respiratory distress syndrome (ARDS), the beneficial effects of positive end-expiratory pressure (PEEP) on ventilator-induced lung injury (VILI) are proportional to the extent of dynamic lung strain reduction [1,2]. This depends on the variable recruitment produced by PEEP. Current quantification of alveolar recruitment and PEEP-induced changes in dynamic lung strain relies on computed tomography (CT), which lacks bedside accessibility. The recruitment-to-inflation ratio (R/I) is a novel tool able to predict lung recruitability at the bedside [3]. It offers valuable insights into PEEP-induced alveolar recruitment, proving its useful for setting mechanical ventilation to minimize dynamic lung strain [4].
**Objectives:** We conducted an experimental study on a high recruitable ARDS model, ventilated with two PEEP levels (low and high) in the context of a low-tidal volume lung-protective strategy, to investigate whether R/I reflects the impact of PEEP on dynamic lung strain and lung recruitability assessed through the "gold standard" CT scan method.
**Methods:** Fourteen lung-damaged pigs (lipopolysaccharide infusion) underwent CT scans at PEEPLOW (5 cmH2O) and PEEPHIGH (i.e., PEEP generating a plateau pressure of 28–30 cmH2O). Both dynamic lung strain and PEEP-induced tissue and gas recruitment were assessed through CT scan analysis: Tissue recruitment (TREC) was computed as the absolute decrease in the weight of non-aerated lung tissue between the two PEEP levels [5]. Gas recruitment (GASREC) was estimated as the amount of gas entering previously nonaerated lung units [6]. PEEP-induced dynamic lung strain variation was computed as the difference between dynamic lung strain at PEEPLOW (the ratio of tidal volume to the total end-expiratory gas volume at 5 cmH2O) and dynamic lung strain at PEEPHIGH (tidal volume divided by the sum of total end-expiratory gas volume at 5 cmH2O *plus* GASREC) [7]. Tissue recruitment and gas recruitment were normalized to the weight and gas volume of previously ventilated lung areas at PEEPLOW (normalized-TREC and normalized-GASREC). The R/I ratio was measured through a one-breath derecruitment maneuver from PEEPHIGH to PEEPLOW [3].
**Results:** The median [interquartile range] R/I ratio was 1.08 [0.88–1.82], indicating high lung recruitability (R/I > 0.5). Compared to PEEPLOW, tissue and gas recruitment at PEEPHIGH were 246 g [182–288] and 385 ml [318–668], respectively. The dynamic lung strain was 0.37 [0.29–0.44] at PEEPHIGH and 0.59 [0.46–0.80] at PEEPLOW ($p < 0.001$). R/I significantly correlated with the variation in dynamic lung strain across the two PEEP levels ($r = -0.93$; [95% CI, −0.78 to −0.98]). A strong correlation was found between R/I ratio and normalized GASREC ($r = 0.90$; [95% CI, 0.71 to 0.97]).
**Conclusions:** R/I ratio reflects the impact of PEEP on dynamic lung strain and lung recruitment, proving it is useful for setting PEEP to minimize the harmful effects of PEEP during mechanical ventilation.

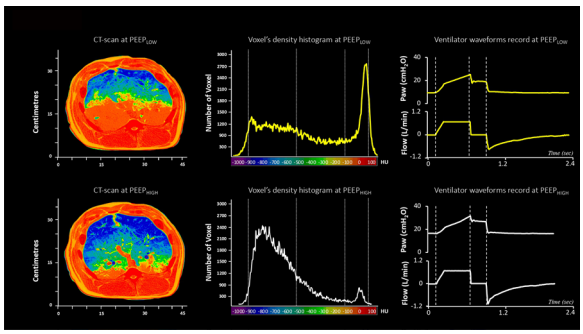


**Fig. 1 (abstract 001441)** Left and middle panels: Representative computed tomography (CT) images and corresponding voxel density histograms of a large transverse lung section acquired under two different experimental ventilation conditions at end-expiration. Each image was interpreted using the UCLA color coding table (OsiriX image processing software, http://www.osirixfoundation.com, Geneva, Switzerland). Non-aerated lung tissue, ranging from − 100 to + 100 Hounsfield Units (HU), was depicted in shades of red (from dark red to orange), poorly aerated lung tissue (between − 500 to − 100 HU) was represented in shades of green, and normally aerated lung tissue (between − 900 to − 500 HU) was coded in dark and light blue. However, hyperinflated lung tissue (ranging from − 1000 to − 900 HU), which would have been represented in purple, was not observed upon raising PEEP from PEEPLOW to PEEPHIGH. Right panel: experimental records in a representative animal showing the airflow and the opening airway pressure (Pao) traces during both experimental ventilation conditions. Dashed lines indicate the constant flow period

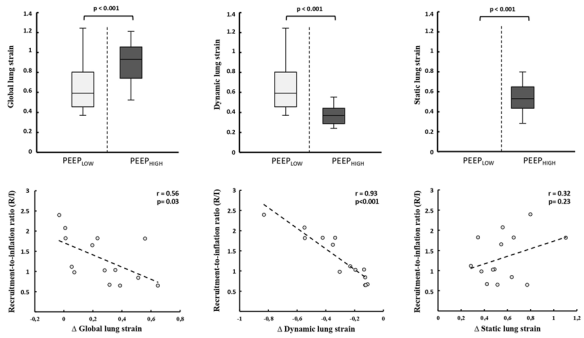


**Fig. 2 (abstract 001441)** In the upper panel, box-plot graphs represent variation in global, dynamic and static lung strain going fromPEEPLOW (*light gray*) to PEEPHIGH (*dark gray*). The lower panel depicts the correlations between the recruitment-to-inflation (R/I) ratio and the changes in global, dynamic and static lung strain going from PEEPLOW to PEEPHIGH. The dotted line represents linear regressions, and each dot represents one pig

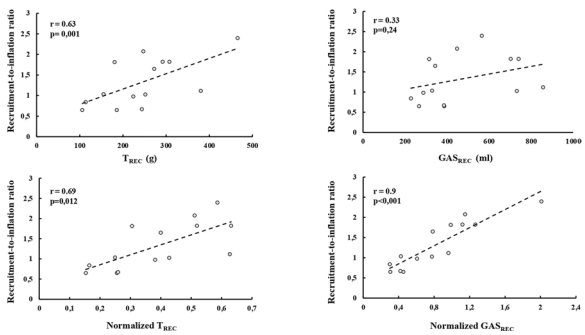


**Fig. 3 (abstract 001441)** Correlations between recruitment-to-inflation ratio (R/I) and tissue recruitment (TREC) (left upper panel), gas recruitment (GASREC) (right upper panel), normalized TREC (left lower panel) and normalized GASREC (right lower panel). Tissue and gas recruitment were assessed by the CT-scan method. Normalized TREC expresses the difference in weight of nonaerated lung tissue between PEEPLOW and PEEPHIGH divided by the total end-expiratory lung weight at PEEPLOW. Normalized GASREC expresses the PEEPHIGH-related gas volume entering the recruited lung tissue divided by the total end-expiratory gas volume at PEEPLOW. The dotted line represents linear regression, and each dot represents one pig

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001445

### Relevance of thoracic CT angiography in the emergency department—predictive factors for alternative diagnoses

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**Introduction:** The clinical presentation of pulmonary embolism (PE) in the emergency department is characterized by varied and nonspecific signs. Thoracic CT angiography confirms the diagnosis and rules out differential diagnoses. Rationalizing the use of this technique is essential to optimize emergency department resources. Our study aimed to investigate the relevance of requesting thoracic CT angiography in the emergency department and to determine predictive factors for alternative diagnoses.
**Objectives:** We aimed to investigate the relevance of thoracic CT angiography in the emergency department and to identify predictive factors for alternative diagnoses.
**Methods:** Prospective observational monocentric study conducted between February and September 2022. Inclusion of adult patients (age ≥ 18 years) admitted to the emergency department for suspected PE based on clinical, electrical, and biological arguments. Data on demographics, clinical, biological, and evolutionary outcomes were collected from an electronic medical record (EMR). The primary outcome was the presence of PE on CT angiography.
**Results:** We included 210 patients, with a sex ratio of 1.1. The mean age was 68 ± 16 years. The main comorbidities were hypertension (37%), diabetes (37%), and coronary artery disease (21%). The mean Geneva score was 6 ± 2.5. The probability was low in 11 patients (5.2%), intermediate in 178 (84%), and high in 18 (8.6%). D-dimer levels were negative in 13 patients (6.3%). Pulmonary embolism was found in 24.3% of patients. Alternative diagnoses found on CT angiography were: pneumonia in 20 (9.5%), pleurisy in 13 (6.1%), and COVID-19 pneumonia in 16 (7.6%). The admission rate to the intensive care unit was 15%. In-hospital mortality was 14%. The rate of discharge to home was 67%. Predictive factors for alternative diagnoses were: history of chronic respiratory failure OR = 2.11; 95% CI [1.015; 4.410]; $p = 0.046$; Troponin levels ≥ 100 ng/L; Se 70%; Sp 50%; OR 2.25; 95% CI [1.97; 2.98].
**Conclusions:** Troponin levels ≥ 100 ng/L and a history of chronic respiratory failure are predictive factors for alternative diagnoses that may lead to an unnecessary request for thoracic CT angiography in the emergency department.

**Topic:** Imaging in intensive care

## 001446

### Factors Associated with Complications in Elderly Patients Admitted for Acute Dyspnea

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**Introduction:** Acute dyspnea is a common reason for emergency department visits in patients over 85 years old. This symptom can be indicative of several potentially serious underlying pathologies. The morbidity and mortality associated with acute dyspnea are higher in the elderly due to physiological aging of the cardiorespiratory system, the multifactorial nature of dyspnea, and the frequency of associated comorbidities that can decompensate, complicating management and emphasizing the importance of identifying patients at risk of deterioration early in their admission.
**Objectives:** To identify factors associated with the occurrence of complications in elderly patients hospitalized in the emergency department for acute dyspnea.
**Methods:** Prospective, observational study conducted in the emergency department over a period of one year (2023). All patients aged 65 years and older admitted to the emergency department for acute dyspnea were included. Patients arriving in the resuscitation room in cardiorespiratory arrest were not included, and those transferred to another facility, those who refused medical advice, and those with missing data were subsequently excluded. Oral consent was obtained before data collection on the form. The primary outcome was in-hospital mortality, and secondary outcomes were admission to intensive care, intubation, and nosocomial infections.
**Results:** We included 235 patients with a mean age of $76 \pm 8$ years and a gender ratio of 1.1. The main comorbidities were hypertension in 167 patients (71%), diabetes in 99 patients (42%), heart failure in 66 (28%), and chronic obstructive pulmonary disease (COPD) in 16 (7%). The etiologies of dyspnea found in our study were acute heart failure in 103 patients (44%), community-acquired pneumonia in 74 patients (31.5%), including 12 (5%) cases of inhalation pneumonia, pulmonary embolism in 36 patients (15.3%), pleural effusion in 34 patients (14.5%), acute exacerbation of COPD in 29 patients (12%), and diabetic ketoacidosis in 26 patients (11%). Mortality was 26%. Twenty-two patients (9.4%) required orotracheal intubation, 25 (10.6%) were transferred to the intensive care unit, and 10 patients (4.3%) developed nosocomial infections. In univariate analysis, only a history of hypertension and a SOFA score $\geq 3$ were associated with mortality with respective $p$ values of 0.04 and $< 0.001$. Factors associated with transfer to the intensive care unit were the use of non-invasive ventilation (NIV) of the VS-AI-PEP type with $p < 0.001$ and a SOFA score $\geq 3$ with $p < 0.001$. Factors associated with intubation were a history of hypertension, a diagnosis of pulmonary embolism, and a SOFA score $\geq 3$ with respective $p$ values of 0.005, 0.03, and $< 0.001$. Factors associated with the occurrence of nosocomial infection were male gender ($p = 0.02$), a history of diabetes ($p = 0.05$), a history of heart failure ($p = 0.04$), a diagnosis of community-acquired pneumonia ($p = 0.02$), the use of NIV ($p = 0.004$), and a SOFA score $\geq 3$ ($p = 0.015$).
**Conclusions:** Identifying risk factors for complications in elderly patients hospitalized for acute dyspnea can improve initial management. The results of our study highlight the prognostic value of the SOFA score.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001447

### Diagnostic performance and impact of a multiplex PCR pneumonia panel in ICU patients with pneumonia: a prospective multicentric observational study (The MORICUP-PCR study)

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**Introduction:** Rapid identification of microorganisms and early adaptation of anti-infectious therapy are critical in managing severe pneumonia [1].
**Objectives:** This study aimed to assess the diagnostic performance of multiplex respiratory PCR (mPCR) compared to classical microbiological culture (CMC) and to assess the mPCR's impact on early antibiotic treatment (ATB) adaptation in Moroccan ICUs.
**Methods:** Adult patients with pneumonia requiring invasive mechanical ventilation, including community-acquired pneumonia (CAP), hospital-acquired pneumonia (HAP), and ventilator-acquired pneumonia (VAP), were enrolled. Respiratory samples underwent both mPCR and CMC. The agreement between mPCR and CMC was calculated with a 95% confidence interval. Changes in empiric antibiotic therapy (ATB) induced by mPCR results were categorized as escalation, de-escalation, or adequacy. A multidisciplinary team including intensivists, infectious disease specialists, and microbiologists assessed the appropriateness of empiric ATB and the changes induced by the mPCR.
**Results:** A total of 210 patients from 12 ICUs were recruited. The median age was 50 years (range: 33–67), with 66.2% being male. The median SOFA score was 7 (range: 5–8). The distribution of pneumonia types was as follows: 31% were community-acquired pneumonia (CAP), 58% were ventilator-acquired pneumonia (VAP), and 11% were hospital-acquired pneumonia (HAP). The distribution of microorganisms detected by mPCR and CMC is displayed in Fig. 1. mPCR identified almost three times more bacterial targets than CMC, with Acinetobacter being the most identified microorganism in HAP/VAP. The percent positive agreement between mPCR and CMC was 96% (92–98%), and the percent negative agreement was 21% (15–28%). The overall agreement between the two techniques was 63% (57–67%).
mPCR results led to changes in ATB in 138 patients (65%): 25% underwent de-escalation or cessation of ATB, 23% required escalation, 18% required adequacy, and ATB was initiated in 4% of patients. The empiric ATB was deemed appropriate in 40% ($n = 84$) of patients, inappropriate in 31% ($n = 65$), and indeterminate in 9% ($n = 19$). No empiric ATB was prescribed before mPCR in 20% of patients. The appropriateness of empiric ATB significantly increased from 40% before mPCR to 66.7% after mPCR ($p < 0.001$). Post-mPCR, ATB could still be optimized in 48% of cases ($n = 102$). These potential optimizations included de-escalation or cessation of ATB ($n = 69$), escalation ($n = 30$), adequacy ($n = 18$), and initiation of ATB ($n = 3$).

**Conclusions:** This study demonstrates that in Moroccan ICUs, mPCR significantly impacts the management of patients with severe pneumonia, leading to a substantial increase in the appropriateness of empiric ATB. Further research is needed to analyse its impact on patients' outcomes, hospital costs, and antimicrobial stewardship.

| Microorganisms | | CAP | | HAP / VAP | |
|---|---|---|---|---|---|
| | | mPCR + | CMC+ | mPCR + | CMC+ |
| Bacteria | Acinetobacter calcoaceticus-baumannii | 2 | 2 | 70 | 47 |
| | Enterobacter cloacae complex | 5 | | 15 | 4 |
| | Escherichia coli | 3 | 1 | 17 | 11 |
| | Haemophilus influenzae | 20 | 1 | 44 | 6 |
| | Klebsiella aerogenes | | | 2 | |
| | Klebsiella oxytoca | 1 | | 1 | 1 |
| | Klebsiella pneumoniae | 6 | 1 | 24 | 13 |
| | Moraxella catarrhalis | 5 | | 6 | |
| | Proteus spp | | | 7 | |
| | Pseudomonas aeruginosa | 4 | 1 | 26 | 7 |
| | Serratia marcescens | 1 | | 6 | 7 |
| | Staphylococcus aureus | 20 | 6 | 48 | 23 |
| | Streptococcus agalactiae | 5 | | 4 | 1 |
| | Streptococcus pneumoniae | 15 | 4 | 15 | 3 |
| | Streptococcus pyogenes | | 1 | | |
| Atypical microorganisms | Chlamydophila pneumoniae | | N/A | 1 | N/A |
| | Legionella pneumophila | | N/A | | N/A |
| | Mycoplasma pneumoniae | 1 | N/A | 1 | N/A |
| Virus | Adenovirus | | N/A | 1 | N/A |
| | Coronaviruses OD43, NL63, HKU1 and 229E | 4 | N/A | 4 | N/A |
| | Human metapneumovirus | | N/A | 1 | N/A |
| | Human rhinovirus/ enterovirus | 1 | N/A | 5 | N/A |
| | Influenza A | 5 | N/A | 3 | N/A |
| | Influenza B | 1 | N/A | | N/A |
| | Parainfluenza virus | 1 | N/A | 1 | N/A |
| | Respiratory syncytial virus | | N/A | 1 | N/A |
| | MERS Coronavirus | 1 | N/A | 1 | N/A |
| Resistance genes | KPC | | | | |
| | NDM | 2 | C = 1 | 24 | C=14 / I=2 |
| | OXA-48 | 1 | C = 1 | 8 | C=4 |
| | VIM | 2 | | 4 | C=2 |
| | IMP | 1 | | 1 | |
| | CTX-M | 2 | | 24 | C=14 / I=1 |
| | mecA/C and MREJ | 4 | | 8 | C=1 / I=4 |

**Fig. 1 (abstract 001447)** Comparison of microorganisms identified by multiplex PCR and classical microbiological culture among ICU patients with pneumonia. CAP: community-acquired pneumonia, HAP: Hospital-acquired pneumonia, VAP:Ventilator-associated pneumonia, mPCR: multiplex PCR, CMC: classical microbiological culture, N/A; non-applicable, C: Compatible with resistance phenotype on antibiotic susceptibility test (AST), I: incompatible with resistance phenotype on AST

Among the bacteria detected by CMC but not included in the mPCR panel, the following were identified: Stenotrophomonas maltophilia, Citrobacter koseri, Pantoea spp, Streptococcus viridans, and Staphylococcus hemolyticus, each with one case detected.

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**Topic:** Infections and prevention

## 001448

### Predictive models for mortality at 3 and 6 months in patients with solid organ tumors assessed in the ICU

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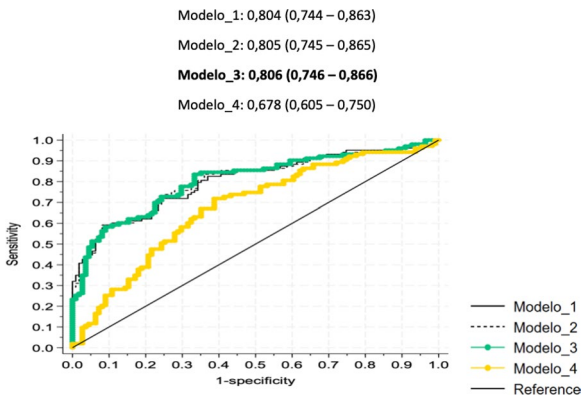
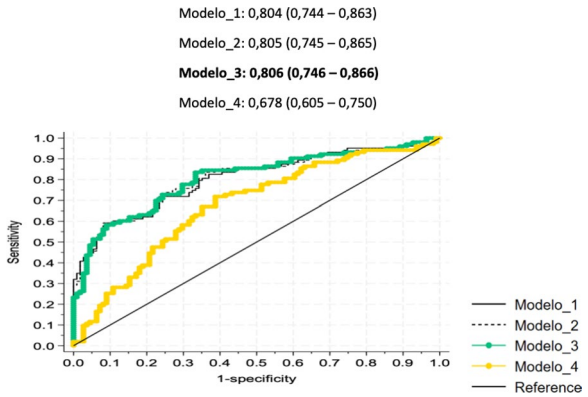
**Introduction:** The increasing impact of cancer on ICU care complicates treatment decisions, requiring shared input from oncologists and intensivists. ICU admission can optimize existing measures and align treatment with patient values.
There are mixed views on ICU mortality for cancer patients; some question its benefits due to high mortality and resource use, while others suggest it should not be generalized.
Our study focuses on predictive models for ICU admission and 3–6 month mortality in solid organ tumor patients facing acute events.
**Objectives:** The objective of the study is to identify the 3 and 6-month mortality rates of oncology patients admitted to our ICU.
**Methods:** Prospective observational study that includes patients over 18 years old with solid organ tumors experiencing an acute event and requiring evaluation by the intensive care team for ICU admission.
**Results:** The study, involving a cohort of 215 patients, found a higher ICU admission probability in men compared to women (OR = 2.62, [95% CI = 1.10–6.23]) ($p = 0.029$) and a reduced admission probability in smokers (OR = 0.27, [95% CI = 0.09–0.80]) ($p = 0.018$). The average age at 3-month mortality was 67.75 years (SD 9.77) compared to 64.95 years (SD 10.65) in survivors ($p = 0.046$).
Significantly, 23.08% ($n = 24$) of patients with heart disease died compared to 11.71% ($n = 13$) without it ($p = 0.027$). Respiratory-origin tumors showed a higher mortality probability (OR = 13.64 [95% CI = 2.75–67.63]) ($p = 0.001$). Tumors in stages II (OR = 3.13 [95% CI = 1.57–6.25]) ($p = 0.001$) and III (OR = 19.36 [95% CI = 2.15–174.35]) ($p = 0.008$) significantly correlated with 3-month mortality. Previous surgical treatment lowered the 3-month mortality probability (OR = 0.40 [95% CI = 0.18–0.92]) ($p = 0.031$), while disease progression increased it (OR = 2.12 [95% CI = 1.07–4.21]) ($p = 0.032$).
Functional assessments at admission (ECOG 2 or Karnofsky 70–50) showed higher 3-month mortality probabilities (OR = 2.42 [95% CI = 1.33–4.41]) ($p = 0.004$), increasing in ECOG 3–4 or Karnofsky 40–10 patients (OR = 8.48 [95% CI = 1.79–40.11]) ($p = 0.007$).
At 6 months, significant findings included an age difference between deceased (67.69 years, SD 9.74) and surviving patients (64.54 years, SD 10.77) ($p = 0.025$). Respiratory tumors again showed higher mortality (OR = 11.03 [95% CI = 2.35–51.89]) ($p = 0.002$), followed by digestive tumors (OR = 4.82 [95% CI = 1.13–20.51]) ($p = 0.033$). Tumors in stages II (OR = 3.42 [95% CI = 1.67–7.00]) ($p = 0.001$), III (OR = 11.97 [95% CI = 1.31–109.51]) ($p = 0.028$), and disease progression (OR = 2.29 [95% CI = 1.12–4.68]) ($p = 0.023$) correlated with higher 6-month mortality.
Functional assessments (ECOG 2 or Karnofsky 70–50) were predictive of 6-month mortality (OR = 2.95 [95% CI = 1.58–5.51]) ($p = 0.001$), increasing in ECOG 3–4 or Karnofsky 40–10 patients (OR = 14.30 [95% CI = 1.80–113.91]) ($p = 0.012$).
**Conclusions:** The model that encompasses the ECOG scale, tumor stage, vital prognosis, status of oncological disease, age, ex-smoker status, tumor extent, and renal insufficiency is the one that best predicts the probability of 3-month and 6-month mortality.




**(abstract 001448)** Predictive models of 3-month mortality in the total cohort




**(abstract 001448)** Predictive models of 6-month mortality in the total cohortT

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**Topic:** Haematologic-oncologic issues in the ICU.

## 001450

### Acquired thrombotic thrombocytopenic purpura with severe features in the ICU: a single-center experience

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**Introduction:** Thrombotic thrombocytopenic purpura (TTP) is a rare hematological and critical care emergency, with a high mortality rate if left untreated. Acquired TTP (aTTP) occurs due to ADAMTS13 deficiency, and organ dysfunction arises as a consequence of widespread microvascular thrombosis. Previous studies illustrated a significant variability in TTP severity, life-supporting treatments and mortality among patients admitted to the ICU, in part due to differences in admission or plasma exchange (PEX) availability policies. We report a retrospective clinical profile analysis of 7 critically ill patients with severe TTP treated in our Intensive Care Department.
**Objectives:** Clinical review of severe features and hospital trajectories in aTTP patients admitted to the intensive care department of a tertiary university hospital in Lisbon, Portugal.
**Methods:** Clinical review of all patients admitted with newly diagnosed aTTP from 2007 to 2023, according to the intensive care department database. All identified cases were subjected to individual

medical record review regarding diagnostic workup, severity assessment, therapeutic management and clinical course.
**Results:** Among 7 patients, there were 5 females, with a median age of 51 years. All patients had microangiopathic hemolytic anemia, LDH elevation and activity level of ADAMTS13 $\leq$ 10%. Anti-ADAMTS13 autoantibodies were detected in 3 patients. No secondary causes were identified. All patients had a PLASMIC score. All patients had at least one severe neurologic manifestation and 6 had acute symptomatic seizures. The identified structural central nervous system lesions included large vessel occlusion stroke (2), isolated intraventricular hemorrhage (1), and diffuse cerebral microhemorrhages (1). Mechanical ventilation was required in 6 patients due to reduced consciousness. Acute kidney injury (AKI) was observed in 5 patients, and 2 required renal replacement therapy in the ICU. All patients with AKI recovered kidney function during the hospital stay. Cardiac involvement was documented in 2 patients (troponin elevation and pericardial effusion). There was no record of gastro-intestinal involvement or associated pregnancy. All patients were treated with PEX combined with corticosteroid immunomodulation, and in most recent years rituximab and caplacizumab were introduced as concomitant first-line treatments (4 patients, 2 with refractory disease). One patient died after the transition to end-of-life care due to catastrophic neurologic involvement and multiple comorbidities. The other 6 patients survived hospital discharge. Neurologic sequelae were present in 2 patients.
**Conclusions:** aTTP is a life-threatening disease that has faced major diagnostic and therapeutic advances over the last decade. All identified patients with this rare entity had severe neurologic manifestations and multiorgan dysfunction, emphasizing that early recognition and ICU admission can provide essential monitoring and optimized multidisciplinary care.

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**Topic:** Haematologic-oncologic issues in the ICU

## 001451

## Our experience of patients with chimeric antigen receptor (CAR) T-cell therapy admitted in the Intensive Care Unit

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**Introduction:** Few data exist about the clinical features, management, complications, and outcomes of patients who require admission to the intensive care unit (ICU) for severe adverse events that frequently after Chimeric antigen receptor T-cell (CAR-T) therapy for refractory hematological malignancies.
**Objectives:** To analyze and describe the outcomes of patients receiving CART therapy and admitted to the intensive care unit.
**Methods:** This is a retrospective observational cohort study that included all consecutive adults admitted to the ICU within 3 months after CAR-T therapy from October 2019 to February 2024. Clinical syndromes were classified as cytokine-released syndrome (CRS), Immune effector cell-associated neurotoxicity syndrome (ICANS) or Haemophagocytic lymphohistiocytosis (HLH). Demographic, clinical, laboratory, management, complication, and outcome data were extracted from medical records. All patients were followed until death or hospital discharge.
**Results:** In the study period, 169 patients underwent CAR-T therapy and 41 (24.2%) required ICU admission with a median of 5 ($p$ 4–7.5) days after CAR-T infusion. Median APACHE II score was 21 ($p$ 14.5–24) 80% of the patients received Axicabtagene Ciloleucel therapy being refractory Large B-Cell Lymphoma the most frequent underlying malignancy. Forty patients were admitted due to CRS and 35 developed ICANS (80% with grade 3–4). One patient was admitted with ICANS symptoms without concomitant CRS. Haemophagocytic lymphohistiocytosis was diagnosed in 2 patients. Steroids were given to 90% of the patients including 11% who received high-dose pulse therapy. Tocilizumab was used in 33/40 (82.5%) patients, with a median of 2 [1–4] doses. Sixteen subjects (44.4% of patients with ICANS) received treatment with anakinra. Nine patients required invasive mechanical ventilation and 11 high nasal flow cannula. Sixteen patients required vasopressors and one patient was supported with continuous renal replacement therapy. Overall, 16 patients (39%) developed infections: 7 episodes of bacteremia, 5 pneumonias, 1 meningitis, and 3 invasive pulmonary aspergillosis. Six patients died during hospitalization: 5 in the period from the onset of the programme to December 2022 (5/23 = 21.7%) and 1 from 2023 to March 2024 (1/18 = 5.5%) $\chi$22.116 $p$ 0.145.
**Conclusions:** One out of every four patients receiving CAR-T therapy require ICU admission with a high incidence of ICANS. In our experience, hospital mortality is low and our data suggest an improvement in the mortality rate with the acquisition of experience in the management of these patients.

**Topic:** Haematologic-oncologic issues in the ICU

## 001452 Application of PICAT scale in patients undergoing allogeneic hematopoietic cell transplant entering the intensive care unit

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**Introduction:** Application of picat scale in patients undergoing allogeneic hematopoietic cell transplant entering the intensive care unit.
**Objectives:** The PICAT scale (Prognostic Index for Intensive Care after Allogeneic Transplantation) has been proposed as an alternative to classical scores for predicting in-hospital mortality in patients undergoing allogeneic bone marrow transplantation (TAMO). The aim of this study is to compare the mortality estimated by the PICAT scale with the in-ICU mortality of TAMO patients admitted to the Intensive Care Service (ICU) of a tertiary hospital.
**Methods:** Retrospective study that included all TAMO patients admitted to the ICU over a period of 13 years. The PICAT items are time from hospital admission to ICU admission, LDH ≥ 2 upper limit of normal (ULN), bilirubin ≥ 2 mg/dL, albumin < 3 g/dL, respiratory failure as the reason for ICU admission, INR ≥ 2, myeloablative conditioning, > 60 years, Hematopoietic Cell Transplantation-specific Comorbidity Index > 2. Patients were grouped into three subgroups according to the original study: PICAT < 2; 2–4; > 4 and studied mortalities were calculated.
**Results:** During the study period, 88 patients with TAMO were admitted to the ICU. The mean age was 48 ± 14 years (60% male). The most frequent cause of hospital admission was infection (37%; $n = 33$), and in the ICU, respiratory failure (52%; $n = 47$) followed by sepsis (18%; $n = 16$). The mean time to ICU admission was 30 ± 51 days, and the mean ICU stay was 13 ± 20 days. The overall in-ICU mortality was 44% ($n = 45$).
Of the 88 TAMO patients admitted to the ICU, 29 had a PICAT score of less than 2; 41 between 2–4 and 18 > 4. The in-ICU mortality of patients according to PICAT groups was: 37.9% ($n = 11$) in PICAT < 2; 51.27% ($n = 21$) in PICAT 2–4 and 41% ($n = 8$) in PICAT > 4. These groups, according to the PICAT scale, would have corresponded to a mortality of 34%, 69%, and 91%, respectively.
**Conclusions:** In this series, in-ICU mortality, especially in groups with higher scores on the PICAT scale (PICAT 2–4 and > 4) and therefore more severe, did not correlate with the mortality estimated by this scale. Therefore, we consider that the PICAT scale is not a good predictor of mortality and does not appear to be superior to other indices more commonly used in the ICU (APACHE-II, SOFA, or SAPS3).

**Topic:** Haematologic-oncologic issues in the ICU

### 001453

### Ventilatory modalities in cardiogenic shock: insights from the altshock-2 registry

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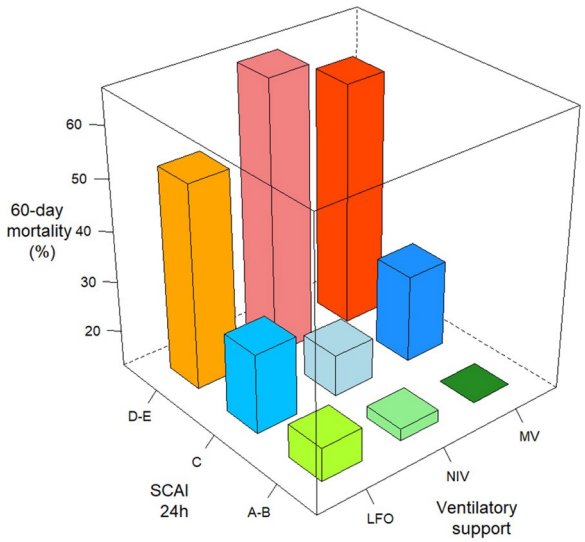
***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001453

**Introduction:** Cardiogenic shock (CS) remains a critical condition potentially leading to multiorgan failure
associated with significant morbidity and mortality. Respiratory failure is common in the CS population representing the most common organ failure and is significantly associated with worse outcomes. Data from recent registries showed that the rate of CS patients treated with positive pressure ventilation (PPV) is up to 70%. Despite the increased use of PPV, the optimal ventilation strategy remains unclear, and hemodynamic profiles and underlying aetiologies present unique challenges for clinical decision-making.
**Objectives:** To describe the use and the relation to the outcome of different ventilation strategies in a contemporary, large, prospective registry of CS patients.
**Methods:** All patients enrolled in the AltShock-2 registry were analysed. The Altshock-2 Registry is a multi-center prospective data collection (ClinicalTrials.gov Identifier: NCT04295252).
The assessment of the need for ventilatory support and the selection of ventilatory mode [non-invasive ventilation (NIV), including continuous positive airway pressure (CPAP) and bilevel positive airway pressure, or invasive mechanical ventilation, (iMV)] were at the discretion of the treating physician. We categorized the patients into three groups according to the highest intensity of ventilatory support throughout their hospitalization: oxygen therapy (OT), NIV, and iMV.
The primary endpoint was the cumulative probability of time to all-cause death. We examined differences in aetiology, clinical and laboratory characteristics, hemodynamic, echocardiographic findings and prognostic scores on admission and at 24-h.
We prospectively assigned SCAI stages to individual patients according to the updated classification.
**Results:** Among 657 patients enrolled from March 2020 to November 30th, 2023, 198 (30.1%) received oxygen therapy (OT), 96 (14.6%) underwent non-invasive ventilation (NIV), and 363 (55.3%) underwent invasive mechanical ventilation (iMV). Patients in the iMV group were significantly younger compared to those in the NIV and OT groups (63 vs. 69 years, $p < 0.001$). There were no significant differences between the groups regarding cardiovascular risk factors. Patients with SCAI B and C were more frequently treated with OT and NIV compared to iMV (65.1% and 65.4% vs. 42.6%, respectively, $p > 0.001$), while the opposite trend was observed in SCAI D patients (12% and 12.2% vs. 30.9%, respectively, $p < 0.001$). All-cause mortality at 24 h did not differ amongst the three groups, while the 60-day mortality was significantly higher in the iMV compared to the OT and NIV groups (40.2% vs. 26% and 29.3%, $p = 0.005$), even after the exclusion of patients with cardiac arrest at presentation. In the multivariate analysis including SCAI stages, NIV was not associated with worse mortality compared to IMV (HR 1.97, 95% CI [0.85–4.56]), even in more severe SCAI stages such as D.
**Conclusions:** Compared to previous studies, we observed a rising trend in the utilization of NIV among CS patients, irrespective of the aetiology and SCAI stages. In this clinical scenario, NIV emerges as a safe option for appropriately selected patients.




**(abstract 001453)** OT, oxygen therapy; NIV, non-invasive ventilation; iMV, invasive mechanical ventilation; SCAI, Society for Cardiovascular Angiography and Interventions

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**Topic:** Cardiovascular issues in ICU.

## 001454

## Factors associated with mortality in patients with connective tissue disease in an ICU of a tertiary hospital between 2018 and 2022, in Colombia

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**Introduction:** Rheumatologic diseases encompass a broad group of disorders, from organ-specific to systemic disorders, including systemic lupus erythematosus (SLE), rheumatoid arthritis (RA) and systemic sclerosis (SSc). In Colombia, the most prevalent connective tissue disease (CTD) is rheumatoid arthritis (1.49%), the least prevalent include SLE, Sjögren's syndrome and scleroderma (2). The course of these diseases is heterogeneous and sometimes the manifestations can be severe requiring admission to the intensive care unit (ICU). Different intrinsic and extrinsic factors of the disease make treatment a challenge (3) because ICU mortality has been reported to be between 29 and 54% (4). In Colombia, few studies provide information on patients with CTD and their behavior in the ICU (2,5); therefore, it is important to carry out studies of this nature to better characterize this patient population.
**Objectives:** To describe a cohort of patients with CTE who required admission to the ICU at a tertiary-level hospital and to identify possible variables associated with mortality.
**Methods:** Observational, descriptive study, with an analytical component in a cohort of patients with diagnoses of CTD admitted to ICU, in the period from 2018 to 2022. The Inclusion criteria were patients with admission to the ICU for any cause and with a new or previous diagnosis of CTD (SLE, RA, SSc and myopathies) and the exclusion criteria were under 18 years of age, pregnant women and medical records with incomplete data. The information was collected directly from the clinical records. Descriptive statistics were performed, describing means, modes, interquartile ranges, median, standard deviation and variance according to each type of variable, and frequency tables were used for categorical variables. After verification of normality assumptions for quantitative variables by means of the Shapiro–Wilk test, T student and Mann–Whitney tests were applied as applicable. For qualitative variables, the chi-square test was used to compare the groups for the mortality outcome.
**Results:** Of 63 patients diagnosed with CTD, mortality was 58.77%. On the other hand, 42 (66.67%) were male, and the comorbidities that showed significant differences in the mortality outcome were: systemic arterial hypertension (49.21%), chronic kidney disease (38.1%), systemic lupus erythematosus (SLE) (38.1%), antiphospholipid syndrome (APS) (19.05%), pulmonary hypertension (4.76%), The remaining general characteristics are shown in Table 1. Regarding severity criteria, when a comparison was made between living and dead patients to identify differences with respect to the Sequential Organ Failure Assessment (SOFA) score, a higher mean was found for living patients with a statistically significant difference. When comparing the groups of living and dead patients to establish the difference in the Acute Physiology and Chronic Health Disease Classification System II (APACHE II) mean, a higher score was found in the group of dead patients with a statistically significant difference. The SLEDAI 2 K score had a higher mean in the living patients without showing a statistically significant difference.
**Conclusions:** In 63 patients with CTD mortality was high. Variables associated with mortality were systemic arterial hypertension, chronic kidney disease, systemic lupus erythematosus, antiphospholipid syndrome and pulmonary hypertension. APACHE II and SOFA severity scores also showed statistically significant differences between the living and deceased groups. Prospective studies with greater statistical power and better methodological design are needed to establish which factors are related to mortality in the ICU.

**Table 1 (abstract 001454)** Baseline characteristics of CTE patients compared by mortality outcome.

| Baseline characteristics | Alive | Dead | P value |
|---|---|---|---|
| Age. n (ME) | 41 (46.58) | 22 (58.77) | 0,015* |
| Male gender. n (%) | 28 (66.67) | 14 (33.33) | 0.139 |
| Myocardial infarct n (%) | 6 (85.71) | 1 (14.29) | 1.477 |
| Hypertension n (%) | 20 (64.52) | 11 (35.38) | 0.008 |
| Congestive heart failure n (%) | 7 (53.85) | 6 (46.15) | 0.909 |
| Cerebrovascular disease n (%) | 2 (100.00) | 0 | 1.108 |
| Chronic pulmonary disease n (%) | 4 (44.44) | 5 (55.56) | 1.967 |
| Renal disease n (%) | 16 (66.67) | 8 (33.33) | 0,043 |
| Type 2 Diabetes mellitus n (%) | 6 (54.55) | 5 (45.45) | 0.650 |
| Sepsis n (%) | 13 (46.43) | 15 (53.57) | 7.714 |
| Septic shock n (%) | 7 (36.84) | 12 (63.16) | 9.544 |
| Auricular fibrillation n (%) | 3 (60.00) | 2 (40.00) | 0.061 |
| Active smoking n (%) | 8 (61.54) | 5 (38.46) | 0.090 |
| Systemic Lupus erythematosus n (%) | 16 (66.67) | 8 (33.33) | 0.043 |
| Rheumatoid arthritis n (%) | 18 (58.06) | 13 (41.94) | 1.321 |
| Systemic Sclerosis n (%) | 3 (60.00) | 2 (40.00) | 0.061 |
| Antiphospholipid syndrome n (%) | 8 (66.67) | 4 (33.33) | 0.016 |
| Pulmonary hypertension n (%) | 2 (66.67) | 1 (33.33) | 0.003 |
| Interstitial lung disease n (%) | 4 (66.67) | 2 (33.33) | 0.007 |
| Ischemic cardiomyopathy n (%) | 6 (75.00) | 2 (25.00) | 0.396 |
| CNS Infection n (%) | 2 (4.88) | 0 | 1.108 |
| Respiratory infection n (%) | 8 (50.00) | 8 (50.00) | 2.145 |
| Gastrointestinal Infection n (%) | 4 (80.00) | 1 (20.00) | 0.532 |
| Urinary infection n (%) | 9 (60.00) | 6 (40.00) | 0.223 |
| Skin and soft tissue infection n (%) | 3 (37.50) | 5 (62.50) | 3.067 |
| Pericarditis n (%) | 1 (100.00) | 0 | 0.545 |
| Pulmonary embolism n (%) | 2 (100.00) | 0 | 1.108 |
| Lupus nephritis n (%) | 8 (72.73) | 3 (27.27) | 0.343 |
| Acute kidney injury n (%) | 13 (44.83) | 16 (55.17) | 9.697 |
| Gastrointestinal Bleeding n (%) | 1 (50.00) | 1 (50.00) | 0.206 |
| Antibiotics use n (%) | 25 (60.98) | 19 (86.36) | 4.381 |
| SOFA ME* | 40 (1115.5) | 23 (900.5) | 0.013 |
| APACHE II | 40 (1089.5) | 23(926.5) | 0.006 |
| SLEDAI 2K | 10 (18.6) | 6 (25) | 0.244 |
| Dead n (%) | 40 (63.49) | 23 (36.51) | - |

Source: own elaboration, * Wilcoxon rank test, ** Student's t-test.

**Topic:** Systemic diseases

## 001456

### How well Phoenix score does?

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**Introduction:** The novel Phoenix sepsis criteria for sepsis and septic shock in children identify children with life-threatening organ dysfunction caused by a dysregulated host response to infection associated with increased risk of mortality and a subset of patients with cardiovascular dysfunction, which is associated with higher mortality. With this paradigm shift, the distances between Sepsis-3 definitions for adults and pediatric definitions are shortened.
**Objectives:** To compare the Phoenix score with the former sepsis criteria from 2005, based on systemic inflammatory response syndrome (SIRS) in terms of sepsis diagnosis and mortality prediction.
**Methods:** This is a descriptive retrospective study developed in a pediatric intensive care unit. We tested the performance of the Phoenix score on a historic database of septic patients younger than 18 years identified with the 2005 Goldstein criteria. Neonates and patients with incomplete data were excluded.
**Results:** Phoenix score could be calculated in 375 patients of the 470 that the database contained. 202 (53.9%) were male and the median age of the sample was 25.4 months (IQR: 7.6–84.1).

- 150 patients were registered as septic using 2005 criteria: these were mainly classified as non-septic using Phoenix score (121), 9 were classified as septic and 20 as septic shock. Mortality in this group was 0.6%.
- From the 29 severe sepsis detected with 2005 criteria, 13 were classified as non-septic patients, 10 as septic and 6 patients as having a septic shock.
- Most septic shock patients were also classified as patients with shock with a Phoenix score (170 of 195).

Phoenix score ≥ 2 was associated with a mortality of 4.5% and patients with septic shock (sepsis with ≥ 1 cardiovascular point), 13.3%. These results did not differ from the ones obtained when Goldstein criteria were used if we consider severe sepsis as sepsis and sepsis is considered as infection. We also did not find any differences in terms of the need for mechanical ventilation, renal replacement therapy, extracorporeal support for the length of stay in the hospital or in the pediatric intensive care unit.
**Conclusions:** 80% of the patients were classified into the same categories, using SIRS-based criteria or Phoenix score, taking into account the elimination of the term severe sepsis. Patients with incremented risk of mortality were correctly identified with both criteria.

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**Topic:** Sepsis.

## 001457 Sepsis code activation criteria and in-hospital mortality: a retrospective cohort study of 14,546 patients

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**Introduction:** Early recognition and timely management of sepsis are crucial for improving patient outcomes. The sepsis code is a protocol designed to facilitate rapid identification and treatment of patients with suspected sepsis. This study aimed to analyze the relationship between sepsis code activation criteria and in-hospital mortality in a large cohort of patients from a university hospital in Mallorca, Spain.
**Methods:** A retrospective cohort study was conducted on 14,546 patients with sepsis code activation at a university hospital in Mallorca, Spain. The activation criteria included dichotomous variables (Y/N) for temperature > 38 °C or < 36 °C, heart rate > 100 bpm, respiratory rate > 30 breaths/min, PaCO2 < 32 mmHg, leukocytosis > 12,000/μL, leukopenia < 4,000/μL, SBP < 90 mmHg or MAP < 65 mmHg, oxemia < 90%, oliguria, decreased consciousness, creatinine rise > 1.5 × or > 0.3 from baseline, INR > 2 or platelet decrease < 100,000/μL, hyperbilirubinemia > 3.0 mg/dL, C-reactive protein (CRP) > 2 × baseline, procalcitonin > 2 × baseline, and lactate > 2 mmol/L. A propensity score was calculated to elucidate the risk associated with each activation criterion. Hierarchical clustering analysis was performed to identify patient subgroups based on activation criteria and mortality risk.
**Results:** Factors directly associated with increased in-hospital mortality included age, hypothermia, tachypnea, leukopenia, shock indicators (hypotension, hypoxia, oliguria, decreased consciousness, and elevated lactate), coagulopathy (mainly INR prolongation), and elevated procalcitonin. Fever and elevated CRP were inversely associated with mortality. Hierarchical clustering analysis revealed two main patient clusters: a younger group (mean age 45 years) with fever and

no tachypnea, and an older group (mean age 75 years) without fever but with tachypnea. These clusters demonstrated distinct mortality risk profiles.
**Conclusions:** Specific sepsis code activation criteria, such as hypothermia, tachypnea, leukopenia, shock indicators, coagulopathy, and elevated procalcitonin, were associated with increased in-hospital mortality. Conversely, fever and elevated CRP were associated with lower mortality risk. Clustering analysis identified two distinct patient subgroups with different clinical characteristics and mortality risk profiles. These findings highlight the importance of considering individual sepsis code activation criteria and patient subgroups when assessing mortality risk in patients with suspected sepsis.

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3. None

**Topic:** Sepsis

## 001458

### Impact of a clinical pharmacist-led antimicrobial stewardship program in a semi-intensive care unit: a randomized controlled trial

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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001458

**Introduction:** Antimicrobial stewardship programs (ASPs) are crucial for optimizing antibiotic use and improving patient outcomes in critical care settings. This study aimed to evaluate the impact of a clinical pharmacist-led ASP on antibiotic optimization and clinical response in a semi-intensive care unit (semi-ICU) of a high-complexity hospital.
**Methods:** A non-blinded, randomized controlled trial was conducted in the semi-ICU of a high-complexity hospital. Patients were randomized to either the intervention group, where a clinical pharmacist performed daily evaluations of antibiotic indication and optimization according to clinical guidelines and available microbiology results, or the control group, which received standard care. Demographic, clinical, and pharmacological data were collected. Therapeutic drug monitoring (TDM) interventions and clinical response at day 7 were assessed. Clinical response was defined as a decrease in fever, absence of hypothermia, > 50% decrease in C-reactive protein (CRP) or procalcitonin (PCT), PCT < 0.5, leukocyte count < 11,000, attending physician's opinion of resolution or improvement of infection symptoms, and lack of need for antibiotic escalation.
**Results:** The study enrolled 43 patients, with 24 assigned to the control group and 19 to the intervention group. The median age of the participants was 58 years (IQR 42–69), with females accounting for 55% of the study population. The median BMI was 25.7 (IQR 22.8–30.6). The most common suspected infection foci were abdominal (13/47), followed by urinary (10/47), respiratory (8/47), and other foci (16/47). In the control group, the number of patients receiving optimizable therapy decreased from 13 on day 1 to 12 on day 4. In contrast, the intervention a reduction in optimizable therapy, from 12 patients on day 1 to only 1 patient on day 4. At day 7, unfavorable responses were observed in 7 out of the 12 unoptimized patients in the control group, while none of the patients in the intervention group experienced an unfavorable response.
**Conclusions:** The implementation of a clinical pharmacist-led ASP in a semi-ICU improved antibiotic optimization and clinical response. The ASP reduced the number of patients receiving optimizable therapy and increased the proportion of patients with favorable clinical outcomes. These findings highlight the importance of pharmacist-driven interventions in critical care settings to enhance antibiotic stewardship and patient care.

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2. Okada N, Fushitani S, Azuma M, et al. Clinical evaluation of pharmacist interventions in patients treated with anti-methicillin-resistant Staphylococcus aureus agents in a hematological ward. Biol Pharm Bull. 2016;39 (2):295–300.

**Topic:** Transfusion and haemostasis disorders

## 001460

### Absolute mechanical power vs mechanical power normalized by predicted body weight. ¿Which one predicts better the outcome of critically ill ventilated patients?

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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001460

**Introduction:** Mechanical power has been pointed out as the parameter that encloses all ventilation-induced lung injury-contributing factors. However, it is not clear its effects in critically ill ventilated patients and it is no clear either if it is necessary normalized its value by the predicted body weight or by the amount of aerated lungs.
**Objectives:** Analyze if the mechanical power normalized by the predicted body weight (noMP) is a better mortality predictor than the absolute mechanical power (AMP) in critically ill-ventilated patients.
**Methods:** Retrospective unicentric observational study in a 28-bed polyvalent ICU. All adult patients connected to invasive mechanical ventilation (IMV) > 24 h admitted to ICU from 2015 to 2022 were included. Patients ventilated at any time in pressure control mode were excluded. Demographic variables, comorbidities and severity scores were recorded at the admission time. Respiratory variables were registered continuously every two minutes during the IMV time. The median AMP was calculated as the median of all the MP values and the median norMP was calculated by dividing the AMP by the predicted body weight. Patients were divided into quartiles and a univariate and multivariate analysis were done for the AMP and norMP. The analysis were done with R software. $P$ values < 0.05 were significant.
**Results:** 2068 patients were included. The characteristics of the general population are in Table 1. The median AMP were 15 J/min (12–19) and median norMP were 0.24 (J/min/Kg) (0.19–0.29). In the univariate and multivariate mortality analysis both variables were significantly associated with an increase in mortality (Tables 2 and 3) with similar OR. Both mutivariate models have similar AUC (Figs. 1 and 2).

**Conclusions:** Higher values of AMP and norMP increase mortality rates with the same OR and AUC. Both measures of MP are useful to predict mortality.

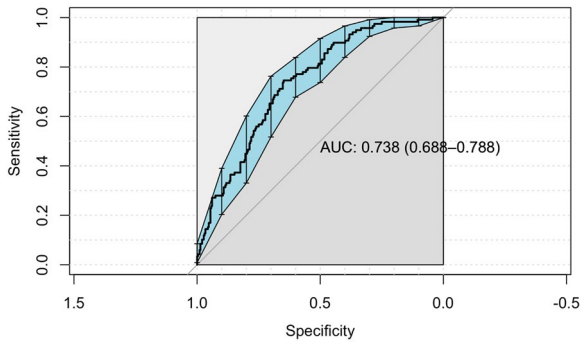
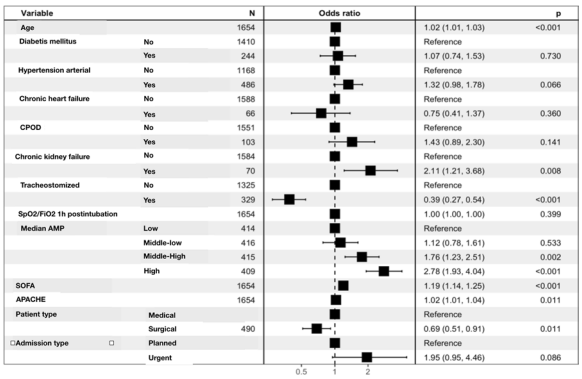



**Fig. 2 (abstract 001460)** AUC multivariate analysis norMP

**Table 1 (abstract 001460)** Characteristics of the general population.

| Variable | Total population (N=2068) | Died in the ICU (N=588) | Survived in the ICU (N=1480) | *P* values |
|---|---|---|---|---|
| General characteristics and severity of the illness | | | | |
| Male, N (%) | 1428 (69) | 416 (71) | 1012 (68) | 0.3 |
| Age (years), median (p25-75) | 63 (52-72) | 67 (58-74) | 61 (49-71) | **<0,001** |
| BMI median (p25-75) | 26 (24-29) | 27 (24-29) | 26 (24-29) | 0.2 |
| SOFA, median (p25-75) | 5 (4-7) | 6 (5-8) | 5 (3-6) | **<0,001** |
| APACHE II, median (p25-75) | 21 (16-26) | 24 (19-29) | 20 (14-25) | **<0,001** |
| Reason for admission, N (%) | Medical 1444 (70)<br>Surgical 624 (30) | Medical 458 (78)<br>Surgical 130 (22) | Medical 986 (67)<br>Surgical 494 (33) | **<0,001** |
| Type of admission, N (%) | Urgent 1976 (96)<br>Scheduled 92 (4) | Urgent 573 (97)<br>Scheduled 15 (3) | Urgent 1403 (95)<br>Scheduled 77 (5) | **0,01** |
| SpO2/FiO2 1h within intubation, median (p25-75) | 235 (164-284) | 207 (152-274) | 240 (167-286) | **<0,001** |
| Comorbidities | | | | |
| Hypertension, N (%) | 588 (28) | 213 (36) | 375 (25) | **<0,001** |
| Diabetes, N (%) | 292 (14) | 113 (19) | 179 (12) | **<0,001** |
| Chronic heart failure, N (%) | 87 (4) | 34 (6) | 53 (4) | **0,03** |
| Chronic lung disease, N (%) | 123 (6) | 57 (10) | 66 (4) | **<0,001** |
| Asthma, N (%) | 30 (1) | 6 (1) | 24 (2) | 0.4 |
| Chronic kidney disease, N (%) | 96 (5) | 58 (10) | 38 (3) | **<0,001** |
| Complications and outcomes | | | | |
| ICU LOS (days), median (p25-75) | 11 (6-22)* | 7 (3-16) | 11 (6-22) | **<0,001** |
| ICU mortality, N (%) | 588 (28) | | | |
| IMV days, median (p25-75) | 6 (3-14)* | 6 (3-14) | 6 (3-14) | 0.9 |
| Tracheostomized, N (%) | 406 (20) | 66 (11) | 340 (23) | **<0,001** |
| Reintubation, N (%) | 170 (8) | 44 (7) | 126 (8) | 0.5 |
| Ventilatory variables | | | | |
| MP (J/min), median (p25-75) | 15 (12-19) | 17 (14-21) | 15 (12-18) | **<0,001** |
| norMP (J/min/Kg), median (p25-p75) | 0.24 (0.19-0.29) | 0.27 (0.22-0.32) | 0.23 (0.19-0.27) | **<0,001** |

**Table 2 (abstract 001460)** Multivariate analysis AMP.



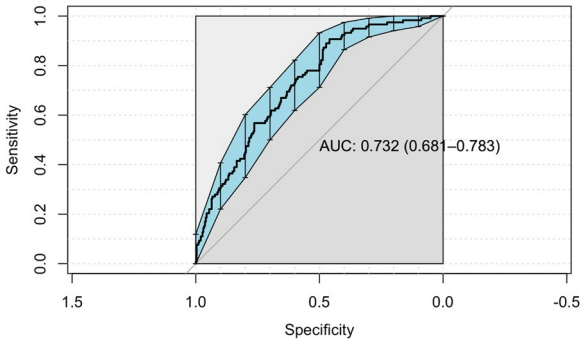
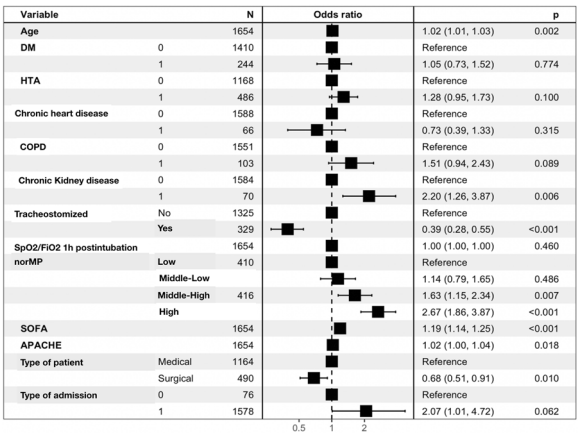




**Fig. 1 (abstract 001460)** AUC multivariate analysis AMP

**Table 3 (abstract 001460)** Multivariate analysis norMP.




**Reference(s)**

1. Gattinoni L, Tonetti T, Cressoni M, et al. Ventilator-related causes of lung injury: the mechanical power. Intensive Care Med. 2016;42 (10):1567–1575. https://doi.org/10.1007/s00134-016-4505-2. Epub 2016 Sep 12. PMID: 27620287.
2. Zhang Z, Zheng B, Liu N, Ge H, Hong Y. Mechanical power normalized to predicted body weight as a predictor of mortality in patients with

acute respiratory distress syndrome. Intensive Care Med. 2019 Jun;45 (6):856–864. https://doi.org/10.1007/s00134-019-05627-9. Epub 2019 May 6. PMID: 31062050
3. This study has been funded by "Instituto de Salud Carlos III (ISCIII)" through the project "FIS PI20/01674" and co-founded by the Europan Union

**Topic:** Acute respiratory failure and mechanical ventilation

## 001461

### Correlation of peripheral perfusion parameters and sublingual microcirculation in healthy volunteers and septic shock patients

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001461

**Introduction:** In shock, microcirculation has been proposed as a new endpoint of resuscitation (1). Despite the availability of videomicroscopy, several barriers have limited its use in clinical practice (2). Skin perfusion monitoring is increasingly used as an alternative since it can be easily performed and is widely available. Yet, the relationship between sublingual microcirculation and skin perfusion in shock is complex.
**Objectives:** To characterize the correlation of peripheral perfusion and sublingual microcirculation parameters in septic shock patients and in healthy volunteers.
**Methods:** Population: 34 healthy volunteers and 16 septic shock patients were included.
**Design**: Cross-sectional study
**Procedure:** Healthy volunteers were studied after 20 min of semirecumbent position. Septic shock patients were assessed within the first 24 h of ICU stay.
**Microcirculatory measurements:** Sublingual microcirculatory network was evaluated by means of an incident dark field illumination (IDF) imaging device. Each subject underwent 3 sublingual microcirculatory recordings. We performed a software-assisted analysis (AVA 3.2, Microvision Medical) to determine total vessel density (TVD), proportion of perfused vessels (PPV), perfused vascular density (PVD), microvascular flow index (MFI) and red blood cell velocities (RBCv). Quantitative RBCv was determined using space-time diagrams in 10 capillaries per video. Heterogeneity was shown by the Coefficient of Variation of RBCV (SD/mean).
**Skin perfusion:** Capillary refill time (CRT) was timed with a chronometer after releasing a 10-s pressure on the phalanx. Perfusion index (PI) was automatically derived from a pulse oximeter.
**Statistical analysis:** Appropriate tests were used to detect differences between healthy volunteers and septic patients. We used the Pearson correlation coefficient to assess the relationship between peripheral perfusion and microcirculation. A $P$ value $< 0.05$ was considered statistically significant.
**Results:** Healthy volunteers were 35 years old and 60% were male. Table 1 shows the clinical and epidemiologic characteristics of patients with septic shock.
*Microcirculatory variable:* Patients with septic shock showed decreased PVD, PPV, MFI, and RBC velocities along with increased heterogeneity when compared with normal volunteers (Fig. 1).
*Peripheral perfusion and microcirculatory variables:* In healthy volunteers, we did not find a correlation between CRT and RBCV ($R2 = 0.065$, $p = 0.17$), MFI ($R2 = 0$) or PVD ($R2 = 0.071$, $p = 0.11$). Conversely, in septic patients, we did find significant correlation between CRT and RBCV ($R2 = 0.44$, $p = 0.006$), MFI ($R2 = 0.36$, $p = 0.017$), but no correlation between either CRT and PVD ($R2 = 0.11$, $p = 0.2$) or CRT and PPV ($R2 = 0.20$, $p = 0.09$) (Fig. 2). Perfusion Index and CRT showed a correlation both in healthy and septic subjects ($R2 = 0.24$, $p = 0.011$, $R2 = 0.36$, $p = 0.039$, respectively.
**Conclusions:** The main finding of this study is that CRT correlated with microcirculatory parameters representative of flow but no correlation was found with parameters reflecting perfusion such as PVD and PPV.

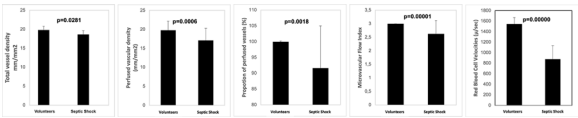

**Fig. 1 (abstract 001461)** Microcirculatory variables in healthy volunteers and septic shock patients

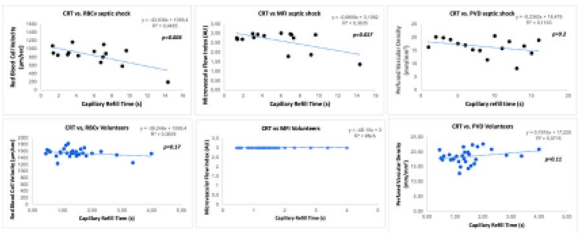

**Fig. 2 (abstract 001461)** Correlation between peripheral perfusion and microcirculatory variables

**Reference(s)**

1. 2. Dubin A, Kanoore Edul VS, Caminos Eguillor JF, Ferrara G. Monitoring Microcirculation: Utility and Barriers—A Point-of-View Review. Vasc Health Risk Manag. 2020;16:577–589.
2. 1. Duranteau J, De Backer D, Donadello K, et al. The future of intensive care: the study of microcirculation will help to guide our therapies. Crit Care. 2023;27 (1):190.

**Topic:** Cardiovascular issues in ICU

## 001462

### Acute Respiratory Distress Syndrome in severely burned patients

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001462

**Introduction:** Acute respiratory distress syndrome (ARDS) is a common pathology in intensive care unit associated with a high mortality rate (40–60%) [1,2].
**Objectives:** to study characteristics of ARDS and to determine prognosis factors in burns.
**Methods:** Retrospective descriptive study was conducted in an intensive burn care department in Tunisia over 4 years (January 2018 to December 2021) including patients who developed ARDS during their ICU admission. ARDS was defined referring to the Berlin 2012 criteria.
**Results:** during the study period, 1150 patients were admitted, 360 were intubated (31%) of whom 100 developed ARDS (28%). The average age was $40 \pm 13$ years with a sex ratio of 1.8
The mean APACHE and IGSII were, respectively ($18 \pm 8{,}4$) and ($34 \pm 15{,}3$). Total body surface area burned (TBSA) was $46\% \pm 18$. The delay of occurrence of ARDS was $6 \pm 4$ days after burns. ARDS was severe in 60% of cases ($n = 60$) and moderate in 40% of cases ($n = 40$).

Causes of ARDS were: infection in 56 patients, inhalation injury in 22 patients and mixed in 22 patients. During ICU stay, patients developed complications: nosocomial infections in 71% of cases and acute kidney failure in 36% of cases. The mean duration of mechanical ventilation was 12.6 ± 5,3 days and the mean of ICU stay was 13,7 ± 5 days. Mortality was 39%. In multivariate analysis, independent mortality risk factors for ARDS were TBSA greater than 39% ($p = 0,02$), IGSII scores higher than 27 ($p < 10–3$), APACHE II higher than 14,5 ($p = 0,01$), inhalation injury ($p < 10–3$) and occurrence of shock ($p = 0,04$).
**Conclusions:** In burn patients, ARDS had a frequency of 28% and a mortality of 39%. Risk factors for mortality were: TBSA > 39%; IGSII score > 27; APACHE II > 14.5, inhalation injury and occurrence of shock.

**Reference(s)**

1. 2- Lam NN, Hung TD, Hung DK. Acute respiratory distress syndrome among severe burn patients in a developing country: application result of the berlin definition. Ann Burns Fire Disasters 2018;31:9–12.
2. 1-Silva L et al. Acute respiratory distress syndrome in burn patients: incidence and risk factor analysis. Ann Burns Fire Disasters 2016.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001463

### Impact of mechanical power in critically ill ventilated patients depending on the degree of hypoxemia

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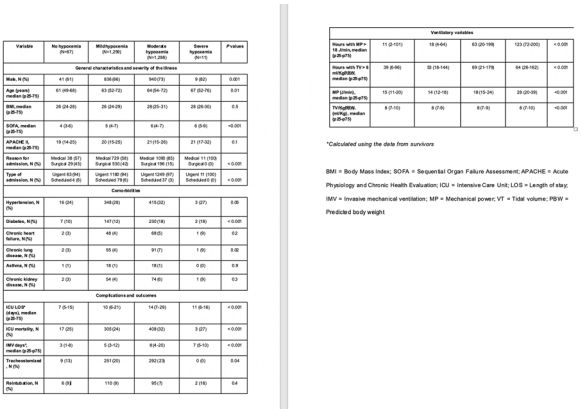
***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001463

**Introduction:** Mechanical power has been pointed out as the parameter that encloses all ventilation-induced lung injury-contributing factors. However, studies conducted to date provide data regarding mechanical power during the early hours of mechanical ventilation that may not correspond to the real scenario.
**Objectives:** Analyzed whether the hours of invasive mechanical ventilation (IMV) with a mechanical power (MP) > 18 J/min influences the outcome of critically ill patients depending on their degree of hypoxemia.
**Methods:** Retrospective observational study conducted at a single center in Spain. Patients admitted to the intensive care unit, > o = 18 years of age, and ventilated for over 24 h were included.
We extracted the MP values throughout the entire IMV period from the clinical information system every two minutes. The sum of time values above 18J/min was calculated to obtain the value in hours. We analyzed if the number of hours the patient was under ventilation with an MP > 18J/min was associated with mortality, invasive mechanical ventilation days, and intensive care unit length of stay in the different subgroups of hypoxemia.
**Results:** During the study period, 10,874 patients were admitted to the ICU, from which 2,623 were ventilated for more than 24 h.
There were 67 (2.5%) patients in the non-hypoxemic group (SpO2/FiO2 > 355), 1259 (48%) had mild hypoxemia (SpO2/FiO2 = 355–215), 1286 (49%) moderate hypoxemia (SpO2/FiO2 = 214–90), and 11 (0.4%) severe hypoxemia (SpO2/FiO2 < 90). The comparison of the general characteristics of the different groups is shown in Table 1.
The univariate analysis showed a significant association between more hours with MP > 18 J/min and higher mortality in the non-hypoxemic, mild hypoxemic, and moderate hypoxemic groups, but no association was seen in patients with SpO2/FiO2 < 90. In the multivariate analysis, these differences only remain in mild and moderate hypoxemic groups (Tables 2 and 3). The OR in both subgroups was 1.002, which means that the probability of death increases by 0.2% for each hour with MP > 18 J/min. The contribution of MP hours > 18 J/min to IMV days was higher in severe hipoxemia (R2 = 0.83), followed by moderate hypoxemic (R2 = 0.62) and non-hypoxemic subgroups (R2 = 0.62) and, finally, folowed by mild hypoxemic patients (R2 = 0.58). The contribution of MP hours > 18 J/min on ICU LOS was approximately 50% in all subgroups (non-hypoxemic: R2 = 0.58, mild hypoxemic: R2 = 0.47, moderate hypoxemic: R2 = 0.55, severe hypoxemic: R2 = 0.51).
**Conclusions:** Continuous monitoring of MP by automated CIS analysis shows that the number of hours with MP above 18 J/min increases mortality in critically ill ventilated patients with mild to moderate hypoxemia.

**Table 1 (abstract 001463)** Demographic characteristics in the different hypoxemic subgroups.



| Variable | No hypoxemia (N=67) | Mild hypoxemia (N=1,259) | Moderate hypoxemia (N=1,286) | Severe hypoxemia (N=11) | P-value |
|---|---|---|---|---|---|
| **General characteristics and severity of the illness** | | | | | |
| Male, N (%) | 41 (61) | 836 (66) | 940 (73) | 9 (82) | 0.001 |
| Age (years), median (p25-75) | 61 (49-68) | 63 (52-72) | 64 (54-72) | 67 (52-75) | 0.01 |
| BMI, median (p25-75) | 26 (24-28) | 26 (24-29) | 28 (25-31) | 29 (26-30) | 0.5 |
| SOFA, median (p25-75) | 4 (3-6) | 5 (4-7) | 6 (4-7) | 6 (5-9) | <0.001 |
| APACHE II, median (p25-75) | 19 (14-23) | 20 (15-25) | 21 (15-26) | 21 (17-32) | 0.1 |
| Reason for admission, N (%) | Medical 38 (57) Surgical 29 (43) | Medical 729 (58) Surgical 530 (42) | Medical 1098 (85) Surgical 196 (15) | Medical 11 (100) Surgical 0 (0) | <0.005 |
| Type of admission, N (%) | Urgent 63 (94) Scheduled 4 (6) | Urgent 1190 (94) Scheduled 79 (6) | Urgent 1249 (97) Scheduled 37 (3) | Urgent 11 (100) Scheduled 0 (0) | <0.005 |
| **Comorbidities** | | | | | |
| Hypertension, N (%) | 16 (24) | 349 (28) | 419 (33) | 3 (27) | 0.05 |
| Diabetes, N(%) | 7 (10) | 147 (12) | 230 (18) | 2 (18) | <0.005 |
| Chronic heart failure, N(%) | 2 (3) | 48 (4) | 68 (5) | 1 (9) | 0.2 |
| Chronic lung disease, N (%) | 2 (3) | 55 (4) | 91 (7) | 1 (9) | 0.02 |
| Asthma, N (%) | 1 (1) | 18 (1) | 18 (1) | 0 (0) | 0.9 |
| Chronic kidney disease, N (%) | 2 (3) | 54 (4) | 74 (6) | 1 (9) | 0.3 |
| **Complications and outcomes** | | | | | |
| ICU LOS* (days), median (p25-75) | 7 (5-15) | 10 (6-21) | 14 (7-26) | 11 (6-16) | <0.005 |
| ICU mortality, N (%) | 17 (25) | 305 (24) | 408 (32) | 3 (27) | <0.005 |
| IMV days*, median (p25-p75) | 3 (1-6) | 5 (3-12) | 8 (4-20) | 7 (5-10) | <0.005 |
| Tracheostomized, N (%) | 9 (13) | 291 (23) | 292 (23) | 0 (0) | 0.04 |
| Reintubation, N (%) | 0 (0) | 110 (9) | 95 (7) | 2 (18) | 0.4 |

| Ventilatory variables | | | | | |
|---|---|---|---|---|---|
| Hours with MP > 18 J/min, median (p25-p75) | 11 (2-101) | 18 (4-64) | 63 (20-199) | 123 (72-200) | <0.005 |
| Hours with TV > 8 ml/kgIBW, median (p25-p75) | 39 (6-66) | 55 (18-144) | 69 (21-178) | 64 (26-162) | <0.005 |
| MP (J/min), median (p25-p75) | 15 (11-20) | 14 (12-18) | 18 (13-24) | 20 (20-30) | <0.005 |
| TV/kgIBW, (ml/kg), median (p25-p75) | 8 (7-10) | 8 (7-9) | 8 (7-9) | 8 (7-10) | <0.005 |

*Calculated using the data from survivors

BMI = Body Mass Index; SOFA = Sequential Organ Failure Assessment; APACHE = Acute Physiology and Chronic Health Evaluation; ICU = Intensive Care Unit; LOS = Length of stay; IMV = Invasive mechanical ventilation; MP = Mechanical power; VT = Tidal volume; PBW = Predicted body weight

**Table 2 (abstract 001463)** Multivariate moratlity analysis mild hypoxemic patients.

| Variables | OR | CI | *P* values |
|---|---|---|---|
| **General characteristics** | | | |
| Age | 1.01 | 1.002-1.02 | 0.02 |
| SOFA at admission | 1.19 | 1.13-1.27 | <0.001 |
| APACHE II | 1.05 | 1.03-1.07 | <0.001 |
| Reason for admission: surgical | 0.72 | 0.53-0.98 | 0.03 |
| Type of admission: urgent | 1.73 | 0.84-3.98 | 0.16 |
| HT | 1.58 | 1.14-2.18 | 0.005 |
| CKD | 1.99 | 1.08-3.64 | 0.03 |
| **Respiratory variables** | | | |
| Hours with MP > 18 J/min | 1.002 | 1.001-1.003 | 0.004 |
| Hours with Vt >8ml/Kg PBW | 0.99 | 0.99-1 | 0.06 |

SOFA = Sequential Organ Failure Assessment; APACHE = Acute Physiology and Chronic Health Evaluation; HTA = Hypertension; DM = Diabetes mellitus; CKD = Chronic Kidney Disease; MP= Mechanical power

**Table 3 (abstract 001463)** Multivariate mortality analysis in moderate hypoxemic patients.

| Variables | OR | CI | *P* values |
|---|---|---|---|
| **General characteristics** | | | |
| Age | 1.02 | 1.01-1.03 | <0.001 |
| SOFA at admission | 1.19 | 1.13-1.25 | <0.001 |
| APACHE II | 1.01 | 0.99-1.03 | 0.15 |
| Reason for admission: surgical | 0.74 | 0.51-1.07 | 0.12 |
| Type of admission: urgent | 0.76 | 0.37-1.64 | 0.47 |
| HT | 1.19 | 0.87-1.63 | 0.26 |
| CKD | 2.08 | 1.21-3.59 | 0.008 |
| DM | 1.31 | 0.91-1.87 | 0.14 |
| CPOD | 1.83 | 1.13-2.96 | 0.01 |
| **Respiratory variables** | | | |
| Hours with MP > 18 J/min | 1.002 | 1.001-1.002 | <0.001 |
| Hours with Vt >8ml/Kg PBW | 0.99 | 0.99-0.99 | <0.001 |

SOFA = Sequential Organ Failure Assessment; APACHE = Acute Physiology and Chronic Health Evaluation; HTA = Hypertension; DM = Diabetes mellitus; CKD = Chronic Kidney Disease; MP = Mechanical power

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3. This study has been funded by "Instituto de Salud Carlos III (ISCIII)" through the project "FIS PI20/01674" and co-founded by the Europan Union.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001464

### Randomized and controlled clinical trial on the effects of neuromuscular electrostimulation on exercise capacity and muscle strength in critically ill patients on invasive mechanical ventilation

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001464

**Introduction:** Neuromuscular electrostimulation (NMES) is often used to prevent muscle weakness in critically ill patients admitted to the intensive care unit (ICU) with low or no level of collaboration. However, its effects are still to be elucidated.
**Objectives:** This study compared, in critically ill patients on invasive mechanical ventilation (IMV) due to respiratory pathology, the effects of NMES on exercise capacity and muscle strength at ICU and hospital discharge. In addition, time on IMV, and ICU and hospital stay were evaluated.
**Methods:** This randomized, controlled, double-blinded clinical trial was conducted at the Respiratory Intensive Care Unit of Hospital Clínic in Barcelona. Patients ($\geq$ 18 years) connected to IMV for < 72 h and expected to spend $\geq$ 24 h in IMV due to acute or chronic acute respiratory pathology were included. Both the intervention group (IG) and control group (CG) received musculoeskeletal physiotherapy but the IG additionally received NMES for 30 min/day and 5 days/week through a COMPEX 3 (Cefarcompex, Compex Médical SA, Switzerland). Exercise capacity and muscle strength were assessed by the sit-to-stand test (STS) and the medical research council (MRC) scale, respectively, at baseline (i.e.: the first day in which the patient was able to perform the test), and ICU and hospital discharge. We also evaluated time on IMV.
**Results:** A total of 8 patients in the IG (median age 64 [54–73] y.o.) and 12 patients in the CG (66 [60–74] y.o.) were included. Functional capacity through STS did not differ between CG and IG neither at ICU discharge (1.6 (2.4) vs 2.4 (4.4) repetitions; $p = 0.648$) nor at hospital discharge (3.5 (4) vs 4.6 (4.7) repetitions; $p = 0.659$). Similarly, no differences were found in MRC between groups. However, in comparison to the CG, the IG presented a shorter ICU stay (10 [8–14] vs 11 [7–23] days; $p = 0.028$) and time on IMV (6 [3–12] vs 7 [5–15] days; $p = 0.019$). Hospital stay did not differ between groups.
**Conclusions:** NMES did not provide benefits on functional capacity and muscle strength in critically ill patients invasively ventilated due to respiratory pathology. However, NMES may reduce time on IMV and ICU stay in this population of patients.

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4. Research grant on nurse and/or respiratory physiotherapy. Catalan Society of Pneumology (SOCAP)

**Topic:** Nursing care and physiotherapy

## 001465

### Chrono-immunology: challenges in understanding circadian rhythm disruption in ICU

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001465

**Introduction:** The circadian clock is a sophisticated mechanism that functions to synchronize endogenous systems with the 24-h day in a wide variety of organisms. The immune system demonstrates robust circadian rhythmicity with daily variations in immune parameters, including lymphocyte proliferation, antigen presentation, and cytokine gene expression. These rhythms seem to be sensitive to perturbations in circadian homeostasis, with differential effects depending on the cell type, model system, and outcome measure.
**Objectives:** Evaluation of the degree of circadian disruption of the immune system in ICU patients and the impact on their mortality.
**Methods:** A pilot study was carried out between October 2023 and March 2024 (ICU of SCM "Sf. Treime") on a group of 50 patients. The analysis package (leukocytes, neutrophils, lymphocytes, monocytes) was evaluated in the two acrophases of the circadian rhythm day and night, analyzes were collected in the first 24 h after admission to the IT. Mean age 56.68 ± 3.45 years, $P = 0.204$. The patients were divided into two groups: group I with APACHE II score of 10–20 points Sofa 8–12 points and group II with APACHE II Score 21-28p SOFA13-18p. The clinical and laboratory data, the time spent in the ICU, the mortality rate were evaluated.
**Results:** In the patients from group I ($n = 28$) in the general analysis of the blood collected in the two acrophases, a reduced circadian rhythmicity of lymphocytes and monocytes was observed, their quantity increased by 9–14% in the evening acrophase compared to the morning acrophase. A rhythmic activity was also observed in the case of leukocytes with their increased amount in the morning acrophase by 11–13% compared to the night. In group II patients who had an APACHEII Score of 21–28 ($n = 22$), this rhythmicity was insignificant with a difference of 0.5–2% in the case of lymphocytes and 1.2–1.9% in the case of leukocytes. The lethality in group I was 7.1% ($n = 2$), in group II the lethality was 22.7% ($n = 5$).
**Conclusions:** As a result, it was observed that patients admitted to the IT in serious condition have a disrupted circadian system with an impact on their mortality. Despite active investigation of the crosstalk between the clock and the immune systems, we still understand very little about the mechanism by which clock disruption hyper-activates immunity and what effect chronic inflammation might have on the circadian machinery. The importance of chrono-immunological research goes beyond chrono-pharmacological applications, where medication can be optimized by timed drug administration. A better understanding of this area may allow preventive and improved therapeutic approaches for immunological diseases and inflammation-linked disease states including metabolic syndrome.

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**Topic:** Infections and prevention

## 001467

### Impact of hemadsorption technique connected to extracorporeal circulation during cardiac surgery on antibiotic concentrations: a randomised controlled clinical trial

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001467

**Introduction:** At present, the use of adsorption membranes during cardiopulmonary bypass (CPB) could reduce cardiac surgery-associated acute kidney injury (CSA-AKI) in patients with an expected extracorporeal circulation time of more than 90 min. Furthermore, the risk of postoperative infection is high, so effective antimicrobial prophylaxis is crucial. Currently, cefuroxime is a second-generation cephalosporin administrated as antimicrobial therapy in these patients.
**Objectives:** To assess the impact of adsorption membranes connected to the cardiopulmonary bypass (CPB) circuit on plasma concentrations of cefuroxime, in the context of a randomised controlled trial (SIRAKI-02).
**Methods:** We performed a retrospective analysis of a randomised and completed clinical trial comparing the CPB connected to the oXiris membrane vs. standard CPB therapy during non-emergent cardiac surgery. For this study we selected eighteen patients that had not received any kind of ultrafiltration during cardiac surgery. The intervention group ($n = 9$) received Prismaflex eXeed II™ system with a high-adsorbent oXiris® membrane (Baxter International Inc.). Control group ($n = 9$) was subjected to the conventional procedure, which did not involve any adsorption membrane. In the intervention group, blood flow was maintained at 200–300 mL/min while the mean CPB pump flow was 4.3 L in both groups. Mean CPB time was 127 min in the intervention group and 132 min in the control group.
All patients were treated with cefuroxime in prophylaxis doses according to institutional standards. Blood samples were collected after unclamping the CPB circuit and cefuroxime concentrations in plasma were measured using ultra-high-performance liquid chromatography coupled to tandem mass spectrometry (UHPLC-MS/MS) technique.
Cut-off values of 8 mg/L from EUCAST were used as the target minimum inhibitory concentration (MIC) of cefuroxime for the most common microorganisms causing community-acquired sepsis in our

hospital: *E. coli* and *S. aureus*. Therefore, the target clinical cefuroxime concentration was four times the MIC: 32 mg/L.
Comparison between groups was assessed using the Mann–Whitney *U* test in the statistical package SPSS v25 (IBM Corp. Endicott, NY, USA).
**Results:** In both groups, cefuroxime concentrations remained above 90% of the dosing interval. Cefuroxime medians (interquartile ranges) were 42.5 (34.9–54.9) mg/L and 44.6 (32.3–57.3) mg/L for the oXiris and control groups, respectively. No statistical differences were observed between them ($p = 0.5364$).
**Conclusions:** According to the results obtained, the use of oXiris® membrane does not alter the cefuroxime concentrations in comparison with the conventional procedure. Thus, this technique could not have potential drawbacks in the context of cefuroxime administration.

**Reference(s)**
1. No.

**Topic:** Acute Kidney Injury and haemofiltration

## 001469

### Brain not processing: how do we rationalise the use of NT-proBNP in critical care?

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001469

**Introduction:** BNP (B-type natriuretic peptide) and its inactive fragment NT-proBNP (N-terminal pro-B-type natriuretic peptide) are mainly secreted from the myocardium under stress. These natriuretic peptides are best in investigating isolated heart failure situations. However, they are also elevated in several other conditions; sepsis is among the most common. The cardiac involvement in sepsis is part of multiorgan dysfunction that sometimes confounds the picture of septic shock. The request for NT-proBNP attempts to detect the component of cardiogenic shock in sepsis. However, in sepsis, multiple other factors apart from cardiac involvement could independently raise the levels of natriuretic peptides, diluting its justification.1
In recent years, we have noted the increasing use of NT-proBNP in our 32-bed general ICU and 23-bed neurocritical care unit (NCCU). To rationalise this, we conducted a service evaluation of the total number of tests performed and a simultaneous literature review to understand the role of these natriuretic peptides in current practice in the non-cardiac critical care population.
**Objectives:** To determine the number of NT-proBNP tests ordered and, consequently, the cost incurred.
Undertook a literature search to establish an evidence base for using NT-proBNP in critically ill patients.
**Methods:** We conducted a service evaluation (approved by the institution) to determine the number of tests ordered from 2014 to 2023 in our 32-bed general ICU and 23-bed NCCU by ordering a data extraction from Epic electronic health record.
We assessed the cost of individual tests from the laboratory and calculated the total cost incurred.
We conducted a PubMed search using the keywords BNP or NT-ProBNP in sepsis. All three authors studied and discussed the relevant articles before reaching any conclusion.
**Results:** We noticed that NT-proBNP test requests increased yearly from 2014 to 2023. Both ICUs do not deal with a primary carer for cardiac patients.
Despite significant variation in the demographics of both ICU patients, both ICUs requested many tests, and no differentiation was noted in ordering behaviour. In some years, the requests were more from NCCUs than general ICUs (Fig. 1).
The high number of tests performed have the lowest values, but we also noticed that the tests resulted in very high values of BNP, as shown in Fig. 2.
The cost analysis shows that each test cost approximately £20, and the total cost incurred is over £100,000 in those years.
The current ESC guidelines2 recommend NT-proBNP for diagnosing and managing chronic heart failure patients. Some studies have supported using these tests to support clinical diagnosis and rule out heart failure in emergency and acute care settings. 3 However, sepsis can have independent raised levels of these peptides secondary to raised cytokines levels. 4 Other common factors associated with sepsis, like atrial fibrillation without structural heart damage, respiratory failure, renal failure, and fluid shifts, can also increase the levels.5–8 Certain conditions like obesity, flash pulmonary oedema, and pericardial tamponade may reduce the levels of natriuretic peptides. General intensive care commonly has these scenarios in their patient population. The test loses its specificity, although it maintains high sensitivity. In addition, these tests are not recommended by any intensive care society guidelines.
With this knowledge, we presented the data in a local governance meeting in March 2024, and a collective decision was made to restrict these test requests only after consultant approval to rationalise the number of tests and curb the unnecessary cost attached to them.
**Conclusions:** Excessive/irrational use of NT-proBNP in critical care settings is associated with significant hidden cost.
We will re-evaluate the use of the test in 12 months to see the effect of this project.
If we continue to see excessive/irrational use, may need an ongoing education programme for clinicians.

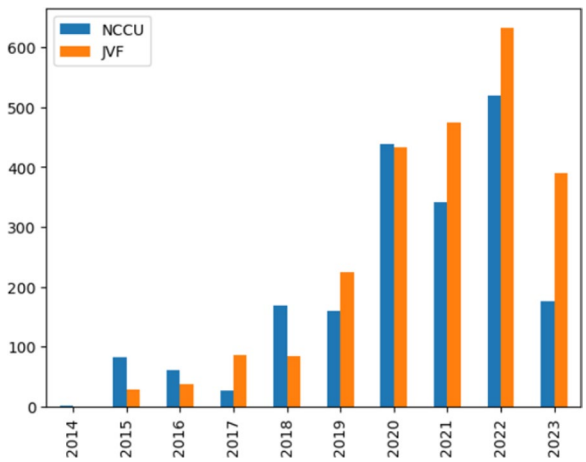


**Fig. 1 (abstract 001469)** Number of tests performed (on the Y-axis) every year (on the X-axis). JVF -John Farman ICU, NCCU—Neurocritical care unit

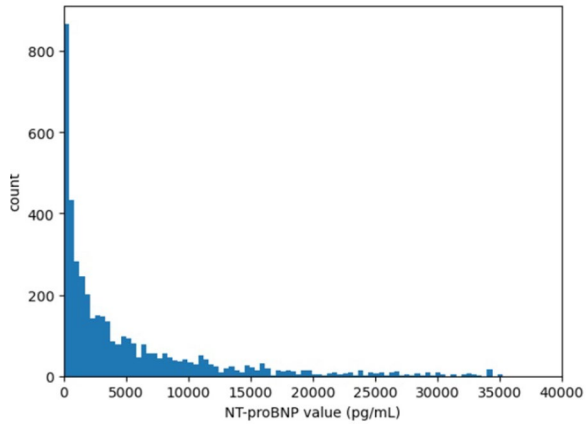


**Fig. 2 (abstract 001469)** NT-proBNP (N-terminal pro-B-type natriuretic peptide) value (X-axis) and the total number of patients (Y-axis)

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**Topic:** Cardiovascular issues in ICU

## 001470

## Extracorporeal circulation-induced microcirculatory perfusion disturbances and edema are unaffected by pharmacological modulation of endothelial permeability using Tie2 activator razuprotafib


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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001470


**Introduction:** Extracorporeal membrane oxygenation (ECMO) can be a life-saving intervention, but is still associated with high complication rates. ECMO induces systemic inflammation [1], which may activate and damage the endothelium, thereby causing edema and organ dysfunction. Previously, we showed that cardiopulmonary bypass (CPB) impairs microcirculatory perfusion [2], which was paralleled by vascular leakage and a disturbed angiopoietin/Tie2 system [3]. The angiopoietin/Tie2 system is involved in the regulation of endothelial permeability. Pharmacologically activating the endothelial Tie2 receptor with vasculotide reduced CPB-induced vascular leakage and microcirculatory perfusion disturbances [3].

**Objectives:** This study investigated whether reducing endothelial permeability by activating Tie2 using razuprotafib reduces extracorporeal circulation (ECC)-induced microvascular dysfunction.

**Methods:** Rats were subjected to 75 min of venoarterial ECC after treatment with razuprotafib ($n=11$) or placebo ($n=11$), or underwent a control procedure ($n=8$). Microcirculatory perfusion was assessed with intravital microscopy. Renal and pulmonary vascular leakage and edema were assessed by FITC-labeled dextran extravasation (70 kDa) and wet-to-dry weight ratio. Protein and mRNA analyses related to inflammation, endothelial adhesion molecule expression and the angiopoietin/Tie2 system were performed in plasma, kidney and lung tissue.

**Results:** ECC impaired microcirculatory perfusion compared to controls ($2.1\pm1.9$ vs. $13.2\pm3.2$ perfused capillaries, $p<0.0001$), which persisted one hour after stopping ECC ($5.4\pm4.6$, $p<0.05$). ECC increased vascular leakage as assessed by wet-to-dry ratio in kidneys ($4.5\pm0.2$ vs. $4.0\pm0.2$, $p<0.0001$), but not in lungs (4.8 [4.4–6.2] vs. 4.8 [4.6–5.7], $p>0.99$) compared to controls. ECC did not affect pulmonary (0.03 [0.02–0.07] vs. 0.04 [0.02–0.06] µg/mg, $p=0.99$) nor renal (0.55 [0.31–0.64] vs. 0.34 [0.15–0.63] µg/mg, $p=0.49$) FITC dextran extravasation. Compared to controls, ECC increased circulating TNF-α ($7.4\pm5.5$ vs. $0.2\pm0.1$ ng/mL, $p<0.01$), interleukin-6 ($2.6\pm1.8$ vs. $0.4\pm0.1$ ng/mL, $p<0.01$), angiopoietin-1 ($645\pm561$ vs. $25\pm16$ ng/mL, $p<0.0001$) and angiopoietin-2 ($87\pm59$ vs. $0\pm0$ ng/mL, $p<0.001$) levels, but not ICAM-1 ($34\pm8$ vs. $28\pm5$ ng/mL, $p=0.19$) levels.

Razuprotafib administration did not affect microcirculatory perfusion, wet-to-dry ratio or dextran extravasation in both organs. Interestingly, razuprotafib did not affect Tie2 mRNA, but increased VE-PTP mRNA expression by 52% in lungs ($p<0.01$), though not in kidneys, compared to placebo. Remarkably, circulating TNF-α was lower ($2.6\pm1.8$ ng/mL, $p<0.05$) following razuprotafib compared to placebo.

**Conclusions:** ECC-induced microcirculatory perfusion disturbances were paralleled by renal edema and a disturbed angiopoietin/Tie2 system. Activation of the endothelial receptor Tie2 with razuprotafib did not protect the microcirculation against ECC-induced alterations in rats.

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4. This work was supported by the Dutch Research Council [Veni 2019 to CvdB] and BJA-ESAIC grant 2021 [CvdB]. The remaining authors are financially supported by their department.

**Topic:** Translational biology

## 001471

### The development of a core outcome set for trials of airway clearance interventions in the critically ill, adult population

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001471

**Introduction:** Airway clearance interventions are a key component of airway care, facilitating and enhancing mucociliary clearance to prevent secretion encumbrance. Patients receiving invasive mechanical ventilation have impaired cough due to the presence of an artificial airway. Sub-optimal airway clearance and resultant retained secretions predispose these patients to an increased risk of ventilator-acquired pneumonia and extubation failure. Identification of effective and safe interventions to optimise airway clearance in the critically ill is, therefore, of paramount importance. To date, studies have used various outcomes to examine the effect of airway clearance interventions. This limits the ability to compare and synthesize clinical studies. Without a core outcome set (COS), important barriers to evidence synthesis to inform clinical decision-making remain.
**Objectives:** To establish a consensus-based COS for use in future studies of airway clearance interventions in the invasively ventilated, critically ill adult population.
**Methods:** Two stages:
Item generation. A systematic search of the evidence base established a list of outcomes used in previous research examining suctioning, manual/ventilator hyperinflation, mechanical insufflation exsufflation (MI-E), nebulisation, active humidification and manual techniques. We then conducted semi-structured interviews with former patients and clinicians to identify outcomes of importance to them.
A two-round modified online Delphi study was completed, recruiting participants through professional and personal networks and social media. Outcomes for inclusion in the COS were those scored as "critical for inclusion" by $\geq$ 70% of respondents and "not important" by < 15%.
**Results:** We recruited 243 participants with international representation from 26 countries including multi-professional clinicians, researchers, industry members and ICU survivors/family. Round one was completed by 193 (78%) participants, with 136 participants completing Round two.
Item generation through systematic searches highlighted 31 items for inclusion into the delphi (round one). Interviews did not highlight any further items for inclusion. During round one, participants suggested 40 additional outcomes. Through discussion and research group consensus, due to overlap and repetition of suggested outcomes, 7 additional outcomes were agreed, totalling 38 outcomes being included in the Delphi round two.
Following two Delphi rounds, seven outcomes gained consensus. Relating to efficacy, outcomes were mechanical ventilation duration; cough strength; lung compliance; atelectasis resolution, and work of breathing; Safety outcomes included oxygen saturations and re-intubation rate.
**Conclusions:** Through a rigorous method we developed a COS for future studies of airway clearance interventions in the invasively ventilated, critically ill adult population. It is now important to gain consensus on how each of these outcomes should be measured.
Delphi registration: COMET Initiative | Development of a core outcome set for trials of airway clearance interventions in the critically ill (comet-initiative.org)

**Reference(s)**
1. ES held a NIHR-funded clinical doctoral fellowship.

**Topic:** Nursing care and physiotherapy

## 001473

### A perioperative parameter-based nomogram for predicting severe acute kidney injury in liver transplant recipients without pre-existing kidney dysfunction

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001473

**Introduction:** Despite Liver transplantation (LT) being a lifesaving procedure for patients with end-stage liver disease, nearly half of LT recipients face the risk of developing acute kidney injury (AKI) post-surgery (1,2). In particular, severe AKI (S-AKI, AKI stage 3), leading to increased demand for renal replacement support during hospitalization and beyond, resulting in prolonged recover (3,4). For individuals without pre-existing kidney dysfunction or complications, the emergence of postoperative S-AKI presents both physically and psychologically challenges. Timely prediction of S-AKI occurrence in such patients may assist clinicians in implementing early interventions to prevent its progression, thereby potentially improving outcomes (5).
**Objectives:** This prospective cohort study aimed to develop a predictive model and construct a nomogram to forecast severe acute kidney injury (S-AKI) in liver transplantation (LT) patients without pre-existing chronic kidney disease.
**Methods:** Adults who underwent LT and were subsequently transferred to the ICU between January 2022 and June 2023 were screened. Individuals with pre-existing kidney dysfunctions were excluded. Patients were categorized based on the development of S-AKI post-LT. Factors associated with its occurrence were identified using the Least Absolute Shrinkage and Selection Operator (LASSO) method, considering preoperative, intraoperative, and postoperative factors. Machine learning techniques were employed to develop predictive models for selecting the most suitable model. The Shapley Additive Explanations method was utilized to assess the impact of each risk factor, nomograms based on these factors were developed as bedside tools for clinical application.
**Results:** Study demographic data and outcome are summarized in Table 1, among 405 patients, 44 experienced S-AKI. Identified risk factors included the MELD score, intraoperative bleeding, and postoperative levels of ALT, D-dimer, and TEG R within 24 h following LT (Table 2). Logistic regression achieved the highest AUROC of 0.885 among seven machine-learning models, indicating its suitability (Fig. 1). TEG and MELD scores had the highest weights in the Logistic regression model (Fig. 2). The nomogram, based on these factors with a point Detailed results are summarized in Fig. 1 and Table 1 at 93, demonstrated high sensitivity (70.5%) and specificity (93.4%) for predicting S-AKI post-LT (Fig. 3).
**Conclusions:** The logistic regression model, incorporating the MELD score, bleeding, ALT, D-dimer, and TEG R-value, shows promise for early prediction of S-AKI post-LT. Nomograms derived from this model offer clinical utility in various scenarios.

**Table 1 (abstract 001473)** Demographic and clinical characteristics of the study population.

| Subjects | Overall n=405 | Non Severe AKI n=361 | Severe AKI n=44 | P value |
|---|---|---|---|---|
| **Demographic data** | | | | |
| Male (n, %) | 295(72.8) | 258 (71.7) | 37 (84.1) | 0.116 |
| Age[mean±SD, y] | 50.2±10.9 | 50.0±11.1 | 51.9±9.9 | 0.269 |
| **Comorbidities and Etiology of liver transplantation** | | | | |
| Diabetes mellitus(n, %) | 62(15.3) | 56 (15.6) | 6 (13.6) | 0.899 |
| Hypertension(n, %) | 33(8.1) | 30 (8.4) | 3 (6.8) | 0.609 |
| Cirrhosis | | | | |
| Hepatitis B (n, %) | 133(32.8) | 118 (33) | 15 (34.1) | 1.000 |
| PBC (n, %) | 28(6.9) | 27 (7.5) | 1 (2.3) | 0.342 |
| Alcoholic (n, %) | 17(4.2) | 15 (4.2) | 2 (4.5) | 1.000 |
| AIH (n, %) | 25(6.2) | 22 (6.1) | 3 (6.8) | 0.746 |
| Other (n, %) | 30(7.4) | 26 (7.3) | 4 (9.1) | 0.556 |
| Liver cancer (n, %) | 150(37.0) | 136 (38.0) | 14 (31.8) | 0.526 |
| Hepatic failure (n, %) | 140(34.6) | 115 (32.1) | 25 (56.8) | 0.002 |
| Other (n, %) | 9(2.2) | 9 (2.5) | 0 (0) | 0.606 |
| Ascites [M($P_{25}$, $P_{75}$),mL] | 200(0-1600) | 200 (0-1500) | 400(0-200) | 0.315 |
| Meld score [M ($P_{25}$, $P_{75}$)] | 13.0(8.52-19.0) | 12.0 (8.0-17.9) | 16.6 (11.2-31.4) | <0.001 |
| Baseline Scr | 67.0(54.0-81.0) | 67.0(55.0-81.0) | 62.0(50.0-81.0) | 0.417 |
| **Operation details** | | | | |
| Bleeding[M($P_{25}$, $P_{75}$),mL] | 600 (400-1000) | 600 (400-800) | 1000 (600-1500) | <0.001 |
| RBC transfusions [M ($P_{25}$, $P_{75}$),u] | 4.0(0-8.0) | 4 (0-8) | 8 (4-10.89) | <0.001 |
| Plasma transfusions [M ($P_{25}$, $P_{75}$),mL] | 500(0-1000) | 400.0(0.0-1000.0) | 950.0(400.0-1450.0) | <0.001 |
| Anhepatic period [M ($P_{25}$, $P_{75}$),min] | 35.0(35.0-35.0) | 35.0 (35.0-35.0) | 35.0 (35.0- 35.0) | 0.752 |
| Warm ischemia time [M ($P_{25}$, $P_{75}$),min] | 13.6±2.1 | 13.5±2.1 | 14±2.3 | 0.141 |
| Cold ischemia time [M ($P_{25}$, $P_{75}$),min] | 6.7±0.7 | 6.7±0.7 | 6.8±0.6 | 0.365 |
| **Postoperative index within 24h** | | | | |

**Table 2 (abstract 001473)** LASSO regression of perioperative risk factors for severe AKI post-LT.

| Variable | Univariable | | | Multivariable | | |
|---|---|---|---|---|---|---|
| | Crude OR | 95%CI | P value | Adjusted OR | 95%CI | P value |
| Bleeding [M($P_{25}$,$P_{75}$),mL] | 1.00 | 1.00-1.00 | <0.001 | 1.001 | 1.00-1.001 | 0.021 |
| Meld score[M($P_{25}$,$P_{75}$)] | 1.07 | 1.04-1.10 | <0.001 | 1.063 | 1.026-1.103 | 0.001 |
| ALT[M($P_{25}$,$P_{75}$), u/l] | 1.00 | 1.00-1.00 | <0.001 | 1.001 | 1.00-1.001 | 0.001 |
| D-dimer [M($P_{25}$,$P_{75}$), ug/ml] | 1.05 | 1.03-1.07 | <0.001 | 1.032 | 1.016-1.051 | <0.001 |
| TEG R value [M($P_{25}$,$P_{75}$),min] | 1.28 | 1.19-1.39 | <0.001 | 1.188 | 1.088-1.309 | <0.001 |

OR, odds ratio; Meld, model for end-stage liver disease; ALT, alanine transaminase

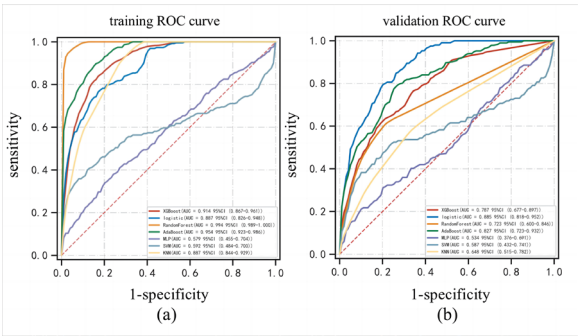


**Fig. 1 (abstract 001473)** Comparison of the area under receiver operating characteristic (AUROC) of seven machine learning models. (a) Predicted ROC curve in the training sets. (b) Predicted ROC curve in the validation sets

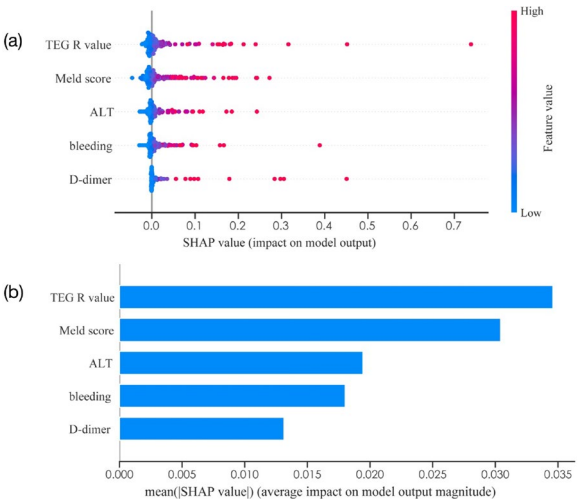


**Fig. 2 (abstract 001473)** Shapley additive explanations (SHAP) analysis for the Logistic Model. (a) The attribute of each risk factor. Red dots representing high-risk values and blue dots representing low-risk values. (b) The weight of each risk factor. The x-axis: the predictive contribution

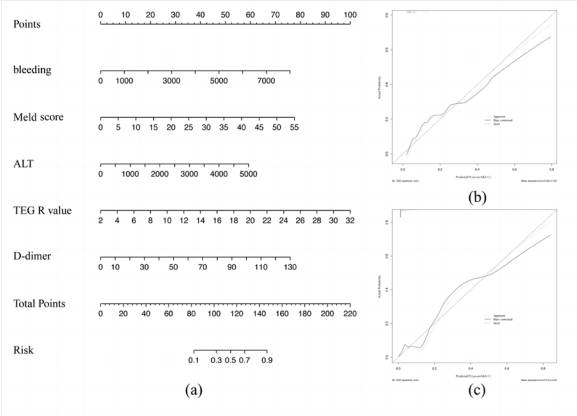


**Fig. 3 (abstract 001473)** Nomogram developed by the risk factors of the Logistic Model. (a) Nomogram to predict severe AKI post-LT with selected predictors. (b) Calibration curve of training sets. (c) Calibration curve of validation sets

**Reference(s)**

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001474

### Restoring trans-laryngeal airflow after tracheostomy for critical illness: first results from the SEA CTV trial

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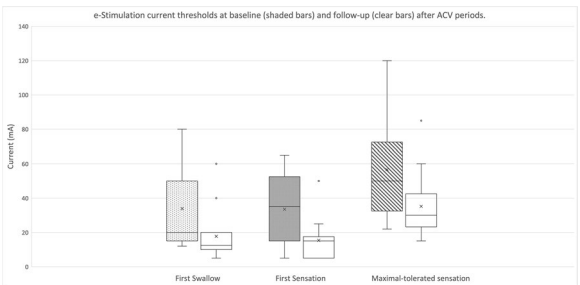
**Introduction:** Between 10 and 15% of all invasively ventilated critically ill patients require tracheostomy, typically to facilitate weaning from ventilation. [1] An inflated tracheostomy tube cuff allows positive pressure to be delivered to the lungs, but the larynx and upper airways are excluded from the flow. Retrograde gas flows can be delivered via the tracheostomy tube subglottic suction port, facilitating speech and restoring laryngeal physiological function. [2] Our medical device trial, Safe and Effective Above-Cuff Tracheostomy Vocalisation (SEA CTV) investigates the impact of above-cuff vocalisation (ACV) on laryngeal function.

**Objectives:** Measure the sensitivity of the larynx and pharynx using electrical stimulation after tracheostomy and after a period of regular ACV use.

**Methods:** Following trial registration and ethical approval (NCT04647786; IRAS 278006), 20 patients with cuff-inflated tracheostomy were recruited to the first phase of the study (focussed on assessing the safety of the SEA CTV device). Participants had a pharyngeal stimulation catheter (*Gaeltech*, Scotland) inserted nasally. A current stimulator (DS7A, *Digitimer* Ltd, UK) was triggered at 5 Hz with a 200 ms pulse width (DS2 *Digitimer* Ltd, UK). Current was slowly increased to record first and maximum-tolerated sensations, and the first observed swallow. Measurements were made at baseline and at completion of ACV, defined as: established cuff-down, ACV no longer indicated, 7-days of ACV, or death. Data distributions were summarised with mean (standard deviation) and compared using 2-tailed T-tests.

**Results:** ACV was used for a mean of 1.8 h per day, for a mean of 5.8 days. Fifteen of twenty participants had paired measurements taken (2 patients died before follow-up and 3 patients were too agitated or refused the procedure on at least one occasion). Mean (SD) currents (baseline vs follow-up, mA) were: First sensation (33.5 (20.0) vs 15.4 (12.0), $p = 0.006$); Maximal sensation (56.6 (30.9) vs (35.2 (19.1), $p = 0.032$); First swallow (33.9 (24.2) vs 17.7 (14.9), $p = 0.038$). See Fig. 1.

**Conclusions:** Stimulation currents are a surrogate of laryngeal sensitivity, which improved significantly over the course of the study intervention. Previous work has identified similar improvements using repeated pharyngeal electrical stimulation therapy, [3,4] but ours is the first study to report improvements in stimulation thresholds by restoring trans-laryngeal airflow with ACV. Future work will report laryngeal and pharyngeal functional metrics measured at nasendoscopy (FEES) and include control groups who do not receive ACV. Our results suggest that ACV may play a role in promoting early laryngeal rehabilitation after tracheostomy in critical illness.




**(abstract 001474)** e-Stimulation current thresholds at baseline (shaded bars) and follow-up (clear bars) after ACV periods. Box and whisker plots show Median (line), Mean (X), IQR and range. Dots represent outlier data

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001476

### Diaphragmatic dysfunction in patients with prolonged mechanical ventilation

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001476

**Introduction:** Diaphragm dysfunction significantly impacts clinical practice because it mainly determines the weaning outcome. The ratio of Dabdominal/Dpleural pressure can be used to assess the contribution of accessory inspiratory muscles or compensatory abdominal expiratory muscles (1); however, its relation with respiratory mechanics is necessary to determine the excessive load imposed on the inspiratory muscles.
**Objectives:** The aim is to evaluate inspiratory muscle function related to respiratory mechanics to identify the main determinants of ventilator dependence in patients with clinical signals of diaphragmatic weakness.
**Methods:** A prospective observational study was carried out at HU: R. Sofía, Córdoba, September 2023–February 2024, approved by the institutional ethics committee (Musc-Txp23). Twelve patients were included, in whom we observed clinical signs such as paradoxical (negative) oscillation of the abdominal wall, elevated hemidiaphragm on chest x-ray, and did not wean him after seven days of controlled mechanical ventilation. All patients were studied in pressure support ventilation mode.
Transdiaphragmatic pressure (Pdi) and its components, gastric pressure (Pga) and esophageal pressure (Pes), airway pressure (Paw), and flow, were recorded. Sampling 1045 Hz. For the calculations, ten respiratory cycles were averaged: Respiratory mechanics (lung and chest wall elastance, total resistances), respiration components (tidal volume, respiratory frequency, Ti/Ttot), DPgas/DPes, and DPdi/DPelast index: Pdimax, inspiratory effort partition (PTP, cmH2O*s/min), Work (WOB, J/L.
Data were analyzed by descriptive statistical methods and expressed as medians (IQR), absolute values, and percentages. The relationship between variables was carried out by linear regression.
**Results:***Characteristic of patients*: N 12. Male 9 (75%). Age 60 (56.75–64.75)y. Diagnosis: Lung transplantation 10 (83.33%); trauma 2 (16.37%). MV at study days: 15.5 (8.25–20.5). Total MV days 50 (25–79). Inspiratory support 6 (5–9.25)/PEEP 5.75 (5–6) cmH2O. Lung Elastance 15.10 (13.71–18.03) cmH2O. Total Resistances 10.44 (8.35–13.31) cmH2O/L/s. PTPelast 82.27 (58.83–151.06) cmH2O*s/min. WOB 9.13 (5.83–15.93) J/L/min. Diaphragmatic weakness causes Paralysis 8 (66.66%) and polyneuropathy 4 (33.33%). The table and figures show respiratory components and muscle function parameters.
**Conclusions:** Clinical observation is essential in detecting diaphragmatic weakness in critically ill patients. Advanced monitoring allows confirmation of the diagnosis. In the patients studied, elastic impedance and diaphragmatic paralysis were the significant determinants of the inability to overcome workload. DPgas/DPes and DPdi/DPelas index evaluate the severity and weaning outcome and could be used to establish possible therapeutic avenues.

**Table (abstract 001476)** Respiratory muscle function.

| Patient No | Vt (ml) | Ti/Ttot | ΔPgas/ΔPes | ΔPdi ($cmH_2O$) | ΔPelast ($cmH_2O$) | ΔPdi/ΔPelast | Pdimax ($cmH_2O$) |
|---|---|---|---|---|---|---|---|
| 1 | 350 | 0.37 | 0.72 | 0.96 | 4.61 | 0.21 | 2.36 |
| 2 | 530 | 0.44 | -0.54 | 6.87 | 7.33 | 0.94 | 6.81 |
| 3 | 650 | 0.33 | -0.56 | 13.95 | 12.00 | 1.16 | 14.00 |
| 4 | 293 | 0.23 | 1.63 | -3.29 | 9.00 | -0.37 | 10.42 |
| 5 | 652 | 0.47 | 1.19 | 7.00 | 14.79 | 0.47 | 12.01 |
| 6 | 251 | 0.23 | -0.28 | 5.14 | 7.01 | 0.73 | 12.15 |
| 7 | 742 | 0.42 | -0.71 | 10.87 | 10.21 | 1.06 | 12.65 |
| 8 | 438 | 0.33 | 0.19 | 9.08 | 15.09 | 0.60 | 17.17 |
| 9 | 508 | 0.37 | -0.49 | 9.13 | 7.52 | 1.21 | 8.06 |
| 10 | 255 | 0.43 | 1.00 | 0.01 | 5.43 | 0.00 | 0.00 |
| 11 | 506 | 0.39 | 0.37 | 4.10 | 7.54 | 0.54 | 2.12 |
| 12 | 512 | 0.26 | -0.21 | 12.05 | 12.00 | 1.00 | 23.00 |
| Median | 507 | 0.37 | -0.01 | 6.94 | 8.27 | 0.67 | 11.22 |
| (IQR) | (307.31-620.00) | (0.28-0.43) | (-0.53-0.93) | (1.75-10.44) | (7.09-12.00) | (0.27-1.05) | (3.47-13.66) |

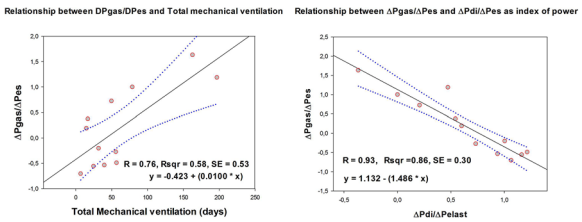


**Fig. 1 (abstract 001476)** Relationships between muscle function and duration of mechanical ventilation

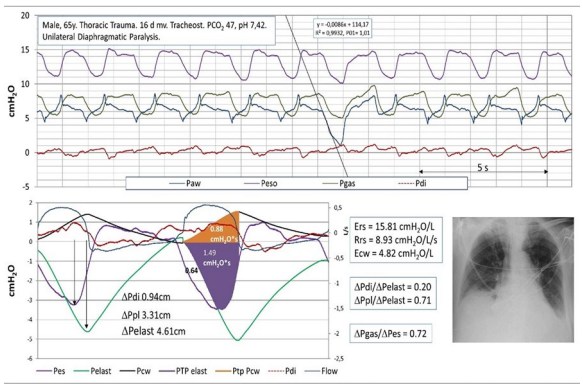


**Fig. 2 (abstract 001476)** Patient 1. Representative case of severe unilateral paralysis. Note that unilateral and bilateral paralysis may share similar findings in transdiaphragmatic pressure

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001478

### The toll of the cure and those who can pay it

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001478

**Introduction:** The inherent suffering of the critical disease process and the potential for severe functional impairment take part in the decision to admit to the intensive care unit (ICU). The complexity increases when involving elderly patients with chronic diseases or lower overall fitness. Nevertheless, people aged 80 years and older represent the fastest-growing subgroup in ICU admissions.
**Objectives:** The primary objective was to evaluate the proportion of very old patients ($\geq$ 80 years) admitted to an ICU and compare the baseline characteristics and acute outcomes to find predictors of hospital mortality and long-term mortality.
**Methods:** Retrospective cohort of 578 patients admitted to an ICU between January and December 2022. Patients were clustered in subgroups based on age: young (< 65 years), old (65–80 years) and very old ($\geq$ 80 years). Clinical Frailty Scale (CFS) was assessed at admission and one year after hospital discharge; score $\geq$ 4 was defined as frail.
**Results:** Median age was 61 years (IQR 50–69 years). Very old patients represented 8,5% ($n = 49$) of the admissions, with a median age of 83 years (IQR 81–85 years). 31,6% ($n = 183$) were classified as old, and 59,9% ($n = 346$) as young. Unlike the younger patients, a significantly higher proportion of very old patients were admitted after emergent surgery (32.7%, $p < 0.001$) and none had a planned admission after elective surgery. Median ICU and hospital length of stay were similar between groups, but SAPS II was higher for very old and old patients (62 vs 53 vs 42, $p < 0.001$). The proportion of frail patients in the very old group was significantly higher (83.7%, $p < 0.001$) but had no relation to ICU mortality (RR 0.84, 95%CI 0.6–1.3. $p = 0.436$). Multivariate analysis revealed that hospital mortality and one-year mortality were higher for very old patients and frail patients (RR 2.4, 95%CI 1.1–5.4, $p < 0.001$; RR 2.0, 95%CI 1.4–3.1, $p < 0.001$). In terms of organ support, those under mechanical ventilation and renal replacement therapy, but not vasopressor, also had a higher risk of mortality (RR 2.2, 95%CI 1.3–3.5, $p < 0,001$; RR 4.0, 95%CI 2.4–6.6, $p < 0.001$). 6.1% of the very old patients were discharged to nursing homes, and 5.5% and 4.0% in older and younger groups, respectively ($p < 0.001$). One year after hospital discharge, 49.4% of the survivors were classified as frail with greater risk for older patients (RR 2.9, 95%CI 1.8–4.6, $p < 0.001$).
**Conclusions:** The number of older adults requiring ICU admission has increased worldwide as the population ages. The outcome of very old patients is determined by both the severity of the acute condition and their reduced physiological reserve. Further studies may improve the capacity to differentiate the elderly that benefit from ICU admission and both age and frailty should be considered.

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**Topic:** Ethics and end-of-life care

## 001479

### Interest of a European Network for researchers studying sleep and circadian rhythms in ICU: a need and a proposal

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**Introduction:** Sleep and circadian disruptions in ICU patients are frequent and have severe consequences such as prolonged duration of mechanical ventilation and high mortality.
Studying and quantifying sleep and circadian rhythms in the ICU is challenging and limited to a few experienced teams involving a small number of patients. Large cohort studies and clinical trials have not been carried out, especially in Europe, precluding from investigating causes of sleep and circadian disruptions and slowing the development of therapeutic strategies.
Yet, significant progress has been made these last years: sleep questionnaires are now validated or very simple to use to assess patient-reported sleep experience, but are poorly correlated with polysomnography. More recently, miniaturized polysomnograph and automated sleep scoring algorithms dedicated to ICU are now available for research purposes. In addition, algorithms are being developed to monitor circadian rhythms using routinely collected clinical data from ICU patients.
**Objectives:** We wanted to investigate the number of studies on sleep and circadian rhythms performed in European countries.
**Methods:** We searched in PubMed/Medline database from 1995 to 2024 articles on sleep and circadian rhythms in ICU using the following terms: "intensive care unit" AND (sleep OR circadian rhythm) AND (Albania OR Austria OR Belgium OR Bulgaria OR Croatia OR Czech Republic OR Cyprus OR Denmark OR Estonia OR Finland OR France OR Germany OR Greece OR Hungary OR Ireland OR Italy OR Latvia OR Lithuania OR Luxembourg OR Malta OR Netherlands OR North Macedonia OR Norway OR Poland OR Portugal OR Romania OR Slovakia OR Slovenia OR Spain OR Sweden OR United Kingdom OR Turkey). We added the United Kingdom because of previous collaborations and Turkey because this country is eligible for European grants. The search was restricted to the English language and adult population. We selected only articles reporting at least one measure of sleep or one assessment of circadian rhythms in adult patients.
**Results:** From the 371 articles retrieved, 92 effectively investigated sleep or circadian rhythms in adult ICU patients. Among them, only 12 (13%) involved 2 European countries and 2 articles were multinational studies (> 2 European countries).

**Conclusions:** International collaboration in Europe for sleep and circadian rhythms studies is poor. We propose to create a **E**uropean **S**leep & **CI**rcadian **R**hythms in I**CU S**tudy group (E-SCIRCUS) gathering research teams (doctors, researchers, nurses, scientists…) in Europe interested in this topic.
The objectives of this network could be:

1. To share experience in studying sleep/circadian rhythms in ICU
2. To perform multi-center international studies, to reduce the "center effect"
3. To build a multinational database (polysomnography, sounds recordings, circadian recordings, …)
4. To apply for European grants and fund research projects of the members
5. To share and disseminate new technologies in Europe

**Topic:** Nursing care and physiotherapy

## 001481

### The association between body mass index and long-term mortality in critically ill patients with frailty: a retrospective registry-based study

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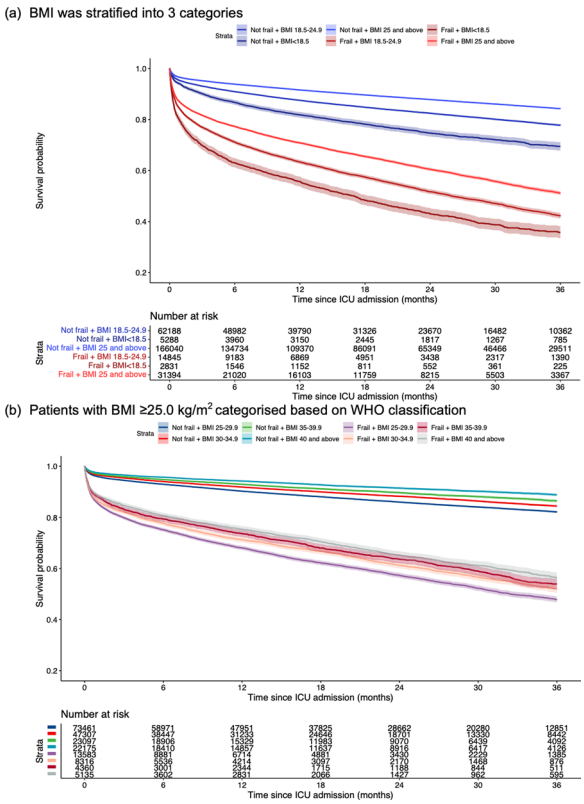
***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001481

**Introduction:** Obesity (defined as a body mass index [BMI] ≥ 30 kg/m$^2$ is increasingly prevalent [1], especially amongst individuals aged 60 years and older [1, 2]. While a BMI ≥ 25 kg/m$^2$ has been reported to be associated with frailty [3], the relationship between frailty and obesity is complex and only reported in adults in the community and admitted to the hospital. The relationship between frailty, BMI, and long-term survival has not been thoroughly investigated in patients with critical illness.
**Objectives:** We aimed to investigate the associations between frailty, BMI and long-term outcomes among patients admitted to ICU.
**Methods:** In this binational, registry-based cohort study, we included all adults admitted to Australian or New Zealand ICU's 1st January 2018 through 31st March 2022 with a documented clinical frailty scale (CFS) and a BMI. Frailty was defined as a CFS ≥ 5. The primary outcome was survival time up to three years after ICU admission, assessed using the Cox proportional hazards model along with interaction analyses between frailty, BMI and 3-year survival.
**Results:** Of the 282,586 eligible patients, 49,070 (17.4%) were frail. The patients with frailty had a lower median [IQR] BMI than those without frailty (27.4 [23.2–33.0] vs. 28.2 [24.5–33.2]). Frailty was associated with reductions in survival time (adjusted hazard ratio [aHR] = 1.67, 95%-CI: 1.62–1.73). Frailty was associated with a similar reduction in survival time amongst patients with BMI 18.5–24.9 kg/m$^2$ (reference group, 77,033 patients, aHR: 1.72, 95%-CI: 1.66–1.78) and BMI < 18.5 kg/m$^2$ (8,099 patients, HR = 1.69, 95%-CI: 1.55–1.83, pinteraction = 0.083). However, it was associated with a larger reduction in survival time in patients with BMI ≥ 25 kg/m$^2$ (197,434 patients, aHR = 1.86, 95%-CI: 1.81–1.91; pinteraction < 0.001).
**Conclusions:** An increasing BMI was associated with larger reductions in survival time in the presence of frailty. This may have implications for managing patients with concurrent obesity and frailty in the context of critical illness.




**(abstract 001481)** Kaplan–Meier survival curves of patients with and without frailty from initial admission to ICU until follow-up of up to three years. (a) The BMI was stratified into 3 categories (BMI < 18.5, 18.5–24.9 and ≥ 25.0 kg/m$^2$); and (b) BMI ≥ 25.0 kg/m$^2$ is categorised based on WHO classification (BMI 25.0–29.9, 30.0–34.9, 35.0–39.9, ≥ 40 kg/m$^2$)

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4. n/a

**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001482

### Exploring the influential factors to bed block in adult intensive care units in Australia

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001482

**Introduction:** Bed block problems including delayed and after-hours discharge have been a consistent, major issue especially for Australian regional ICUs1. Research evidence has shown that discharge delay and after-hours discharge are associated with increased ICU and hospital length of stay leading to worsened patient outcomes and increased healthcare costs 2,3. There is limited in-depth understanding in the literature on the actual discharge process.
**Objectives:** This study aimed to understand the barrier and facilitators to the ICU patient discharge process in adult ICUs.
**Methods:** This was a qualitative exploratory multisite study. It was conducted in three regional adult ICUs in Queensland. We used fieldnote taking, interviews with staff and consumers and document analysis as data collection techniques. Content analysis was conducted following a deductive Structure, Process and Outcomes framework and then an inductive process using the Theoretical Domains Framework.
**Results:** We observed 69 discharges across three sites and conducted 76 interviews with 59 staff and 17 consumers. Qualitative data analysis revealed barriers to discharge including ineffective communication and coordination, within and across teams and departments; uncertainty and inconsistency in discharge decision making and lack of patient/family involvement in discharge decision making especially on the timing of discharge. In addition, ICU has been given low priority when allocating ward bed with patients being discharged based on ICU bed demands rather than patient discharge criteria. Facilitators included clarity on professional roles in ICU discharge; effective communication within the ICU team and context-specific strategies to support the discharge process.
**Conclusions:** The findings provide an in-depth understanding of the barriers and facilitators to the ICU discharge process which will inform future targeted interventions to address the bed block issue.

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4. University of the Sunshine Coast LAUNCH research grant 2022.


**Topic:** Health Services Research and Outcome

## 001484

## The focal CT score: an objective analysis tool for grading of focal lung injury. A preliminary analysis


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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001484


**Introduction:** Acute respiratory distress syndrome (ARDS) can be clinically subgrouped into phenotypes based on the distribution of infiltrates and hyperinflated areas seen on computed tomography (CT). An individualized ventilation treatment strategy tailored towards the specific phenotype (focal or diffuse distribution pattern) seems to be beneficial, and treatment approaches based on an inaccurate CT assessment have been shown to increase mortality [1]. Current methods of ARDS characterization on CT are solely subjective, and an objective method of measurement might increase the accuracy of the assessment.
**Objectives:** The objective of this study was to investigate and characterize the spatial distribution of pulmonary infiltrates and hyperinflation on CT in patients with diffuse ARDS. The study also aimed to create a CT-based score (the Focal-CT score) as a complementary analysis method in the process of grading focal injury determining ARDS phenotype.
**Methods:** CT scan images of mechanically ventilated patients with SARS-Covid-19 and moderate to severe ARDS, admitted to the intensive care unit at Uppsala University Hospital, Sweden, were analyzed retrospectively. The distributions of Hounsfield units (HU) (measured as a percentage of the total amount of voxels) were depicted in histograms for nine equally sized regions of the lungs. The overlap of the area under the curve (AUC) between the apical non-dependent and diaphragmatic dependent areas was used to derive a score of HU distribution. The Focal CT score ranged between 0 and 200, calculated as the absolute value of the difference in AUC between these regions' histograms. A Focal CT-score of 0, deriving from a complete overlapping of the two HU distribution profiles, was interpreted as diffuse ARDS. A Focal CT score of 200, deriving from a complete separation of the two profiles, was interpreted as focal ARDS [2] (see Figure). For the purpose of validation, the ARDS phenotypes were also characterized by visual assessment of the CT scan images by three senior ICU physicians, blinded towards each other's assessments. Clinical data from medical records were also collected from the ICU stay.
**Results:** Thirty-six patients (six women; median age 65 years) were included in the study with a median duration of 4.5 days (IQR 1–8.5) between the dates of ICU admission and CT scanning. All study objects' chest CT images were characterized visually and diagnosed as diffuse ARDS. The mean PEEP set during the CT scan was 13.0 cmH2O (SD ± 3.3) and the median duration of mechanical ventilation was 9 days (IQR 5–18). The mean Focal CT Score was 95.5 ± 42.8, 95% CI, 81.0–110.0 (see Figure).
**Conclusions:** Patients subjectively categorized as diffuse ARDS display morphological changes on CT with a varying degree of focality. Diffuse and focal ARDS are not univocally discernible. Future studies with larger cohorts of patients of various ARDS etiologies are needed to examine diagnostic accuracy and validate this score as a clinical tool.

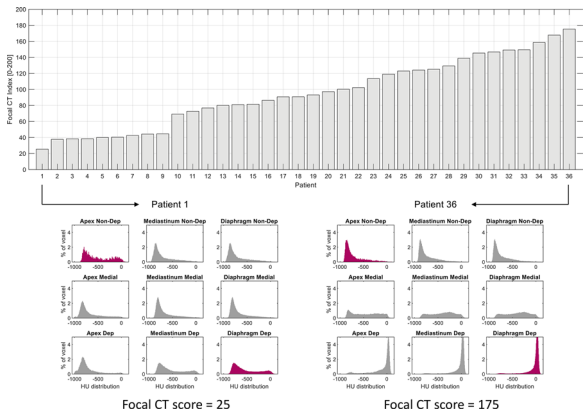


**Fig. (abstract 001484)** Focal CT score in the patients cohort. Above: Histogram reporting the Focal CT score for the 36 patients included in the analysis. Below: HU distribution for the nine defined tredimensional regions of interest (ROI, i.e., Apex non-dependent, Apex medial, Apex Dependent, Mediastinum non-dependent, Mediastinum medial, Mediastinum Dependent, Diaphragm non-dependent, Diaphragm medial, Diaphragm dependent). HU-distribution histograms

characterzed by 5 HU bins and y-axis reporting the percentage of a total voxel in that ROI. The Focal CT score is calculated as the absolute value of the difference between the areas under the curve for the HU-distribution of the Apex non-dependent ROI and and the Diaphragm dependent ROI. The two patients with the extreme values of Focal CT score are reported

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4. Swedish Society for Medical Research (SG-22-0086-H-03)

**Topic:** Acute respiratory failure and mechanical ventilation

## 001485

### Impact on right ventricular function following pulmonary embolism in mechanically ventilated patients with COVID-19

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001485

**Introduction:** COVID-19 is an inherently prothrombotic condition, and a high proportion of COVID-19 patients develop pulmonary embolism. Studies have consistently observed that a significant proportion of patients with respiratory distress syndrome (ARDS) caused by COVID-19 exhibit right ventricular (RV) dilation, RV dysfunction, or acute cor pulmonale. However, the true role of thromboembolism in right ventricular function in this patient cohort is not clear.

**Objectives:** our aim was to assess the impact on right ventricular function following pulmonary embolism in mechanically ventilated patients with COVID-19.

**Methods:** Post hoc analysis of prospective, multicenter study in four university-affiliated hospitals in Chile. Consecutive patients with COVID-19 ARDS requiring mechanical ventilation admitted between April and July 2020 were included. We performed transthoracic echocardiography within 24 h of CT angiography due to clinical suspicion of pulmonary embolism.

**Results:** 175 mechanically ventilated patients were screamed, in 140 patients first CCE was performed within 24 h of ICU admission and in 86 patients CT angiography was performed within 24 h, and in seven patients a CT angiography was performed during the first week. A total of 93 patients (age 57 ± 12 yr, 29 female patients (21%) were included in the study. Severity of disease on admission was APACHE II 15 [IQR 11–21] and SOFA 7 [IQR 5–9], and ICU mortality was 31 (33%). Twenty-six patients (28%) exhibited PE (20 patients had segmental or subsegmental thromboembolism and six patients exhibited lobar pulmonary embolism), and none patients showed massive PE. Forty-two patients (45%) had RV dilation, out of whom fifteen patients (36%) exhibited PE. Twenty patients exhibited ACP out of whom nine (45%) showed PE (a comprehensive comparison between patients with and without ACP was shown in Table 1).

**Conclusions:** Pulmonary embolism was not related to worse right ventricular performance, pulmonary mechanics, hemodynamic instability, or ICU mortality. Nonetheless, the presence of pulmonary embolism was related to acute cor pulmonale in 45% of the cases.

**Table 1 (abstract 001485)** Hemodynamic and echocardiographic parameters between patients with and without PE.

| | n = 93 | Pulmonary Embolism n = 26 | No Pulmonary Embolism n = 67 | p value |
|---|---|---|---|---|
| **Macro-hemodynamic parameters** | | | | |
| SBP, mmHg | 114 [103-126] | 111 [102-122] | 116 [102-127] | 0.340 |
| DBP, mmHg | 61 [55-69] | 61 [54-70] | 61 [56-69] | 0.884 |
| MAP, mmHg | 77 [70-89] | 76 [70-90] | 77 [71-89] | 0.561 |
| NE, mcg/kg/min | 0.05 [0.01-0.16] | 0.06 [0.01-0.18] | 0.05 [0.02-0.17] | 0.602 |
| HR, beats/min | 88 [70-108] | 90 [68-119] | 87 [71-106] | 0.317 |
| CVP, mmHg | 6 [2-9] | 7 [0-8] | 6 [2-9] | 0.743 |
| **Tissue perfusion parameters** | | | | |
| $PCO_2$ gradient, mmHg | 6 [5-9] | 10 [6-14] | 6 [4-8] | **0.012** |
| Central Venous Saturation, % | 72 [65-79] | 64 [57-72] | 76 [70-81] | **0.018** |
| Capillary Refill Time, sec | 3 [2-3] | 3 [2-3] | 3 [2-3] | 0.666 |
| Lactate, mmol/L | 2.1 [1.8-2.7] | 1.9 [1.5-2.9] | 2.2 [1.7-2.7] | 0.531 |
| **Fluid responsiveness predictors** | | | | |
| Maximum IVC diameter, mm | 20 [17-22] | 19 [14-22] | 20 [18-22] | 0.135 |
| Minimum IVC diameter, mm | 17 [14-20] | 17 [11-20] | 17 [14-21] | 0.306 |
| IVC distensibility index, % | 11 [5-27] | 9 [5-35] | 11 [5-26] | 0.947 |
| Pulse Pressure Variation, % | 4 [2-7] | 4 [3-14] | 3 [2-7] | 0.525 |
| **Cardiac output and left ventricle function** | | | | |
| Cardiac output, L/min | 5.1 [4.3-6.3] | 4.9 [4.4-6.3] | 5.5 [4.3-6.3] | 0.572 |
| Cardiac index, L/min/$m^2$ | 2.6 [2.3-3.3] | 2.5 [2.2-3.2] | 2.7 [2.3-3.3] | 0.357 |
| Left ventricular outflow tract diameter, cm | 2.0 [1.9-2.2] | 2.0 [1.9-2.1] | 2.0 [1.9-2.2] | 0.288 |
| Left Ventricular Ejection Fraction, % | 62 [52-69] | 61 [51-65] | 62 [53-70] | 0.581 |
| Left Ventricular Ejection Fraction <45, (%) | 10 (11) | 3 (12) | 7 (10) | 0.849 |
| LVOT VTI, cm | 19 [15-23] | 18 [15-22] | 19 [15-23] | 0.835 |
| Stroke Volume, ml | 62 [48-74] | 58 [46-65] | 63 [49-80] | 0.190 |
| MAPSE, mm | 15 [13-17] | 14 [12-16] | 16 [14-17] | **0.030** |
| Mitral Tissue Doppler Image s' wave, cm/sec | 12 [10-15] | 14 [12-17] | 11 [9-14] | **0.003** |
| **Right ventricle function** | | | | |
| TAPSE, mm | 20 [17-23] | 19 [16-22] | 21 [19-24] | **0.015** |
| Tricuspid TDI s' wave, cm/sec | 13 [11-15] | 13 [11-15] | 13 [11-15] | 0.972 |
| Right end diastolic area, $cm^2$ | 14 [11-17] | 13 [12-18] | 14 [11-15] | 0.590 |
| Left end diastolic area, $cm^2$ | 22 [17-26] | 21 [17-24] | 22 [17-28] | 0.414 |
| RVEDA/LVEDA ratio | 0.59 [0. 50-0.74] | 0.68 [0.52-0.88] | 0.57 [0. 49-0.69] | 0.078 |
| RVEDA/LVEDA ratio > 0.6 | 42 (45) | 15 (58) | 27 (40) | 0.130 |
| Paradoxical septum motion, n(%) | 20 (22) | 9 (35) | 11 (16) | 0.056 |
| **Diastolic function** | | | | |
| Doppler Trans-mitral E wave, cm/sec | 64 [54-79] | 63 [54-85] | 65 [54-78] | 0.947 |
| Doppler Trans-mitral A wave, cm/sec | 62 [46-73] | 55 [44-70] | 63 [47-78] | 0.264 |
| E/A ratio | 1.1 [0.8-1.4] | 1.1 [0.8-1.5] | 1.1 [0.8-1.4] | 0.402 |
| Mitral Tissue Doppler Image e' wave, cm/sec | 10 [8-12] | 10 [9-13] | 10 [7-11] | 0.170 |
| E/e' ratio | 6.8 [5.4-7.9] | 6.5 [5.5-7.6] | 6.8 [5.1-8.5] | 0.515 |
| **Biomarker** | | | | |
| Troponin T, pg/ml | 26 [13-69] | 127 [17-292] | 26 [12-49] | 0.115 |
| D-Dimer, ng/ml | 3183 [1154-7379] | 6838 [3269-28307] | 2025 [1144-6180] | **0.009** |

Continuous data were expressed as median [25th–75th percentiles]. Categorical variables expressed as number (percentage). Five patients with normal right ventricle (RV) function were excluded from the analysis due to poor delimitation of RV free wall. SBP = systolic blood pressure; DBP = diastolic blood pressure; MAP = median arterial pressure; NE = norepinephrine; HR = heart rate; CVP = central venous pressure; LVEDV = left ventricular end diastolic volume; LVESV = left ventricular end systolic volume; MAPSE = mitral annular plane systolic excursion; LVOT = left ventricular outflow tract; VTI= velocity time integral; TAPSE = tricuspid annular plane systolic excursion; TDI = tissue Doppler imaging; RVEDA/LVEDA ratio = right ventricle end diastolic area/left ventricle end diastolic area ratio; E/A ratio = E wave/A wave ratio; E/e' ratio = E wave/tissue Doppler image e' wave ratio; IVC = inferior vena cava.

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3. FONDECYT regular 1241463

**Topic:** Cardiovascular issues in ICU.

## 001486

### Regional distribution of hyperinflation and collapse is associated with lung weight in acute respiratory distress syndrome. A preliminary analysis

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**Introduction:** Despite lung protective ventilation strategies, the regional heterogeneity of lung mechanics characterizing acute respiratory distress syndrome (ARDS) determines the unpredictable regional

distribution of gas, causing hyperinflation and lung collapse and, as such, ventilator-induced lung injury and increased mortality [1]. Positive end-expiratory pressure (PEEP), as well as fluid status and lung oedema, can further influence gas distribution within the lung. Computed tomography (CT) is a reliable way to investigate regional inflation and estimate hyperinflation and lung collapse.

**Objectives:** Using lung CT analysis, we investigated regional gas distribution, comparing Hounsfield unit (HU) distribution profiles of dependent and non-dependent lung regions. The study also aimed to investigate the relationship between the heterogeneity of gas distribution and PEEP, fluid status and lung oedema.

**Methods:** Mechanically ventilated patients with moderate to severe COVID-19 ARDS, admitted to the intensive care unit (ICU) at Uppsala University Hospital, Sweden, underwent lung CT during their ICU stay, and were included in the study. The HU profiles, measured as a percentage of the total amount of voxels, were obtained for three equally sized regions of the lungs (i.e., non-dependent, mediastinal, dependent). To quantify the regional distribution of hyperinflation and lung collapse, the absolute difference between the HU profile for the non-dependent and the dependent areas was computed for each patient. This difference ranged between 0 and 200; where 0 indicated a complete overlapping and 200 a complete separation of the two HU profiles. Lung weight, a surrogate for lung oedema, was calculated from the sequence of CT scans, following the interpolation method [2]. Clinical data were collected from medical records. Data were reported as mean (± standard deviation). Correlations were sought using Spearman rank correlation. F-test statistics ($\alpha = 0.05$) were used for the linear regression analysis.

**Results:** Thirty-six patients were included in the study. PEEP set during the CT scan was 13 cmH2O (± 3) and the mean cumulative fluid balance was 3285 ml (± 2705). The difference between HU profiles was 76.9 ± 36.9, 95% CI:64.4–89.3 (Fig. 1a). The estimated lung weight was 1683 g (± 815). Changes in lung weight (rho = 0.66, $p < 0.001$; R2 0.31, $p < 0.001$), but not in set PEEP (rho = 0.17, $p = 0.33$; R2 0.05, $p = 0.20$) and cumulative fluid status (rho = 0.12, $p = 0.51$; R2 0.001, $p = 0.82$), were significantly correlated with the difference in HU-profiles between dependent and non-dependent regions (Fig. 1b).

**Conclusions:** This study showed variable hyperinflation and lung collapse within the lung parenchyma. Lung oedema, but not fluid status or set PEEP, was significantly associated with the difference in gas distribution between dependent and non-dependent lung regions. Larger studies, including different ARDS aetiologies, are needed to confirm these findings and investigate their impact on clinical outcomes.

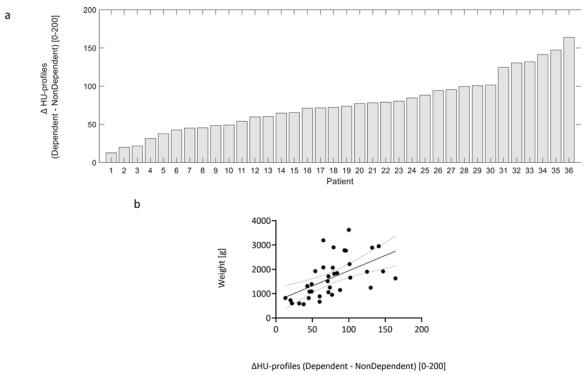


**Fig. 1 (abstract 001486)** A) Absolute differences between HU profiles between dependent and non-dependent lung regions (Δ HU profiles (Dep- NonDep)). Value reported for each patient. B) Linear regression between the Δ HU profiles (Dep- NonDep) and lung weight [g]

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3. Swedish Society for Medical Research (SG-22–0086-H-03)
4. Swedish Heart and Lung foundation (20220536, 20200841, 20200877, 20200825, 20220681, 20230767)

**Topic:** Acute respiratory failure and mechanical ventilation

## 001487

### Renal milrinone clearance in ICU patients follows the intact nephron hypothesis

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001487

**Introduction:** Many drugs that are cleared by the kidneys require dose adjustments to avoid the risk of adverse drug reactions. It is widely accepted that in renal impairment, drug doses can be adjusted proportional to the estimated glomerular filtration rate (eGFR), which is based on the plasma creatinine. The underlying theory supporting this method is the intact nephron hypothesis (INH). According to the INH, the total renal drug clearance is considered linearly related to the glomerular filtration rate (GFR), even when the drug is (also) cleared by tubular secretion. Although milrinone is a drug that is known to

undergo tubular secretion, details of its clearance in ICU patients are unknown.
**Objectives:** Examine renal milrinone clearance in relation to measured creatinine clearance (mCC) in ICU patients.
**Methods:** This observational study used left-over plasma and 24 h urine samples to measure serial milrinone and creatinine levels in ICU patients receiving a continuous milrinone infusion. The samples were only analyzed when no renal replacement therapy was given. Lithium heparin plasma and urine samples were analyzed by liquid chromatography-tandem mass spectrometry (LC–MS/MS). Renal milrinone clearance was determined as:
694· (milrinone excretion in mg/d) / (plasma milrinone in µg/L).
The measured creatinine clearance (mCC) was determined as:
694· (creatinine excretion in mmol/d)/plasma creatinine in µmol/L).
The renal milrinone clearance and mCC were compared with linear regression analysis.
**Results:** Eighteen patients were included (13 men and 5 women), from whom 163 plasma samples and 40 24 h urine samples of 24 h urine were collected. The milrinone administration rates ranged from 0.50 to 2.88 mg/h (0.09 to 1.00 µg/kg/min), with plasma concentrations from 60 to 475 µg/L. Renal milrinone clearance varied from 2 to 387 mL/min and mCC varied from 2 to 121 mL/min. The relationship between the milrinone renal clearance and mCC was linear ($R^2 = 0.79$; $P < 0.001$), with a ratio of 2.42 (95% CI 2.23 to 2.61).
**Conclusions:** In ICU patients, the renal milrinone clearance is more than double the measured creatinine clearance. With a linear relation across a range of clearances, renal milrinone handling follows the intact nephron hypothesis.
Thus linear milrinone dose adjustments based on the mCC in critically ill patients with renal impairment seem justified.

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2. None.

**Topic:** Poisoning/Toxicology/Pharmacology

## 001488
### Gender and age affect quality of life after cardiac surgery
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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001488

**Introduction:** Quality of life (QoL) is a subjective perception of a person's well-being level influenced by sociocultural structures. Indicators of high QoL are a person's ability to carry out daily activities, maintain a good level of mobility, functional independence from others, self-service, social contacts, emotional stability, and no feeling of pain or other symptoms of discomfort [1]. Both preoperatively and postoperatively, QoL plays a vital role in the outcome after cardiac surgery and is affected by preoperative, intraoperative, and postoperative factors [2]. Patients often experience pain, discomfort, muscle weakness, reduced function, symptoms of depression, and an inability to return to their preoperative levels of function. These symptoms significantly diminish their level of QoL.
**Objectives:** This study investigated the QoL of patients who underwent cardiac surgery and the correlation of QoL with gender and sex.
**Methods:** This observational study included 578 consecutive patients who underwent cardiac surgery (CABG, surgical valve replacement/reconstruction, other heart surgery) and were hospitalized in the Cardiac Surgery ICU. Three months after their discharge from the hospital, the QoL was assessed with the EuroQol 5-Dimension 5-level (EQ-5D 5L) health status questionnaire.
**Results:** Of the total, 408 patients aged 70 (62–75) years were evaluated. The respondents' rating of their 'health today' as captured with the Visual Analogue Scale (EQ-VAS) score was 80 (70–90) and negatively correlated to age, $r\ (406) = -0.115$, $p = 0.02$). According to the EQ-5D-5L index value, the rates of self-reported problems (slight, moderate, severe, or extreme) were 46.6% ($N = 190$) for mobility, 41.2% ($N = 168$) for pain/discomfort, 38.5% ($N = 157$) for anxiety/depression, 19.9% ($N = 81$) for usual activities and 6.9% ($N = 28$) for self-care. Women reported higher rates of mobility problems (slight, moderate, severe, or extreme) compared to men [67.1% ($N = 57$) vs. 41.2% ($N = 157$), $\chi 2 = 23.924$, $df = 4$, $sig < 0.001$]. Patients over 65 years old experienced more difficulties (slight, moderate, severe, or extreme problems) with usual activities compared to participants $\leq 65$ years old [23.9% ($N = 65$) vs. 11.8% ($N = 16$), $\chi 2 = 9.873$, $df = 4$, $sig = 0.043$].
**Conclusions:** Patients report a good quality of life in the short-term period after cardiac surgery. Gender and age affect the postoperative quality of life, with women and older patients experiencing deterioration in mobility and ability to perform usual activities, respectively.

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**Topic:** Cardiovascular issues in ICU

## 001489
### Acidemia at ICU admission: prognostic indicator for mortality in critically ill patients
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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001489

**Introduction:** Acidemia is a common clinical finding in critically ill patients admitted to the intensive care unit (ICU). This metabolic disturbance can result from a variety of etiologies. Although acidemia has long been recognized as a marker of systemic disease, its prognostic importance in predicting patient outcomes, particularly mortality, remains an area of active research.
**Objectives:** The aim of this study is to investigate the association between acidemia and mortality among patients admitted to the ICU, to determine whether the presence of acidemia on admission is predictive of a higher risk of mortality.
**Methods:** Retrospective observational study to explore the relationship between acidemia and various clinical variables in patients admitted to an ICU in 2023. Two groups were defined: group 1 (G1) with a pH level $< 7.35$, and group 2 (G2) with a pH level $\geq 7.35$. Clinical data included demographic information, ICU stay duration, mortality rates, need for invasive mechanical ventilation (IMV), admission reason, arterial blood gas parameters (pH, pCO2, HCO3), laboratory values (urea, creatinine), and requirement for renal replacement therapy (RRT). Statistical significance was defined as $p < 0.05$.
**Results:** The study involved 477 patients, with G1 ($n = 119$) and G2 ($n = 358$). G1 had an average age of 67.6 years, 33.6% of women and G2 64.8 years with 34.6% of women. Age and gender differences were not statistically significant. G1 had a slightly higher proportion admitted for medical reasons (74.8%) compared to G2 (66.2%), though not

statistically significant ($p = 0.081$). Patients in G1 had higher severity criteria on admission than those in G2, with statistically significant differences in several parameters: a higher percentage of G1 patients (60%) were admitted to level 3 of care compared to G2 (42.7%) ($p < 0.001$); ICU mortality was significantly higher in G1 (31.1%) compared to G2 (17.6%) ($p = 0.002$). Similarly, hospital mortality after ICU discharge was also significantly higher in G1 (38.6%) compared to G2 (25.4%) ($p = 0.006$); G1 patients had a significantly lower mean pH (7.19 vs. 7.42, $p < 0.001$) and higher mean pCO2 (43.8 vs. 38.6 mmHg, $p < 0.001$) compared to G2. In addition, the mean HCO3- level was significantly lower in G1 (18.1 vs. 24.8 mEq/L, $p < 0.001$). The average concentrations of creatinine (mg/dL) (2.6 vs. 1.6, $p < 0.001$) and urea (mg/dL) (100.9 vs. 70.6, $p < 0.001$) were significantly higher in G1 compared to G2. A higher percentage of patients in G1 required IMV (60.5% vs. 31%, $p < 0.001$) and RRT (31.1% vs. 7.2%, $p < 0.001$) compared to G2.

**Conclusions:** These results suggest that patients with acidemia on admission to the ICU had a more severe clinical profile and worse outcomes compared to those without acidemia. The differences observed underline the prognostic significance of acidemia in critically ill patients and highlight the importance of early recognition and appropriate management of this metabolic disorder.

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**Topic:** Health Services Research and Outcome

## 001490

### Economic evaluation of remifentanil compared to fentanyl for analgo-sedation in mechanically ventilated patients in intensive care unit


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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001490

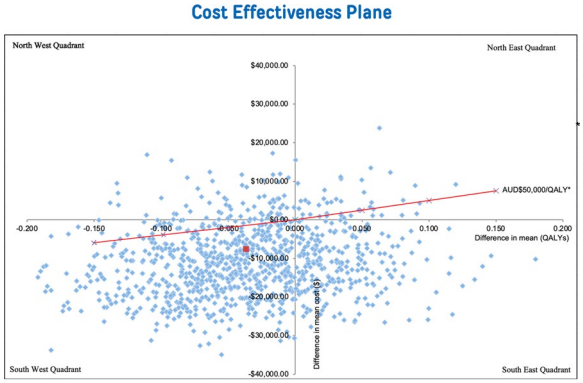

**Introduction:** Over 50,000 critically ill patients annually require mechanical ventilation (MV) in an Australian intensive care unit (ICU) (1). Opioid analgesics (usually Fentanyl) are used to relieve the pain and anxiety associated with IMV but may increase complications from prolonged deep sedation (2,3). In contrast, the ultra-short-acting Remifentanil could provide earlier extubation/ICU discharge and therefore, potentially cost-saving (4). Despite this, the economic disincentive of Remifentanil use in ICU is limited by its acquisition cost (5). Reported economic evaluations demonstrated heterogenous results. Furthermore, there are no published Australian cost-effectiveness analysis (CEA).

**Objectives:** To evaluate the cost effectiveness of Remifentanil compared to Fentanyl in improving quality of life in mechanically ventilated ICU patients from a healthcare perspective.

**Methods:** This was a post-hoc study of a randomised controlled trial (RCT), Remi-fent1 (3). In this study, Health-Related Quality of Life (HRQoL) at six months measured with the EQ-5D-5L instrument was used to calculate outcomes as quality-adjusted life years (QALYs). QALYs were derived by integrating the EQ-5D-5L visual analogue scale (VAS) score with a duration of time. Study data on hospital resource use was used to calculate costs from a healthcare perspective. Primary outcome: Economic evaluation used cost-utility analysis to assess cost-effectiveness overall. The subgroups included sex, age (< 65 vs. ≥ 65 years) and IMV duration (< 72 vs. ≥ 72 h).

**Results:** 210 patients were included (Remifentanil group = 104, Fentanyl group = 106). The overall mean per-patient cost was lower for the Remifentanil group than for the Fentanyl group ($22,306 [$11,157–$51,068] vs. $30,006 [$17,363–$57,868]; $p = 0.006$). The cost-effectiveness of Remifentanil vs. Fentanyl treatment was $192,483/QALY gained. 103 patients were alive at 6 months: No difference in HRQoL; and the mean QALYs gained was similar (0.43 vs. 0.47; $p = 0.11$). The findings were similar by age group, but Remifentanil may be more cost-effective in females than males and those who received IMV for < 72 h.

**Conclusions:** With lower costs and minimal 6-month effects, Remifentanil appeared to be cost-effective compared to Fentanyl. Remifentanil's cost-for-effect trade-off may be deemed 'worthwhile' as an alternative to Fentanyl for better ICU resource allocation. Further evaluation in adequately-powered multi-centre phase-2 trials is required to confirm impacts on longer-term HRQoL and costs outcomes.




* In Australia, the Pharmaceutical Benefits Advisory Committee (PBAC), without a formal willingness-to-pay threshold, deems approximately AUD$50,000 per Quality-Adjusted Life Year (QALY) gained as reasonable value for money.

**(abstract 001490)** Cost-effectiveness plane (CEP): The x-axis denotes the difference in effectiveness and the vertical axis represents the cost difference between the two interventions. The results show that 72% of the 1000 non-parametric bootstrap iterations for Remifentanil fell in the southwest quadrant: lower costs and (perhaps) lower outcomes. The uncertainty surrounding costs and effects due to the statistical variation in both resource use and outcomes was inevitable. Points below this line also represented iterations where remifentanil would be judged as a worthwhile choice over fentanyl

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6. n/a

**Topic:** Sedation, analgesia and delirium

## 001492

### Epidemiology, ventilation management, and outcomes in invasively ventilated COVID–19 patients—an analysis of four observational studies in 4 countries in 2 continents

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001492

**Introduction:** The coronavirus disease 2019 (COVID-19) pandemic has led to an unprecedented global health crisis (1). Epidemiology, ventilation management and outcomes of patients with ARDS due to COVID-19 have been reported extensively (2–5), yet these have never been compared amongst patients from different countries.
**Objectives:** To compare epidemiology, ventilator management and outcomes among COVID-19 ARDS patients from Argentina, Brazil, the Netherlands and Spain.
**Methods:** We conducted an individual patient data analysis of four observational studies. The primary endpoint is mortality in the intensive care unit. Secondary endpoints include mortality at 28 and 60 days, and duration of ventilation. We used propensity score weighting to control for observed confounding factors.
**Results:** This analysis included 6702 patients, 1500 from Argentina, 844 from Brazil, 975 from the Netherlands and 3383 from Spain. There were substantial differences in baseline characteristics between countries. There were small differences in ventilation management. ICU mortality was higher in Argentina and Brazil, compared to the Netherlands and Spain (Fig. 1, 59.6 and 56.6% vs 32.1 and 34.7%; P < 0.001). Similar differences existed for the other mortality rates. The median number of days free form ventilation and alive at day 28 was equally low (0 [0 to 7]. 0 [0 to 18], 1 [0 to 16] and 0 [ 0 to 16] days; P = 0.03), the median number of days free form ventilation and alive at day 60 was higher in the Netherlands and Spain (0 [0 to 37], 0 [ 0 to 50], 33 [0 to 48], and 26 [0 to 48] days; P < 0.001). Propensity score matching confirmed the outcome differences.
**Conclusions:** Outcome of COVID-19 ARDS patients in Argentina and Brazil was substantially worse compared to that of patients in The Netherlands and Spain. It is unlikely that this difference results from differences in case mix or ventilation management.

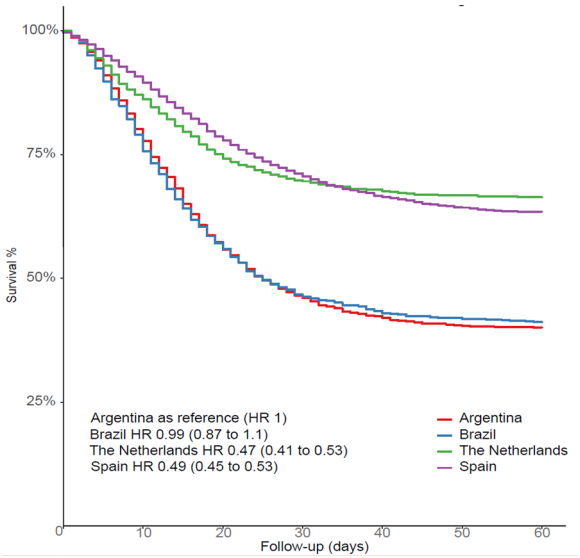


**Fig. 1 (abstract 001492)** Kaplan Meier curves for survival until day 60 in the four countries. HR = hazard ratio

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001493

### Persistent critical illness and long-term outcomes in patients post cardiac surgery: a multicentre retrospective cohort study

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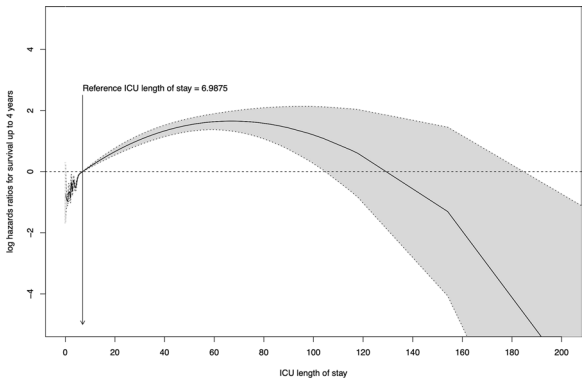
***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001493

**Introduction:** Persistent critical illness (PerCI) is common in patients admitted to intensive care units (ICU). The impact of long-term survival post-cardiac surgery with PerCI is unclear.
**Objectives:** We aimed to investigate the long-term survival of patients with PerCI post-cardiac surgery.

**Methods:** We performed a retrospective, multicentre, cross-sectional study using data submitted to the Australian and New Zealand Intensive Care Society Adult Patient Database from 84 Australian and New Zealand ICUs between 2018–2023. Patients ≥ 16 years post-cardiac surgery and a documented ICU length of stay were included. The presence of PerCI was defined as an ICU length of stay ≥ 7 days. We compared the survival time up to 4 years from ICU admission using time-varying robust-variance estimated Cox proportional hazards models. We further investigated the impact of PerCI as a non-linear predictor of mortality.
**Results:** We included 92,822 patients in the final analysis, and 4497 patients (4.8%) had PerCI. Patients with PerCI had lower four-year (81.5% [95%CI: 80.1–82.9%] vs. 95.0% [95%CI: 94.8–95.1%]; $p < 0.001$) survival rates compared to patients without PerCI. Patients with PerCI had higher mortality (adjusted Hazard Ratio: 2.85, 95%-CI: 2.52–3.22); this was consistent across several sensitivity analyses. When analysed as a non-linear predictor, the hazards of mortality were inconsistent up until seven days, before plateauing up to 100 days of ICU length of stay.
**Conclusions:** In this multicentre retrospective observational study patients with PerCI post cardiac surgery tended to have poorer long-term outcomes. However, the hazards of mortality plateaued beyond the first seven days of ICU stay. Further studies should investigate predictors of developing PerCI, to better prognosticate long-term outcomes.




**(abstract 001493)** Non-linear smooth Hazard ratio curve demonstrating the hazards of mortality were inconsistent up until seven days, before plateauing

**Topic:** Perioperative care

## 001495

### Immunomodulatory therapies for sepsis-induced immunosuppression targeting HLA-DR expression fail to improve overall monocyte function—an ex vivo study

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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001495

**Introduction:** Sepsis survivors are at increased risk of subsequent infection due to persistent immunosuppression; key features include suppressed monocyte HLA-DR expression and lymphopenia [1] Clinical trials using immunomodulatory treatments (e.g. IFN-γ) to restore monocyte HLA-DR have not clearly demonstrated clinical benefit [2].
A possible explanation is that targeting HLA-DR isn't the whole picture; HLA-DR suppression is just one feature of global monocyte dysfunction. Therefore immunomodulatory treatments aimed solely at increasing HLA-DR expression may be insufficient to improve monocyte function [3].
**Objectives:** How do changes in HLA-DR expression after ex vivo stimulation with LPS and IFN-γ relate to global monocyte function.
**Methods:** Peripheral blood mononuclear cells (PBMCs) were isolated from healthy volunteers and from septic ICU patients. To model the monocyte response to a secondary infection, PBMCs were stimulated ex vivo for 24 h with or without LPS, and co-incubated with or without IFN-γ (both 100 ng/ml).
Spectral flow cytometry was used to assess monocyte immunophenotype and function including (i) antigen presentation (HLA-DR/-DP/-DM, CIITA, CLIP, CD80, CD86) (ii) activation (TLR4, NF-κB), (iii) chemotaxis (CCR2), (iv) phagocytosis (FcγR1, NOX-2), (v) cytokine production (TNF-α, IL-1β, IL-10, IFN-γ), (vi) inflammasome assembly (NLRP3), and (vii) T-cell suppression (PD-L1).
HLA-DR expression was compared using the Wilcoxon or Mann–Whitney test (paired and unpaired data, respectively). Monocyte function was analysed using multiple Mann–Whitney tests, and Volcano plots were generated using a false discovery rate of 5%.
**Results:** 24 ICU patients (10 [42%] non-survivors) and 9 volunteers were recruited. [4] Baseline HLA-DR expression was lower in ICU patients ($p < 0.0001$) (Fig a.i.). After the LPS stimulus, HLA-DR increased in volunteers ($p = 0.0039$) but not in patients, consistent with an immunosuppressive phenotype. (Fig a.i.) IFN-γ increased HLA-DR expression in both unstimulated volunteers ($p = 0.0117$) and patients ($p = 0.0385$) (Fig b.i.) and with LPS stimulation ($p = 0.0273$ and $p = 0.0068$, respectively). (data not shown).
In ICU patients, LPS stimulation unmasked multiple defects (all q-values > 1.3) in antigen presentation pathways (HLA-DR, HLA-DP, CD86 and CLIP) and cytokine release (IL-10 and TNF-a) when compared to volunteers. (Fig a.ii. and a.iii., respectively) IFN-γ increased HLA-DR and HLA-DM expression in volunteers but not when co-incubated with LPS. (Fig b.ii.) In ICU patients, IFN-γ had no effect on antigen presentation but increased PD-L1 (Fig b.iii.). Similar effects were seen when IFN-γ was co-incubated with LPS. (data not shown).
**Conclusions:** Monocytes from septic ICU patients display an immunosuppressive phenotype and are unable to respond to a secondary infection.
While IFN-γ treatment increases surface HLA-DR expression in patients it does not modulate other parts of the impaired antigen presentation pathway nor reverse other defective monocyte functions. It does, however, upregulate markers of T-cell suppression (PD-L1), exacerbating the immunosuppressive phenotype.
This may explain why immunomodulatory treatments targeted at increasing monocyte HLA-DR expression have not clearly demonstrated improved outcomes in clinical trials.

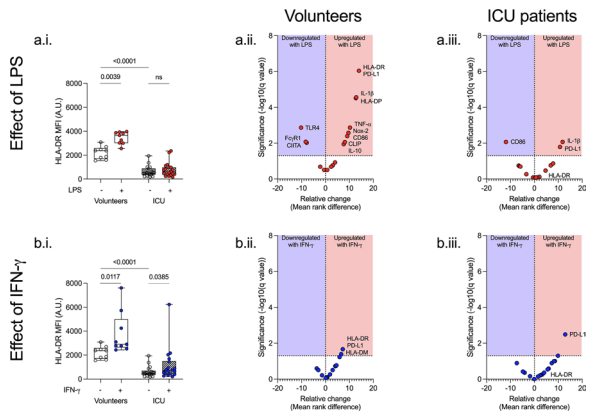


**Fig. (abstract 001493)** LPS stimulation unmasks impaired monocyte HLA-DR expression (a.i.) and function in ICU patients compared to volunteers (a.ii. and a.iii.). IFN-y increases HLA-DR expression (b.i.) but not global monocyte function (b.ii. and b.iii.)

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**Topic:** Sepsis

## 001497

### Prognostic scoring systems used in critically ill patients with spontaneous intracerebral hemorrhage

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**Introduction:** Spontaneous intracerebral hemorrhage (ICH) is a common reason for admission to Intensive Care Units (ICU) and it is associated with high morbidity and mortality. Risk prediction of mortality through the use of scoring systems could be important in clinical decisions.
**Objectives:** The purpose of this study was to determine if a scale created with the combination of a severity scoring system commonly used in ICU and a specific score used in patients with ICH, could improve the prognostic capacity in this type of pathology.
**Methods:** Retrospective study of a cohort of patients admitted to the ICU of Gregorio Marañón Hospital (Madrid, Spain) with a diagnosis of spontaneous intracerebral hemorrhage (ICH) between the years 2022–2023. Data collected included demographics and clinical data, severity of illness assessed by APACHE II, ICH score (intracerebral hemorrhage score), as well as by a score created with the combination of both (ICH-APACHE score) and hospital mortality.
Descriptive statistics were expressed as means with standard deviation for normally distributed continuous variables, medians with interquartile range (IQR) for non-normally distributed variables, and percentages for categorical. The ability of the scoring systems to discriminate prognosis was assessed using the area under the receiver operating characteristic (AUROC) curve. Estimation of their calibration was established through the Hosmer–Lemeshow goodness of fit test. Finally, a comparison between the usual scales and the scale created, through the area difference of paired samples under ROC curves, considering the non-existence of differences between scales when the significance was $p > 0.05$.
**Results:** Eigthy-nine patients, 63% male. Age 62 yrs (51–72). Charlson Comorbidity Index 0 pts (0–2). Severity scores: APACHE II 22 pts (16–26), ICHS 3 pts (2–4), Scoring created (ICH-APACHE II) 25 pts (18–29), GCS 10 pts (5–14). Neutrophil-to-lymphocyte ratio 5 (3–11). The supratentorial location was the most frequently observed (75%), with brainstem involvement in 9% of patients, 57% exhibited midline shift and 63% intraventricular bleeding. During ICU stay, 85% of patients needed mechanical ventilation and hospital mortality was 55%.
We confirmed that all severity scores analyzed were predictors of mortality: APACHE II (OR 1.21; 95% CI 1.11–1.33), ICH score (OR 2.28; 95% CI 1.78–4.39), ICH-APACHE score (OR 1.20; 95% CI 1.10–1.30).
Using the AUROC curves (Fig. 1), the ICH-APACHE score on admission was found to be the most reliable scoring system to discriminate hospital mortality (AUROC 0.82; 95% CI 0.73–0.91) with a good calibration ability (Chi-squared 5–23, $p = 0.63$). The results obtained in the others severity scores were: APACHE II score (AUROC 0.80; 95% CI 0.71–0.89) with good calibration ability too (Chi-squared 10.38, $p = 0.24$) and ICH score (AUROC 0.79; 95% CI 0.70–0.88) with good calibration ability too (Chi-squared 1.01, $p = 0.91$). However, there were no significant differences in the ability to discriminate between the scales analyzed (Table 1).
**Conclusions:** Our data suggest that the severity score created, with a combination of different severity scores systems used in critically ill patients with intra-cerebral hemorrhage, does not improve the prognostic predictive capacity of each of them individually.

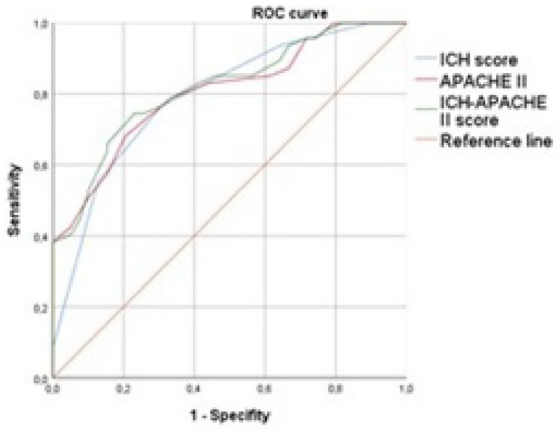


**Fig. 1 (abstract 001497)** AUROC severity scoring system

**Table 1 (abstract 001497)** Area difference of paired samples under ROC curves.

| | Sig. | AUC difference | 95% CI Lower limit | 95% CI Upper limit |
|---|---|---|---|---|
| ICH score vs APACHE_II | ,815 | -,010 | -,092 | ,073 |
| ICH score vs ICH-APACHE II score | ,515 | -,023 | -,092 | ,046 |
| APACHE II vs ICH-APACHE II score | ,118 | -,013 | -,030 | ,003 |

**Topic:** Neurointensive care

## 001498

### Short-term outcomes of extracorporeal cardiopulmonary resuscitation in old age patients with in-hospital cardiac arrest

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001498

**Introduction:** Optimal patient selection is pivotal in improving both survival rates and functional outcomes of extracorporeal cardiopulmonary resuscitation (ECPR). Although advanced age is often considered a relative contraindication for ECPR initiation, the influence of old age on the outcomes of patients treated with ECPR for in-hospital cardiac arrest (IHCA) remains unclear.
**Objectives:** This study aimed to investigate the relationship between advanced age and short-term clinical outcomes of ECPR following IHCA.
**Methods:** Patients aged 65 years or above placed on venoarterial extracorporeal membrane oxygenation (VA-ECMO) for IHCA between January 2018 and December 2022 were retrospectively analyzed.
**Results:** A total of 167 patients were included in the study. Sixty-eight (40.7%) patients were successfully weaned off VA-ECMO, while 99 (59.3%) patients expired on VA-ECMO support. The average age did not show a significant difference between the two groups ($72.7 \pm 6.4$ vs. $74.2 \pm 5.8$; $p = 0.122$). Of the 167 patients, 104 (62.3%) patients were aged between 65 and 75 years and 63 (37.7%) were above 75 years of age. The older group revealed a decreased likelihood of successful weaning from VA-ECMO (20 (31.7%) vs. 48 (46.2%); $p = 0.094$) and a lower survival rate until hospital discharge (14 (22.2%) vs. 39 (37.5%); $p = 0.060$), these differences nonetheless did not reach statistical significance. Moreover, patients within the older group who were successfully separated from VA-ECMO presented a trend towards an unfavorable neurologic outcome, indicated by a greater number of patients with a cerebral performance categories score of 3–5 (24 (50.0%) vs. 16 (80.0%); $p = 0.103$). However, the results were not statistically significant.
**Conclusions:** Although advanced age may demonstrate increased risk with poorer outcomes for ECPR, old age is not an absolute contraindication for VA-ECMO initiation. Patients of old age may require a more thorough evaluation and careful patient selection for optimal ECPR outcomes.

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**Topic:** Cardiovascular issues in ICU

## 001499

### The effect of exogenous melatonin and melatonin receptor agonists on intensive care unit and hospital length of stay: a systematic review and meta-analysis

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001499

**Introduction:** Melatonin is a hormone involved in the promotion and regulation of sleep [1]. Disrupted sleep is common in the ICU [2] and is associated with detrimental effects on multiple body systems [3]. Sleep disruption is implicated in the risk for delirium [4] which in turn is associated with prolonged ICU stay [5]. Melatonin supplements and melatonin receptor agonists have been associated with improved sleep for patients admitted to the ICU [6] and lower incidences of delirium [7]. Melatonin and melatonin receptor agonists may therefore have an effect on ICU and/or hospital length of stay.

**Objectives:** The following are the primary objectives for this systematic review:

1. To investigate the relationship between exogenous melatonin or melatonin receptor agonists in the ICU, and ICU length of stay.
2. To investigate the relationship between exogenous melatonin or melatonin receptor agonists in the ICU, and total hospital length of stay.

The review also aimed to address the following secondary objectives:

1. To examine the effect of the dose of exogenous melatonin or melatonin receptor agonist on the length of ICU and/or hospital stay.
2. To examine the relationship between exogenous melatonin or melatonin receptor agonist, ICU and/or hospital length of stay, and patient age.

**Methods:** Six databases and three trial registries were searched for studies relevant to melatonin, ICU and length of stay. Screening was conducted independently by two reviewers, along with the risk of bias assessments and quality appraisals. Meta-analyses were conducted to synthesise the data on the effect of melatonin and melatonin receptor agonists on ICU an total hospital length of stay.

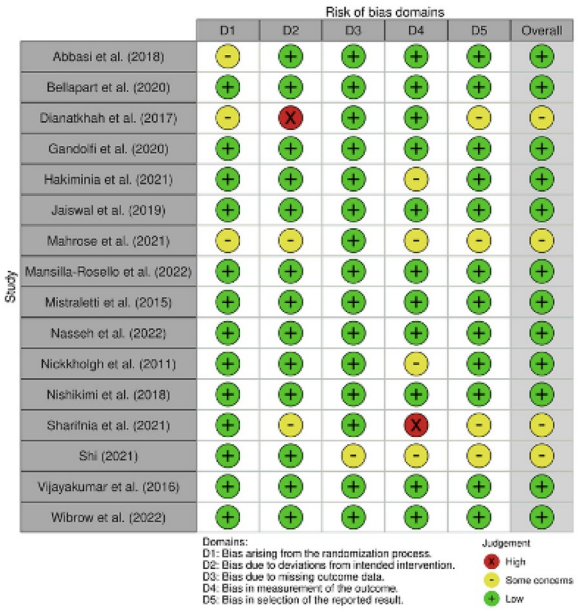
**Results:** Sixteen studies were reviewed. Of those, 13 studies involving 1.903 participants were included in the meta-analysis on the effect of melatonin and melatonin receptor agonists on ICU length of stay. This demonstrated a trend in favour of melatonin but did not reach statistical significance (mean difference [MD] = − 0.29 days [confidence interval (CI) − 0.89, 0.30], $p = 0.332$). Heterogeneity was high across groups ($I2 = 61\%$ [CI 29–79%], $p = 0.002$). The prediction interval indicates that based on current results we can be 95% certain that the MD in the next new study would be between − 2.57 and 1.47 days. Results from subgroups are as follows: melatonin MD − 0.28 days (CI − 0.93, 0.36), $p = 0.387$; ramelteon MD − 1.16 days (CI − 4.6, 2.29), $p = 0.510$.

Ten studies involving 1.930 participants were included in the meta-analysis on the effect of melatonin and melatonin receptor agonists on total hospital length of stay. A non-statistically significant trend in favour of melatonin was again demonstrated (MD = -0.98 days [CI − 2.22; 0.25], $p = 0.118$). Heterogeneity was again significantly high $I2 = 61\%$ [CI 23%–81%], $p = 0.005$). The prediction interval indicates that based on current results. There is 95% certainty that the MD in the next new study would be between − 5.12 and 2.65 days. Melatonin and ramelteon subgroup results are as follows: melatonin MD − 1.31 days (CI − 2.66, 0.05), $p = 0.059$; ramelteon MD 0.71 days (CI − 0.69, 2.11), $p = 0.322$.

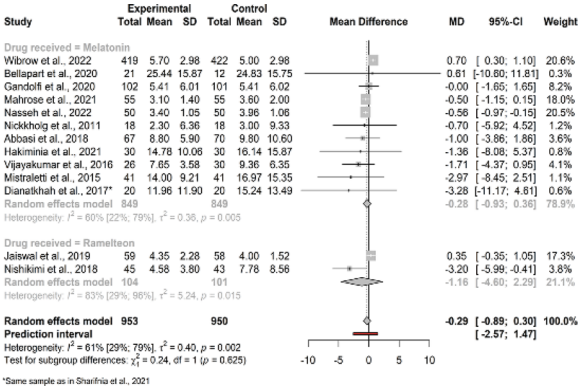
None of the included studies examined whether the dose of melatonin or melatonin receptor agonist affected the length of stay in ICU and/or hospital stay. There was considerable heterogeneity between melatonin dosage and frequency of dosing across studies.

None of the included studies examined the relationship between exogenous melatonin or ramelteon treatment, ICU and/or hospital length of stay, and patient age.

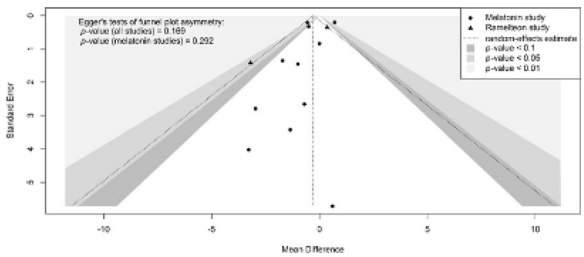
**Conclusions:** Melatonin and melatonin receptor agonists were not associated with a reduction in ICU and hospital length of stay. Results should be interpreted with caution due to significant heterogeneity.



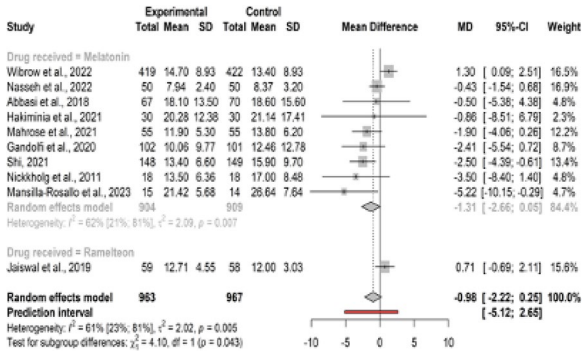

**(abstract 001499)** "Traffic light" plot of the domain-level risk of bias judgements for RCTs



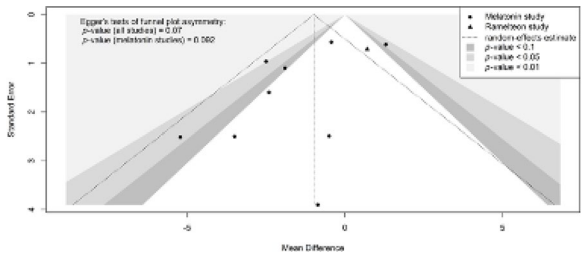

**(abstract 001499)** Forest plot of the effect of exogenous melatonin or ramelteon on ICU length of stay




**(abstract 001499)** Contour-enhanced funnel plot of the effect of exogenous melatonin or ramelteon on ICU length of stay




**(abstract 001499)** Forest plot of the effect of exogenous melatonin or ramelteon on hospital length of stay




**(abstract 001499)** Contour-enhanced funnel plot of the effect of exogenous melatonin or ramelteon on hospital length of stay

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1. No external funding was received to support this research. The authors have no conflict of interests to declare.
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**Topic:** Sedation, analgesia and delirium

## 001502

### Timing until respiratory support and the next pandemic

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001502

**Introduction:** The COVID-19 disease is characterized by severe pneumonia in about 20% of patients leading to admission to intensive care (ICU) in 5 to 10% (1). Non-invasive ventilation (NIV) is well known for its usefulness in acute pulmonary edema (APE) and hipercapnic respiratory failure (2) but current guidelines from ERS/ATS are unable to offer a recommendation on the use of NIV for de novo acute respiratory failure (ARF) (3). Nevertheless, during the COVID pandemic, NIV was largely used as a support on its own or as a bridge before invasive mechanical ventilation (IMV). In this study, our aim was to correlate the timing until respiratory support (RS) and patient outcome in an Emergency Department (ED) and define the role of the Intensive Care Unit (ICU) in this setting.
**Objectives:** Primary outcome was defined as the relation between the timing of NIV (< 48 h or > 48 h) and progression to IMV or death at 28 days. Secondary outcome correlated admission clinical variables and outcome.
**Methods:** Observational and retrospective study from March 2020 to January 2021. Inclusion criteria: > 18 years, with COVID disease who had initiated NIV in the ED. Exclusion criteria: patients who had the previous indication for chronic NIV and maintained their usual parameters, NIV for other causes such as APE. A total of 174 patients met these criteria; 60 patients (34.5%) were supported with NIV alone and survived; 114 patients (65.5%) progressed to IMV and/or died. Data was collected from Soarian Clinical software (Siemens) and through bussiness intelligence system information and statistic analysis was made using Excel (Microsoft Corp.).
**Results:** During this period a total of 4685 patients were admitted to the respiratory circuit (RC). The mean length of stay was 30 h in the RC and 9 h in the general circuit (GC) compared with the previous mean of 6 h. Due to insufficient available ventilators RS was delayed and admission in ICU was decided attending not only to clinical criteria but to human resources as well. Of the 114 non-survivors, 49 (42%) used NIV only, all of them unfit for IMV; 42 patients (37%) progressed to IMV and survived while 23 patients (20%) needing IMV died. For the patients who did IMV and survived, the mean time from admission until the start of NIV was 24 h and for IMV up to 50 h. On the other hand, in the group of patients submitted to IMV who died, the mean time from admission until NIV was 32 h and up to 80 h for IMV. There was, therefore, a difference of 30 h before the start of IMV between the 2 groups.
**Conclusions:** During the COVID pandemic the approach to patients with ARF was evolving, attending both clinical criteria and the availability of resources. The timing until NIV and IMV appear to play an important role in this context. A close collaboration between ED and ICU and an acutely ill patient circuit with the collaboration of both teams should be globally worked out. Finally, looking towards the future, ICU resources should be increased to prepare ourselves for the next pandemic.

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**Topic:** Acute respiratory failure and mechanical ventilation.

### 001504

**Lactate / albumin ratio as a pronostic tool in pulmonary septic shock in a critical care unit in northern Mexico**

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001504

**Introduction:** Sepsis and septic shock are common in critical care, timely diagnosis and prognosis are of utmost importance. L/Aratio has been studied as a prognostic tool with adequate performance to predict mortality. We evaluated lactate/albumin ratio as a prognostic biomarker (1).
**Methods:** A retrospective cohort was conducted. We included patient records of non-pregnant adults who required mechanical ventilation with ARDS due to viral pneumonia during the 2019 pandemic. Descriptive analysis for baseline characteristics at admission was used, median and interquartile range for continuous variables and percentages for categorical variables. An AUC ROC was calculated for lactate/albumin ratio, SOFA, APACHE II and SAPS II, obtained a cut-off value and OR was calculated with 95% CI and a $p = 0.05$.
**Results:** 76 patients were included, and 98% had respiratory illnesses that required admission to the ICU for mechanical ventilatory support. 63% were males, age 59 years (IQR 52–66), BMI 31 (IQR 27–35), hypertension and DM most common comorbidities (67 and 61%, respectively). MAP 71 mmHg (IQR 84–105). Baseline characteristics of laboratory findings are, lactate 1.3 mmol/l (IQR 1–1.7), haemoglobin 13.3gr/dl (IQR 11.7–14.6), total leukocyte count of 15600cels/mm3, serum albumin 30 mg/dl (IQR 26–33), procalcitonin 2 ng/ml (IQR 2–3) and C-reactive protein of 141 mg/l (IQR 63–241). An AUC ROC was calculated for mortality prognostic performance, values for lactate/albumin ratio, SOFA, APACHE II, SAPS II were 0.706, 0.618, 0.658, 0.844, respectively. With a cut-off point of 0.38 at admission, OR for mortality was 3.55 (CI 95% 1.24–10.14, $p = 0.015$). Both groups had a median mechanical ventilation of 10 days, ICU LOS of 12 days, with lower hospital stay for the superior ratio (16 vs 14 days, $p = 0.19$). Overall mortality was 72%.
**Conclusions:** The L/A ratio is a predictor of in-patient mortality in pulmonary shock septico patient when the use is in the first 24 hours.

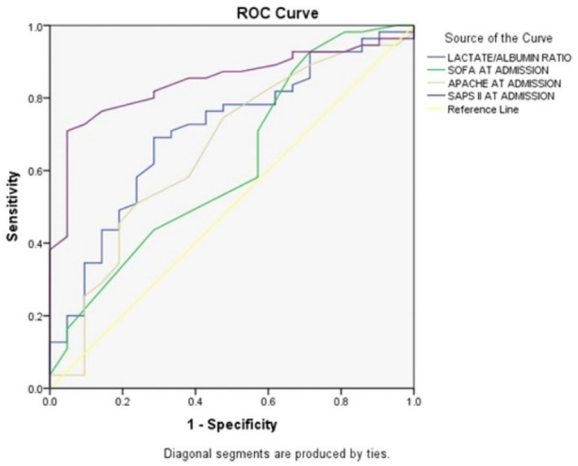


**Fig. 1 (abstract 001504)** AU ROC was calculated for mortality prognostic performance, values for Lactate / albumin ratio, SOFA, APACHE II, SAPS II

**Topic:** Sepsis

### 001506

**Sepsis-induced alterations in skeletal muscle cell membrane cholesterol**

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**Introduction:** Sepsis is often accompanied by muscle weakness and wasting that affect both short- and long-term outcomes. Serum cholesterol levels fall in septic patients, however, the effects of sepsis on membrane cholesterol across different organs—and their potential contribution to organ dysfunction—remains largely unexplored. Given the critical role of cholesterol in maintaining cellular integrity, signalling, and trafficking, alterations in tissue cholesterol levels may exert a significant influence on organ function.
**Objectives:** Pilot study to investigate skeletal muscle membrane cholesterol levels in samples stored from short-term (faecal peritonitis) and long-term (zymosan peritonitis) rat models of sepsis.
**Methods:** Peritonitis was induced in male Wistar rats (~300 g body weight) by either intraperitoneal injection of faecal slurry ($n = 5$) or zymosan ($n = 16$), a glucan polysaccharide component of yeast cell walls, that produces a more prolonged inflammation. Soleus muscle samples were collected at 6 h in the faecal peritonitis model and at 14 days in the zymosan peritonitis model, immediately frozen and stored at − 80 °C until membrane preparation. Control samples were taken from sham-controlled animals ($n = 8$) at 14 days. Membrane cholesterol levels were quantified using an enzymatic assay (Amplex® Red Assay) and normalised to protein concentration (BCA assay). Statistics were performed using Student's *t*-test, with statistical significance established at $p$ values < 0.05.
**Results:** In the zymosan peritonitis model, a significant reduction in skeletal muscle membrane cholesterol levels was observed at 14 days ($p = 0.02$). Similar results were seen in the more severe faecal peritonitis model at 6 h ($p = 0.019$) (Table 1).

**Table 1 (abstract 001506)** Skeletal muscle membrane cholesterol levels

| | Zymosan peritonitis, 14d | Faecal peritonitis, 6h | Healthy sham |
|---|---|---|---|
| Skeletal muscle membrane cholesterol (µg/µg protein) | 0.068 ± 0.014 (16) | 0.062 ± 0.014 (5) | 0.081 ± 0.012 (8) |
| Comparison vs control | 0.02 | 0.19 | – |

**Conclusions**: The zymosan and faecal peritonitis models of sepsis exhibit differing levels of severity, each resulting in diminished membrane cholesterol at distinct time points (6 h vs 14 days), suggesting different underlying mechanisms. While these findings confirm a decrease in cholesterol levels, further research is needed to establish a causal link between alterations in membrane cholesterol and skeletal muscle dysfunction in sepsis.

**Topic:** Sepsis

## 001508

### Impact of ATTM, a sulfide donor, on myocardial plasma membrane tissue cholesterol levels in porcine ischaemia/reperfusion injury

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**Introduction:** Plasma membrane cholesterol plays a critical role in maintaining cellular integrity, signalling, and trafficking. Falls in plasmalemmal cholesterol levels exert a significant influence on cardiomyocyte functionality (1). Studies have highlighted a rapid reduction in myocardial cholesterol levels during ischaemic episodes (2). We are investigating the utility of ammonium tetrathiomolybdate (ATTM) in myocardial ischaemia–reperfusion injury. This sulfide donor transiently inhibits mitochondrial respiration, thereby reducing the production of damaging levels of reactive oxygen species. This was protective in ischaemia–reperfusion (I-R) injury rat models of myocardial infarction, stroke and haemorrhage (3).
**Objectives:** To examine the impact of ATTM treatment on myocardial plasmalemmal cholesterol levels in a porcine model of myocardial I-R injury.
**Methods:** Animal studies were performed at the Translational Biomedical Research Centre, University of Bristol. Myocardial infarction was induced in anaesthetised female large white pigs (67 ± 7 kg) by a 60-min balloon occlusion of the distal left anterior descending coronary artery. At 48 min, ATTM 6 mg/kg was infused over 2 min followed by an 18 mg/kg one-hour infusion. Animals were then recovered and monitored for 24 h at which point they were euthanised with hearts taken for histological and biochemical analyses. Tissue samples were collected from distinct heart regions—the infarct zone in the left ventricle, the penumbra surrounding the infarct, and distant areas within the left and right ventricles. The plasmalemmal fraction was isolated and cholesterol was measured by enzymatic Amplex Red Assay. Levels were normalised to total protein (BCA assay). Results were analysed by Student's *t*-test with statistical significance at $p$ values < 0.05.
**Results:** Infarct size was reduced by ATTM (data previously presented). Compared to control pigs undergoing myocardial I-R injury, a non-significant rise in plasmalemmal cholesterol levels was seen at the infarct site, penumbra, and remote right heart of ATTM-treated pigs (Table 1).

**(abstract 001508)**

| Heart area | Control pigs (8) | ATTM treated pigs (7) | *P* value |
|---|---|---|---|
| Infarct site | 0.141 ± 0.053 | 0.211 ± 0.129 | 0.08 |
| Penumbra | 0.147 ± 0.031 | 0.170 ± 0.046 | 0.29 |
| Remote right heart | 0.153 ± 0.075 | 0.203 ± 0.081 | 0.07 |
| Remote left heart | 0.143 ± 0.045 | 0.138 ± 0.053 | 0.97 |

**Conclusions:** Despite a reduction in infarct size with ATTM, only non-significant increases in plasmalemmal cholesterol were detected at the infarct site, the surrounding penumbra, or remote unaffected regions of the heart. Whether these changes have functional significance requires further study.

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**Topic:** Translational biology

## 001509

### Characteristics and acute outcomes of patients presenting with stroke to neurocritical care

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**Introduction:** Stroke represents a significant global health challenge, marked by considerable morbidity and mortality [1]. Factors influencing survival among stroke patients encompass age, sex, initial stroke severity, hyperglycaemia, fluctuations in blood pressure and hyperthermia. Despite this, research on stroke patients in neuro-intensive care remains limited.
**Objectives:** This study seeks to profile stroke patients in the neurointensive care unit and explore factors that could influence early stroke mortality.
**Methods:** We reviewed adult patients presenting to a tertiary neurocritical care unit in London between January and December 2023 with a diagnosis of ischaemic stroke, intracerebral haemorrhage (ICH) or non-traumatic subarachnoid haemorrhage. Patients < 18 years, pregnant or breast-feeding patients and those with trauma, tumour or infective intracranial lesions were excluded. The diagnosis was confirmed by neuroimaging. Demographic and clinical data were obtained from the hospital databases. Data were analysed using the GraphPad Prism (Version 10.0.3 for macOS, GraphPad Software, Boston, Massachusetts USA, 2023). Spearman rank correlation coefficient was used to calculate nonparametric correlations between death and sex, type II diabetes, hypertension, dyslipidaemia, atrial fibrillation, delirium, presence of infection, chronic kidney disease, chronic respiratory disease, or requirement for mechanical ventilation.
**Results:** We reviewed 120 patients presenting to neurocritical care; 51 male, 68 female, mean age 56 years, range 16–87 years. Diagnoses included ischaemic stroke (23.3%), intracranial haemorrhage (35%)

and non-traumatic subarachnoid haemorrhage (40%). The vascular territory most affected was supplied by the middle cerebral artery (43.3%), followed by the anterior cerebral artery (20.8%). Patients were admitted to ICU for mechanical ventilation (69.2%), neurological complications (e.g. low GCS, hydrocephalus, vasospasm and seizures) (58.3%), cardiac complications (11.6%), respiratory complications (e.g. pneumonia, aspiration pneumonitis and pulmonary embolism) (26.7%) and others (e.g. diabetic ketoacidosis, hyponatraemia) (4.16%). Nearly half (47.5%) of the patients were transferred from other hospitals with 5% being a direct ICU referral. 92.5% of patients had an initial modified Rankin score of 0 or 1 indicating a high baseline level of functioning. In total, 69.2% of required mechanical ventilation either for management of low Glasgow Coma Score (30.8%), to facilitate surgical management, or to manage specific complications e.g. severe agitation or bulbar dysfunction.

Median ICU length of stay was 8 days (IQR 12, range 1–70) and the hospital length of stay was 21 days (IQR 37, range 1–427). 20% of patients died in ICU, 14.1% due to a cardiac death and 5.8% due to brainstem death. In-hospital mortality was 25.8%, though this may not reflect actual mortality as patients were often repatriated to their base hospitals. Acute mortality in stroke patients correlated strongly with hypertension ($p < 0.004$, CI -0.4288 to -0.08351) and mechanical ventilation ($p < 0.0001$, CI 0.1664 to 0.4950).

**Conclusions:** Hypertension and the need for mechanical ventilation were identified as risk factors for acute mortality after ICU admission for stroke.

**(abstract 001509) .**

| Characteristics | No of patients (n=120) |
|---|---|
| Age years (range) | 16-87 |
| <50, (n, %) | 36 (30%) |
| 50-64 (n, %) | 42 (35%) |
| 65-79 (n, %) | 37 (30.8%) |
| >80 (n, %) | 3 (2.5%) |
| Gender (n, %) | |
| Male | 51 (42.5%) |
| Female | 68 (56.7%) |
| Type of stroke (n, %) | |
| Ischaemic stroke | 28 (23.3%) |
| Intracranial haemorrhage | 42 (35%) |
| Non-traumatic subarachnoid haemorrhage | 48 (40%) |
| Vascular territory effected (n, %) | |
| Anterior cerebral artery | 25 (20.8%) |
| Middle cerebral artery | 52 (43.3%) |
| Posterior cerebral artery | 16 (13.3%) |
| Basal ganglia | 3 (2.5%) |
| Internal carotid artery | 6 (5%) |
| Other | 18 (15%) |
| Comorbidities (n, %) | |
| Diabetes type II | 20 (16.6%) |
| HTN | 73 (60.8%) |
| Dyslipidaemia | 44 ( 36.6%) |
| Atrial fibrillation | 8 (6.6%) |
| Known smoker | 36 (30%) |
| Chronic kidney disease | 8 (6.6%) |
| Cerebrovascular disease | 11 (9.2%) |
| Chronic respiratory disease | 13 (10.8%) |
| Indication for ICU management (% ) | |
| Neurological complications | (58.3%) |
| Cardiac complications | (11.6%) |
| Respiratory complications | (26.7%) |
| Other | (4.1%) |
| Source of admission (n, %) | |
| Emergency assessment unit | 21 (17.5%) |
| Emergency department | 6 (5%) |
| Wards | 27(22.5%) |
| Direct ICU referral | 6 (5%) |
| Operating Theatre | 4 (3.3%) |
| External referral | 51 (42.5%) |
| Time of admission (08:00-20:00) (n, %) | 95 79.2%) |
| Mechanical ventilation (n, %) | 83 (69.2%) |
| Duration in days (Median, IQR, range) | 4, 10, 1-55 |
| Length of stay and mortality. | |
| Length of stay in ICU (days), (median, IQR, range) | 8, 12, 1-70 |
| Length of stay in Hospital (days), (median, IQR, range) | 21, 37, 1-427 |
| ICU mortality (n, %) | 24 (20%) |
| Brainstem death (n, %) | 7 (5.8%) |
| Cardiac death (n, %) | 17 (14.1%) |
| In-hospital mortality (n, %) | 31 (25.8%) |
| Modified Rankin Score on admission (n,%) | |
| 0 | 97 (80%) |
| 1 | 15 (12.5%) |
| 2 | 4 (3.3%) |
| 3 | 1 (0.8%) |
| 4 | 2, (1.7%) |
| 5 | 0 (0%) |
| 6 | 0 (0%) |
| GCS on presentation to the hospital (n,%) | |
| <8 | 37 (30.8%) |
| >8 | 83 (69.2%) |

**Topic:** Sepsis

**001512**

## A single centre review of practices managing right ventricular dysfunction in patients with an Impella

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**Introduction:** Right ventricular (RV) dysfunction is an independent predictor of mortality in left ventricular (LV) dysfunction1. Although primarily a device to manage the left ventricle (LV), the Impella has been shown to improve RV function by a series of proposed physiological mechanisms pertaining to interventricular dependence, preload, and afterload2,3. However, there is little evidence of successful strategies to manage the complexities of coexistent RV dysfunction for patients with an Impella in situ.
**Objectives:** Review methods used to manage RV dysfunction in patients with an Impella in situ to investigate if there were trends in management that conferred better outcomes.
**Methods:** The local mechanical circulatory support (MCS) registry at Harefield Hospital was used to retrospectively review data. Between January 2019 and October 2022, all patients admitted to Harefield Hospital intensive care unit who had an Impella placed as part of their management, were reviewed for incidences of RV dysfunction. RV dysfunction was diagnosed on transthoracic or transoesophageal echocardiography. Their management plans and pharmacological therapies were reviewed, and their outcomes were recorded.
**Results:** During the 46-month period, 67 patients had an Impella placed. 39 patients (58%) were diagnosed with RV dysfunction, of which there was a 69% 30-day mortality rate. Management strategies for RV dysfunction included single and combined use of inodiltators (such as milrinone, levosimendan), pulmonary vasodilators (epoprostenol; inhaled therapies such as nitric oxide); and escalation to other MCS, such as extracorporeal membrane oxygenation (ECMO) and ventricular assist devices (VADs). Principal findings were that:

- 7.5% of patients were not given any pharmacological or mechanical management for their RV dysfunction, and all of these patients fell into the mortality group.
- 20% were managed with single therapy milrinone and there was an equal distribution between survival and mortality.
- Multimodal pharmacological therapy was more common in the mortality group with 33% compared with 8.5% in the survival group.
- Of the patients who escalated to other MCS, there was a 61% mortality rate.

**Conclusions:** Non-pharmacological cardiac support is now provided by a range of technologies. Their adoption needs careful consideration given the many facets of concurrent pathologies in these patients. There is an inconsistent approach to patients with RV dysfunction and the use of this form of LV support. They are an under-investigated group, and these results highlight the significant level of mortality in patients with RV dysfunction whilst on Impella support. A lack of treatment is linked with poor outcomes, but other treatment plans show varying outcome results. This is a group of patients with complex physiology and multifactorial organ dysfunction. With such a high mortality rate in this cohort, establishing a consistent approach to their cardiac pathology needs to be established and may yield improved outcomes.

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5. 5.n/a

**Topic:** Cardiovascular issues in ICU

## 001515

## Association of interleukin 6 / absolute lymphocyte count index for the development of acute kidney injury in patients with severe ARDS

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**Introduction:** Acute Kidney Injury (AKI) refers to the sudden loss of renal function determined by an increase in baseline creatinine levels greater than 0.3 mg/dl or an increase of 50% in creatinine serum levels. AKI is very common in the intensive care unit with an incidence of 30–60% and is considered a poor prognostic factor in critically ill patients.
In animal models, IL-6 and lymphocyte transcription and signaling were found to be elevated locally and systemically after 60 min of bilateral renal ischemia. This finding indicated that IL-6 and lymphocyte signaling may be employed as a biomarker and therapeutic target in AKI. Various diseases such as Acute Respiratory Distress Syndrome (ARDS) have increased serum levels of IL-6 and lymphocytes and may predispose to AKI.
There are no studies associating the IL-6 / Lymphocyte ratio with the development of AKI in critically ill patients with severe ARDS.
**Objectives:** Determine the association between the IL-6 / Absolute Lymphocyte Index upon admission to the ICU and the development of Acute Kidney Injury according to KDIGO in patients diagnosed with severe ARDS.
**Methods:** Retrospective cohort study. Patients over 18 years old who were admitted to the intensive care unit with a diagnosis of severe ARDS were included. For qualitative variables, the chi-square test ($\chi^2$) was used, for normally distributed quantitative variables, Student's *t*-test, while for non-normally distributed quantitative variables, the Mann–Whitney *U* test was used. To determine the association of biochemical markers, clinical status upon hospital admission, and the development of AKI, an unadjusted logistic regression was performed to identify variables with the greatest impact. These variables were then used to construct a multiple logistic regression model.
**Results:** A total of 98 patients were included, of whom 53 (54.1%) were male, with a mean age of 61.5 years ($\pm$18.0) and 39.8% of patients developed AKI (Table 1). In the unadjusted logistic regression, the variables with the greatest impact were IL-6 > 1169.0 pg/mL OR of 5.6 (95% CI 0.5, 57.1), and the IL-6/Lymphocytes index > 170.1 OR of 2.4 (95% CI 0.7, 7.9) (Table 2). When adjusting for age using multiple logistic regression, the IL-6/Lymphocytes index > 170.1 had an OR of 2.2 (95% CI 0.6, 8.1), and age > 68 years had an OR of 17.76 (95% CI 1.5, 198.9), with an r2 value of 0.142. (Table 3).
**Conclusions:** In this retrospective study, an association was found between elevated levels of IL-6 and the development of Acute Kidney Injury (AKI) in patients diagnosed with severe Acute Respiratory Distress Syndrome (ARDS). Additionally, it was observed that a high IL-6/Lymphocyte ratio could also be related to a higher risk of AKI. These findings suggest that assessing these biomarkers upon admission to the intensive care unit could be useful in identifying patients with severe ARDS who are at increased risk of developing AKI, thereby allowing for early intervention and improved clinical outcomes.

**Table 1 (abstract 001515)** Baseline characteristics.

| Variable | N = 98 | | | | |
|---|---|---|---|---|---|
| | Without AKI n = 59 | | With AKI n = 39 | | p < 0.05 |
| Age (years) [b] | 57.8 | ±16.8 | 67.18 | ±18.3 | 0.955 |
| Sex (Male) [a] | 29.0 | 49.2 | 24.0 | 61.5 | 0.301 |
| Comorbidities [a] | | | | | |
| Diabetes Mellitus Type 2 | 7.0 | 11.9 | 7 | 17.9 | 0.557 |
| Systemic Arterial Hypertension | 14.0 | 23.7 | 14 | 35.9 | 0.254 |
| Chronic Obstructive Pulmonary Disease (COPD) | 2.0 | 3.4 | 3 | 7.7 | 0.384 |
| Cancer | 8.0 | 13.6 | 4 | 10.3 | 0.758 |
| Hepatic Cirrhosis | 1.0 | 1.7 | 1 | 2.6 | 1.000 |
| Congestive Heart Failure | 0.0 | 0 | 2 | 5.1 | 0.156 |
| Acute Myocardial Infarction | 3.0 | 5.1 | 4 | 10.3 | 0.431 |
| Atrial Fibrillation | 3.0 | 5.1 | 6 | 15.4 | 0.150 |
| Biochemical Parameters [c] | | | | | |
| Interleukin 6 (pg/mL) | 35.9 | 15.0, 89.5 | 47.4 | 7.6, 173.0 | 0.259 |
| Lymphocytes (10^3/uL) | 0.8 | 0.4, 1.3 | 0.8 | 0.5, 1.2 | 0.811 |
| Serum Creatinine at Admission (mg/dL) | 0.7 | 0.6, 0.9 | 0.9 | 0.6, 0.9 | 0.289 |
| Glomerular Filtration Rate at Admission (mL/min/1.73m2) | 96.0 | 82.0, 108.8 | 72.0 | 52.0, 98.0 | 0.000 |

[a] The values are presented as n and percentages, χ²

[b] The values are presented as mean and SD, Student's t-test

[c] The values are presented as median, P 25, and P 75, Mann-Whitney U test

**Table 2 (abstract 001515)** Unadjusted logistic regression.

| Variable | Unadjusted OR | 95% C.I. for OR | | $r^2$ |
|---|---|---|---|---|
| | | Inferior | Superior | |
| Diabetes Mellitus Type 2(1) | 1.625 | 0.522 | 5.063 | 0.01 |
| Constant | 0.615 | | | |
| Systemic Arterial Hypertension(1) | 1.800 | 0.741 | 4.373 | 0.023 |
| Constant | 0.556 | | | |
| Chronic Obstructive Pulmonary Disease (COPD)(1) | 2.375 | 0.378 | 14.913 | 0.012 |
| Constant | 0.632 | | | |
| Cancer(1) | 0.729 | 0.204 | 2.607 | 0.003 |
| Constant | 0.686 | | | |
| Hepatic Cirrhosis(1) | 1.526 | 0.093 | 25.146 | 0.001 |
| Constant | 0.655 | | | |
| Acute Myocardial Infarction (1) | 2.133 | 0.450 | 10.105 | 0.013 |
| Constant | 0.625 | | | |
| Atrial Fibrillation (1) | 3.394 | 0.795 | 14.485 | 0.04 |
| Constant | 0.589 | | | |
| Interleukin 6 (pg/mL) | 1.000 | 1.000 | 1.001 | 0.042 |
| Constant | 0.599 | | | |
| IL6 GROUPS | | | | |
| 1 | 2.429 | 0.815 | 7.240 | 0.063 |
| 2 | 5.667 | 0.562 | 57.131 | |
| Constant | 1.269 | | | |
| Lymphocytes(10^3/uL) | 1.171 | 0.779 | 1.760 | 0.008 |
| Constant | 0.561 | | | |
| Index IL-6 /lymphocytes | 1.000 | 1.000 | 1.000 | 0.033 |
| Constant | 0.627 | | | |
| INDEX IL-6 /lymphocytes Groups | | | | |
| 1 | 1.675 | 0.587 | 4.779 | 0.03 |
| 2 | 2.429 | 0.739 | 7.979 | |
| Constant | 0.657 | | | |

**Table 2 (abstract 001515)** Adjusted logistic regression.

| Variable | Adjusted OR | 95% C.I. for OR | | $r^2$ |
|---|---|---|---|---|
| | | Inferior | Superior | |
| Sex | 0.682 | 0.293 | 1.590 | |
| IL6 Groups | | | | |
| 1 | 0.192 | 0.019 | 1.957 | 0.074 |
| 2 | 0.437 | 0.037 | 5.198 | |
| Constant | 3.323 | | | |
| Sex | 0.612 | 0.244 | 1.530 | |
| Age Groups | | | | |
| 1 | 1.137 | 0.278 | 4.656 | |
| 2 | 1.814 | 0.498 | 7.033 | |
| 3 | 16.562 | 1.498 | 186.799 | 0.155 |
| Index Groups | | | | |
| 1 | 1.617 | 0.520 | 5.021 | |
| 2 | 2.162 | 0.593 | 7.881 | |
| Constant | 1.238 | | | |
| Sex | 1.577 | 0.623 | 3.994 | |
| Age Groups | | | | |
| 1 | 1.120 | 0.267 | 4.699 | |
| 2 | 1.955 | 0.503 | 7.596 | |
| 3 | 19.370 | 1.692 | 221.697 | 0.195 |
| IL6 Groups | | | | |
| 1 | 2.523 | 0.797 | 7.985 | |
| 2 | 6.278 | 0.585 | 67.404 | |
| Constant | 1.597 | | | |
| Age Groups | | | | |
| 1 | 1.229 | 0.304 | 4.983 | |
| 2 | 2.451 | 0.649 | 9.260 | |
| 3 | 21.951 | 1.919 | 251.125 | |
| IL6 Groups | | | | 0.204 |
| 1 | 2.610 | 0.828 | 8.229 | |
| 2 | 7.859 | 0.722 | 85.535 | |
| Lymphocytes (10^3\uL) | 1.330 | 0.843 | 2.099 | |
| Constant | 1.530 | | | |
| Lymphocytes (10^3\uL) | 1.284 | 0.805 | 2.047 | |
| Age (years) | 1.036 | 1.009 | 1.063 | |
| Sex | 0.823 | 0.338 | 2.003 | |
| IL6 Groups | | | | 0.174 |
| 1 | 2.629 | 0.808 | 8.555 | |
| 2 | 5.952 | 0.572 | 61.936 | |
| Constant | 0.112 | | | |
| Lymphocytes (10^3\uL) | 1.295 | 0.815 | 2.058 | |
| Age (years) | 1.036 | 1.009 | 1.064 | |
| IL6 Groups | | | | 0.172 |
| 1 | 2.727 | 0.850 | 8.747 | |
| 2 | 6.225 | 0.606 | 63.973 | |
| Constant | 0.110 | | | |
| INDEX GROUPS | | | | |
| 1 | 1.674 | 0.543 | 5.159 | |
| 2 | 2.249 | 0.625 | 8.101 | |
| Age Groups | | | | 0.142 |
| 1 | 1.393 | 0.393 | 5.398 | |
| 2 | 2.140 | 0.574 | 7.985 | |
| 3 | 17.717 | 1.578 | 198.956 | |
| Constant | 0.936 | | | |
| Age Groups | | | | |
| 1 | 1.229 | 0.304 | 4.983 | |
| 2 | 2.451 | 0.649 | 9.260 | |
| 3 | 21.951 | 1.919 | 251.125 | |
| IL6 Groups | | | | 0.204 |
| 1 | 2.610 | 0.828 | 8.229 | |
| 2 | 7.859 | 0.722 | 85.535 | |
| Lymphocytes (10^3\uL) | 1.330 | 0.843 | 2.099 | |
| Constant | 1.530 | | | |


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**Topic:** Acute Kidney Injury and haemofiltration

## 001517

### Similarity between tracheal pressure derivative and esophageal pressure. Coherence function and cross-correlation analysis


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**Introduction:** Esophageal pressure (Pes) is the reference method to measure respiratory muscle pressure during assisted breathing. The recording of Pes is difficult and fraught with potential errors, i.e.: changes at elastance of the respiratory system. Tracheal Pressure (Ptrach) may be an alternative since it contains information on pleural pressure. The inflection points in its first derivative (Ptrach') could reflect changes in acceleration generated by patient effort and, therefore, in pleural pressure.
**Objectives:** Our objective was to study the relationship between Ptrach´ and Pes signals in the frequency and time domains.
**Methods:** Physiological study in a group of patients during the withdrawal period of mechanical ventilation at different levels of pressure support (PSV). Airway pressure (Paw), Flow, Esophageal pressure (Pes), and Tracheal pressure (Ptrach: Intratracheal pressure sensor M1045564®, Carefusion, Finland) signals were analyzed from files previously recorded for clinical purposes. Sampling 1126 Hz. Measurements: Calculate respiratory mechanics, Ers and Rrs at different levels of assistance through pauses and time constant. Calculate the first derivative of Ptrach (Ptrach. Computation of spectral frequency using fast Fourier transform (FFT). Coherence analysis (MSC) of the spectral density of both signals (minimum variance distortion method). Cross-correlation coefficients at time 0 (Lag 0) and the point of maximum correlation between both signals. Data were expressed as means ± SD or medians and IQR; and comparisons using the Mann–Whitney test.
**Results:** 10 patients were studied. The complete signals were described by three harmonics (H). Global energy distribution Pes vs Ptrach´ (cmH2O2): 1ºH (0.24 Hz) $12.56 \times 103$ vs $9.55 \times 103$ $p = 0.88$; 2ºH (0.43 Hz) $5.01 \times 103$ vs $6.77 \times 103$ $p = 0.30$; 3ºH (0.69 Hz) $17 \times 103$ vs $3.45 \times 103$ $p = 0.34$. MSC for all levels of assistance: 1ºH, 0.93 (0.74–0.99); 2ºH, 0.95 (0.89–0.98); 3ºH, 0.93 (0.72–0.96). Cross-correlation at Lag0: R 0.68 (0.54–0.85) vs max R 0.70 (0.58–0.86) at Lag + 20 (0.02 s). Representative case are shown in figure.
**Conclusions:** Monitoring the first derivative of tracheal pressure can reflect patient effort equivalent to esophageal pressure during pressure support ventilation.

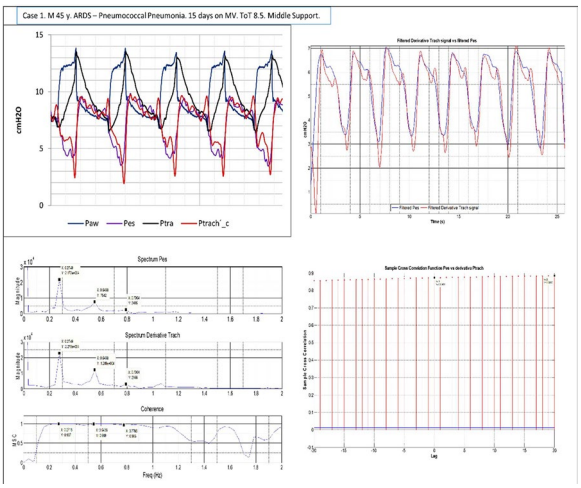


**Fig. (abstract 001517)** Patient 1. A representative case of methodology and results shows a similarity between esophageal pressure and the first derivative of tracheal pressure

**Topic:** Acute respiratory failure and mechanical ventilation

## 001521 Solid cancer patient characteristics and outcomes in the i ntensive care unit: a single center experience

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001521

**Introduction:** We are facing an increase in cancer diagnosis, with some estimates by the WHO organization predicting 29.4 million new cancer cases in 2040. Recent advances regarding potential for treatment have been associated with an upturn in intensive care (ICU) admissions. Whether this is coupled with improved outcomes is a matter of debate, but some studies suggest a mortality reduction. Persistent doubt might be related to missing data regarding outcome or survival prediction in oncological ICU patients.
**Objectives:** Characterize ICU admissions and outcomes of all adult patients pertaining to a diagnosis of solid malignancy over a 10-year period.
**Methods:** Retrospective single-center study conducted in a tertiary oncological referral hospital. Between 2014 and 2023, all non-elective ICU admissions of patients with a solid malignancy diagnosis were included. Primary central nervous system malignancy was excluded. Type and stage of malignancy, clinical condition and organ failure at admission, severity scores, ICU and hospital mortality were evaluated. Parametric tests using X2 were used to study associations with mortality. A $p$-value < 0.05 was considered to have statistical significance.
**Results:** During the study period, a total of 152 patients with solid malignancy were admitted to our ICU. Most patients were male (61%), median age was 68.7 ± 13 years. The most common malignancies were colon and rectal cancer (32%), lung cancer (19%) and gastric cancer (8%). Regarding cancer stage, 59% had low-intermediate stage (I-III) and 41% had stage IV cancer. Type of admission (medical vs surgical) was similar (51% vs 49%). The most common reason for admission was respiratory failure (35%), with a need for invasive mechanical support (IMV) occurring in 76.7% of cases. Acute kidney injury occurred in 56% (continuous renal replacement therapy performed in 10%) and septic shock was reported in 30%. Mean length of ICU stay was 6.7 ± 12 days and mean length of hospital stay was 26.6 ± 28.5. Mean SAPS II score was 48 ± 18. Overall ICU and in-hospital mortality was 30% and 44%, respectively. Highest mortality was seen with liver and bile duct cancer (67%) and lung cancer (51%); it was also associated with higher SAPS II (64 ± 17) and SOFA (10 ± 4) scores, a higher percentage of IMV (87%), higher incidence of AKI (70%) and septic shock (43%). Stage IV cancer patients had a higher ICU mortality vs low-intermediate cancer (46% vs 20%; $\chi^2 p < 0.001$). Higher mortality was seen in patients with a medical vs surgical condition as the main reason for admission (57% vs 30%; $\chi^2 p < 0.01$). There was no difference in mortality regarding age or gender.
**Conclusions:** Overall prognosis of patients with a solid malignancy diagnosis at ICU admission remains ominous, with medical-related factors and advanced cancer stage imputing a higher risk of mortality. This suggests that prevention of medical complications, like infection or thrombosis, might be the most impacting factor in reducing the mortality of these patients.

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**Topic:** Haematologic-oncologic issues in the ICU

## 001523

### Inhalation injury in burns: risk factors for invasive mechanical ventilation

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**Introduction::** Inhalation injury in burns was the most frequent cause of acute respiratory failure (ARF) requiring mechanical ventilation, and increased mortality by 20–70%. [1] Knowledge of risk factors for invasive mechanical ventilation in burns with inhalation injury was crucial for the management of these patients.
**Objectives:** to determine risk factors for invasive mechanical ventilation (IMV) in burns with inhalation injury.
**Methods:** A retrospective descriptive comparative study was conducted in an intensive burn care unit in Tunisia over 4 years (January 2018 and December 2021) focusing on burned patients with pulmonary burns. Patients were divided into two groups: those who were ventilated (MV+) and those who were not (MV−).
Diagnosis of inhalation injury was retained by the presence of at least 2 of the following criteria: fire in an enclosed space, the presence of soot in the oropharynx or sputum, respiratory symptoms associating dry cough, dysphonia with hoarseness of voice, wheezing, ronchi and sibilant, and the presence of facial burns. Bronchial fibroscopy was the reference exam for diagnosis [1].
**Results:** During the study period, 1200 patients were admitted, 130 of whom presented inhalation injuries. The mean age was 42 ± 7 years, with a sex ratio of 3.6. The mean SOFA score was 3.7 ± 2.8. APACHE was 14 ± 6.1. Total body surface area (TBSA) was 38 ± 15%. Burns were profound with an UBS score of 58.5 ± 20.5. Thermal burns were frequent affecting 92% of patients, followed by suicide attempts in 42% of cases. 72 patients required mechanical ventilation (55%), with a delay of 2 days after burns. The mortality in this group (MV+) was 35% vs 14% in (MV-) group.
Risk factors associated with mechanical ventilation in multivariate analysis were: presence of face and neck edema ($p = 0.01$RR 3.991, IC95% [1.02; 4.738]); occurrence of shock ($p = 0.001$, RR 8.1, IC95% [2.12; 9.843]; delay of secondary transfer > 3.2 days ($p = 0.02$ OR = 8.913 IC95% [1. 13–70.32]), UBS score > 61 ($p = 0.03$ OR: 1.04, IC 95% [1.01–1.08];), occurrence of pneumoniae ($p = 0.04$, OR: 1.07 IC 95% 1.00–1.14].
**Conclusions:** In burns with inhalation injury, predictive factors for invasive mechanical ventilation were the presence of oedema of the face and neck, the occurrence of shock, the occurrence of pneumoniae, an UBS score > 61 and transfer time > 3.2 days.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001525

### Assessment of the Accuracy of SAPS 3, APACHE II and EuroSCORE II Prognostic Scores in Patients Undergoing Cardiac Revascularization Surgery

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001525

**Introduction:** Determining risk in patients undergoing cardiac revascularization surgery is essential for clinical management and prognosis. SAPS 3, APACHE II and EuroSCORE II prognostic scores are widely used, however, their relative effectiveness in predicting outcomes such as a death in the intensive care unit (ICU) requires rigorous comparative evaluation.
**Objectives:** To retrospectively investigate the accuracy of SAPS 3, APACHE II and EuroSCORE II scores in predicting the primary outcome of death in the ICU in patients undergoing myocardial revascularization surgery, with emphasis on the superior performance of SAPS 3.
**Methods:** A retrospective study was conducted in a Quaternary University Hospital specialized in cardiac surgery. Adult patients who underwent myocardial revascularization were included. SAPS 3, APACHE II and EuroSCORE II scores were calculated using data from the first 24 h after ICU admission. Accuracy was assessed by the area under the ROC curve (AUC), and calibration was analyzed using the Hosmer–Lemeshow test.
**Results:** The analysis comprised a significant cohort of patients. The results revealed that SAPS 3 had the highest accuracy in predicting death in the ICU, with a higher AUC compared to the APACHE II and EuroSCORE II scores. Furthermore, SAPS 3 demonstrated adequate calibration, indicating alignment between score predictions and observed outcomes.
**Conclusions:** This retrospective study highlighted the superior performance of SAPS 3 in relation to APACHE II and EuroSCORE II scores in predicting death in the ICU in patients undergoing cardiac revascularization surgery. These findings suggest that SAPS 3 may be the most appropriate prognostic score for risk stratification in this specific population, contributing to a more precise and targeted clinical approach.

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**Topic:** Cardiovascular issues in ICU

## 001527

### Does antiplatelet and anticoagulation therapy impact outcome in traumatic brain injury patients?

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**Introduction:** Traumatic brain injury (TBI) still is a major cause of mortality and disability Worldwide. Ageing population is correlated with a higher prevalence of cardiovascular diseases requiring antiplatelet and anticoagulation therapy. The intake of these medications can increase the risk of intracerebral haemorrhage and subsequently outcome and mortality rate.
**Objectives:** This study aims to analyse the effect of antiplatelet and anticoagulation therapy on functional outcomes and mortality in TBI patients.
**Methods:** This is a retrospective observational study of adult TBI patients admitted to the general ICU in a tertiary hospital between 2021 and 2023. The two groups were categorised according to the presence or absence of antiplatelet and anticoagulation therapy (AAT vs non-AAT). Collected data included demographics, comorbidities, type of trauma and brain injury, Glasgow Coma Scale Score (GCS) on ICU admission, neurosurgical intervention, length of stay (LOS), functional outcome and mortality. The main analysis considered hospital mortality and functional outcome at 6 months, defined by Glasgow Outcome Scale (GOS), considering unfavourable GOS 1–3 and favourable GOS 4–5, between the two groups.
**Results:** A total of 82 patients with TBI were included in this study, with a male prevalence of 79% vs 21% female. Twenty-two patients were under AAT prior to TBI. The most elderly patients were observed in the AAT group, mean age $72.8 \pm 9$ years and 86% aged $\geq 65$ years compared with $57 \pm 16$ years and 35% in non-AAT, respectively. Hypertension (82% vs 32%), dyslipidemia (55% vs 27%), coronary artery disease (41% vs 13%) and atrial fibrillation (18% vs 2%) were the most represented comorbidities in AAT patients. The severity of TBI, considering a GCS < 9, was higher in AAT 73% vs 63% in non-AAT group. Intraparenchymal haemorrhage was the most common injury in patients with AAT (73% vs 57% non-AAT) and craniectomy was the most common surgical procedure (27% vs 10% non-AAT), followed by craniotomy (32% AAT vs 33% non-AAT). The overall hospital mortality rate was significantly higher in AAT (77% vs 45%, $p = 0.026$). When analysing patients with $\geq 65$ years, no differences were found between both groups in terms of mortality (78% AAT vs 52% non-AAT, $p = 0.071$). Patients with $\geq 65$ years had a higher mortality rate regardless antiplatelet and anticoagulation therapy (64% vs 40% < 65y, $p = 0.028$). In terms of functional outcome, there was no statistical difference in favourable GOS at 6 months between the two groups (16% AAT vs 33% non-AAT, $p = 0.146$).
**Conclusions:** In the studied population, antiplatelet and anticoagulation therapy was associated with higher overall mortality, but no difference was seen in patients over 65 years between both groups. Also there was no difference in terms of functional outcome at 6 months. As a limitation, the study had a small sample and a great heterogeneity of ages which can lead to bias. Further studies are necessary to determine the impact of antiplatelet and anticoagulation therapy in TBI patient's outcome.

**Topic:** Neurointensive care

## 001528

### Evaluation of throboprophylaxis and risk of venous thromboembolic disease in patients with ischemic cerebrovascular accident using the PADUA Scale

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001528

**Introduction:** STROKE is a public health problem of the first order. In addition, it is the leading cause of permanent disability in adulthood. Many of the patients who survive suffer significant sequelae that limit their activities of daily living. One of the pillars in secondary prophylaxis is anticoagulation, either due to the patient's own comorbidities or neurological sequelae that limit mobility. We used the Padua Scale to describe the risk of VTE in these patients, as well as assess the use of antithrombotic prophylaxis.
**Objectives:** To evaluate the usefulness of the PADUA scale for thromboprophylaxis and the development of thromboembolic disease in patients with stroke.
**Methods:** Descriptive, cross-sectional, analytical, retrospective study. Twenty-four clinical histories of people over 18 years of age admitted to the critical care unit, with a main diagnosis of ischemic stroke, were reviewed during the period from January 1 to August 30, 2023. Cases with a different main diagnosis, incomplete records were excluded. transferred to other centers and voluntary withdrawals. ****** Data on comorbidities, previous vascular events, NIHSS at admission, thrombotic events and intra-hospital thromboprophylaxis, as well as the presence of some type of bleeding or other complications were extracted. Descriptive and analytical statistics were performed with Student's $T$ for quantitative variables and Chi2 test for qualitative ones with SPSS IBM v. 23.0, values of $p < 0.05$ were considered statistically significant.
**Results:** With a predominance of women (58.3%), and a mean age of the entire sample of 62.25 years (41–92 years), it was found that the most frequent morbidities were Hypertension (95.8%) and type 2 DM (45.8%), followed by previous stroke (20.8%). In the entire sample, 70.8% of the patients received thromboprophylaxis during hospitalization, either initially or during hospitalization. Using the Padua Scale, 58.3% of the patients showed a High Risk of presenting VTE in the future, of which 85.7% received thromboprophylaxis ($p$: 0.000, CI: 0.000–0.001). Using the initial NIHSS Scale of the patients, 66.7% presented Moderate Stroke, of which 92.85% of the patients presented a High Risk of developing VTE ($p$: 0.018, CI: 0.008–0.012). None of the patients evaluated presented a thromboembolic event during hospitalization, as well as any type of bleeding complication.
**Conclusions:** Most of the patients who develop Stroke already receive thromboprophylaxis during hospitalization, either at the beginning or during the hospitalization. Patients with moderate Stroke have a higher risk of developing venous thromboembolic disease, so they would benefit from thromboprophylaxis both during hospitalization and at discharge. It would be very useful to use the NIHSS and Padua Scales together to describe the risk of VTE and assess the use of antithrombotic prophylaxis.

**Topic:** Transfusion and haemostasis disorders

## 001529

### Influence of respiratory system compliance on inspiratory effort and ventilatory drive in COVID-19 patients

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001529

**Introduction:** Pleural pressure can be estimated by esophageal pressure measured with an esophageal balloon, which is the gold standard

for assessing muscle pressure during spontaneous breathing. In critically ill patients, factors such as pain, anxiety, discomfort, acidosis can significantly impact ventilatory drive. A previous study evaluated the potential association between inspiratory effort and respiratory system compliance according to two different levels of PEEP and identified that high peep could reduce inspiratory effort if compliance increased. Yet, knowledge regarding the influence of respiratory system compliance on inspiratory effort and ventilatory drive is still limited. This study aims to elucidate any potential correlation between these variables.

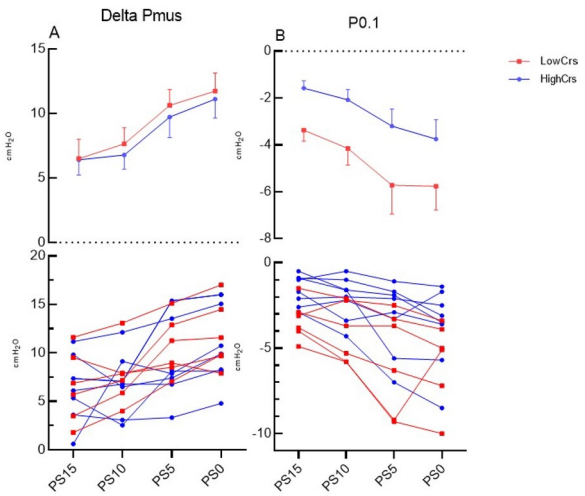
**Methods:** This prospective cohort study was approved by the institutional ethics committee. Fifteen patients with ARDS due to COVID-19 during the mechanical ventilation weaning phase were submitted to four levels of pressure support (15-10-5-0cmH2O) for 20 min each step, data were collected at the final of each step. Esophageal balloon was used, Baydur maneuvers were considered to check the balloon position (adequate slope range 0.8–1.2)4. The software LabVIEW was used to analyze the tracings. We categorized groups by high and low respiratory system compliance (median 34.8 mL/cmH2O). Linear mixed-effects model fit by REML was performed using R 4.2.2 (R Foundation for Statistical Computing, Vienna, Austria; http://www.r-project.org). P values < 0,05 were considered statistically significant.

**Results:** The variables exposed did not show statistical differences between the two groups. Graph A—Pmus presented a wider variation in the LowCrs group [from 6.49 (1.49) to 11.7 (1.39) cmH2O]. Graph B—P0.1 showed a similar variation in the two groups (average difference of 0.22 cmH2O), the LowCrs group started the protocol with higher values of P0.1 [starting at -3.37 (0.47 cmH2O)]. Data is plotted as the mean and standard error of the mean (SEM) and individual values.

**Conclusions:** The data suggests that Crs may not have a direct impact on muscle effort, although P0.1 was, significantly, more pronounced in the LowCrs group. To mitigate adverse outcomes during the weaning phase, it is crucial to monitor respiratory drive, effort, and their influencing variables closely. Further research on this topic is necessary.

**Table 1 (abstract 001529)** Groups were divided by LowCrs: Low chest wall compliance and HighCrs: High chest wall compliance. Data are shown as mean and standard error of the mean (SEM); and Crs: respiratory system compliance and PS: pressure support *p* values. ΔPmus: Delta of respiratory muscle pressure; P0.1: negative airway pressure generated during the first 100 ms of an occluded inspiration (respiratory drive representative).

| | | PS15 | PS10 | PS5 | PS0 | *Crs* | *PS* |
|---|---|---|---|---|---|---|---|
| P0.1 ($cmH_2O$) | Low $C_{rs}$ | -3.36(0.47) | -4.15(0.7) | -5.71(1.23) | -5.76(1) | 0.039 | 0.0001 |
| | High $C_{rs}$ | -1.57(0.31) | -2.07(0.43) | -3.2(0.73) | -3.75(0.82) | | |
| ΔPmus ($cmH_2O$) | Low $C_{rs}$ | 6.49(1.49) | 7.65(1.24) | 10.6(1.23) | 11.7(1.39) | 0.602 | 0.0001 |
| | High $C_{rs}$ | 6.41(1.19) | 6.78(1.09) | 9.72(1.58) | 11.1(1.48) | | |




**Graph 1 (abstract 001529)** Data are plotted as mean and standard error of the mean (SEM). Delta Pmus: Delta of respiratory muscle pressure; P0.1: negative airway pressure generated during the first 100 ms of an occluded inspiration (respiratory drive representative); Groups were divided by LowCrs (red line): Low chest wall compliance and HighCrs (blue lines): High chest wall compliance; Group behavior (above) and individual behavior (below). **A**- Delta PMUS behaviour during pressure support decrement. A- Delta PMUS behavior during pressure support decrement. **B**- P0.1 behaviour during pressure support decrement

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2. No financial support

**Topic:** Acute respiratory failure and mechanical ventilation

## 001530

### Outcomes of chronic critical illness in a Portuguese ICU

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**Introduction:** Advances in intensive care medicine have reduced the mortality rate of ICU patients. However, many patients who survive the initial period of critical illness require organ support for a prolonged period and become chronically critically ill. The definition of chronic critical illness is not uniform; the most frequently cited criteria are mechanical ventilation > 3 weeks and/or tracheostomy. More recently, an ICU stay of more than 8 days associated with one of 6 conditions

(invasive mechanical ventilation, tracheostomy, stroke, head trauma, sepsis or serious injury) was also considered [1], [2].

**Objectives:** To determine the incidence of chronic critical illness and its outcomes in a Portuguese intensive care unit. To identify predictors of survival amongst patients with chronic critical illness.

**Methods:** Single-center retrospective observational study of patients admitted to the polyvalent ICU in Portugal for ≥ 3 weeks in 2023. Demographic and clinical data were extracted from the electronic medical record.

**Results:** Out of 495 patients admitted to the ICU in 2023, 53 (10.7%) had ICU admissions lasting ≥ 3 weeks. Amongst these, the mean age was 58.2 ± 17.4 years and the majority were male (73.6%). The mean length of ICU stay was 34.9 ± 14.6 days and the mean length of hospital stay was 93.9 ± 64.4 days.

The most frequent admission diagnoses were sepsis (30%), trauma (27%), and neurocritical illness without trauma (32%) (Fig. 1). The median SAPS II score on admission was 51, representing severe illness. ICU mortality was 24.5% with survivors staying in the hospital for an average of 80.35 ± 67.17 days. In-hospital mortality was 47.1%.

At 3 months, overall mortality was 55.1%. Amongst hospital survivors, only 8 (15%) were living at home. The rest were discharged to rehabilitation units, with the exception of 4 patients (7.5%) who were lost to follow-up.

To identify factors predicting ICU survival in chronic critical illness, we tested a multivariable logistic regression model including age, sex, admission diagnosis, illness severity at admission (SAPS II) and days of hospitalization prior to ICU admission as predictor variables. Among the patients who survived and those who died, age was the only variable that showed a statistically significant difference between the two groups (*p*-value 0.002) (Table 1).

**Conclusions:** In this single-center study, chronic critical illness was associated with prolonged hospitalization and high mortality. Younger age was the only variable that was associated with improved survival. Further studies will be required to identify variables that predict survival and good functional outcomes as well as to identify potential modifiable risk factors.

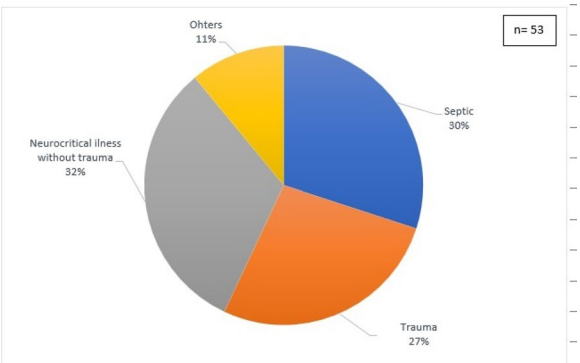


**Fig. 1 (abstract 001530)** Admission diagnoses

**Table 1 (abstract 001530)** Factors predicting ICU survival.

| Characteristic | Died, N=24[1] | Survived, N=25[2] | p-value |
|---|---|---|---|
| Age (years) | 65.54 (16.37) | 51.92 (16.03) | 0.002 |
| Sex | | | 0.6 |
| Male | 18/24 (75%) | 17/25 (68%) | |
| Female | 6/24 (25%) | 8/25 (32%) | |
| Admission diagnosis | | | 0.2 |
| Septic | 10/24 (42%) | 5/25 (20%) | |
| Neurocritical illness without trauma | 8/24 (33%) | 8/25 (32%) | |
| Trauma | 3/24 (13%) | 9/25 (36%) | |
| Others | 3/24 (13%) | 3/25 (12%) | |
| SAPS II | 52.75 (13.38) | 46.04 (14.35) | 0.12 |
| Admission prior to ICU (days) | 7.17 (13.99) | 2.40 (3.58) | 0.4 |

[1]Mean (SD); n/N (%)

[2]Wilcoxon rank sum test; Pearson's Chi-square test; Fisher's exact teste

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**Topic:** Health Services Research and Outcome

## 001531

### Assessment of in-hospital mortality and the need for mechanical ventilation in acute exacerbations of COPD

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**Introduction:** Acute exacerbation of patients with COPD needing hospitlisation in the Intensive care unit (ICU), may require the use of invasive mechanical ventilation (IMV) and therefore, can be associated with a high risk of mortality. Currently, there is no reliable, credible and reproducible method available to assess mortality risk upon admission.

**Objectives:** to assess different COPD scoring systems to predict in-hospital mortality and the need for IMV in AECOPD patients hospitalized in the ICU.

**Methods:** We retrospectively included patients hospitalized for AECOPD in the intensive care unit department of Abderrahmen Memi Hospital from October 2023 to February 2024. We compared 5 scoring systems predicting the need for mechanical ventilation and mortality: CAUDA-70 (Confusion, Acidosis pH < 7.35, Urea > 7 mmol/l, MRC > 4, Albumin < 35 g/l and age > 70 years), NEWS (respiratory rate > 30, oxygen saturation < 91%, need for supplemental oxygen, temperature, systolic blood pressure < 90 mmhg, heart rate > 131 and level

of consciousness < 10), DECAF (Confusion, Urea > 7 mmol/l, Respiratory rate > 30, hypotension, 65 Years above), HACOR (heart rate > 121, CG < 10, respiratory rate > 46, PaO2/FiO2 < 100, pH < 7.25) and CAPS (The COPD and Asthma physiological score from 0 to 100 points) scores.
**Results:** During the study period, 50 patients were hospitalized for AECOPD. They had a male predominance (82%) with a mean age of 66 years. The need for IMV was 52% and the total in-hospital mortality was 40%.
NEWS and HACOR score were associated with a significant prediction of IMV (respectively, $p = 0,03$; AUC: 0,67; IC [0,52;0,825], ($p = 0,03$; AUC: 0,67; IC [0,51;0,82]), while DECAF, CAUDA-70 and CAPS scores were not [ ($p = 0.08$), ($p = 0.57$), ($p = 0.1$), respectively]. No score was significantly associated with the occurrence of in-hospital mortality.
**Conclusions:** The NEWS and HACOR scores outperform other scores in predicting the need for MV in AECOPD patients. Therefore no score was predictive of the occurrence of in-hospital mortality. Larger studies are required for better evaluation of these scores.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001533

### Temporalis muscle thickness and functional outcome in patients with ischemic stroke

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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001533

**Introduction:** Stroke is one of the leading causes of skeletal muscle loss and sarcopenia due to inactivity, immobility, and malnutrition during hospitalization. However, because of the difficulty of measuring muscle mass during acute stroke treatment, sarcopenia in stroke patients has not been extensively studied. Recently, temporal muscle thickness (TMT), which can be easily measured by brain imaging, has been proposed as a practical marker of sarcopenia.
**Objectives:** To determine whether TMT is associated with functional outcomes in patients with ischemic stroke.
**Methods:** Patients with ischemic stroke who transferred to the rehabilitation medicine department after acute stroke treatment between 2021 and 2022 were included in the study. Non-contrast CT, CT angiography, or T1-weighted image of MRI obtained during hospitalization was used to assess TMT. When a patient had multiple scans, the scan closest to the initiation of the comprehensive rehabilitation program was selected preferentially. TMT was measured bilaterally perpendicular to the long axis of the temporalis muscle in a slice 5 mm above the orbital roof, and the average of the bilateral measurements was used for the analysis. The primary outcome of the study was the Modified Barthel Index (MBI) at the time of discharge after a comprehensive rehabilitation program. Modified Rankin Scale (mRS) at 3 months after stroke onset was further assessed. Good functional outcome at 3 months was defined as an mRS score of 0 to 2. Multivariable linear regression and multivariable logistic regression analyses were performed to examine the association between TMT and functional outcome. Patients with ischemic stroke who transferred to the rehabilitation medicine department after acute stroke treatment between 2021 and 2022 were included in the study. Non-contrast CT, CT angiography, or T1-weighted image of MRI obtained during hospitalization was used to assess TMT. When a patient had multiple scans, the scan closest to the initiation of the comprehensive rehabilitation program was selected preferentially. TMT was measured bilaterally perpendicular to the long axis of the temporalis muscle in a slice 5 mm above the orbital roof, and the average of the bilateral measurements was used for the analysis. The primary outcome of the study was the Modified Barthel Index (MBI) at the time of discharge after a comprehensive rehabilitation program. Modified Rankin Scale (mRS) at 3 months after stroke onset was further assessed. Good functional outcome at 3 months was defined as an mRS score of 0 to 2. Multivariable linear regression and multivariable logistic regression analyses were performed to examine the association between TMT and functional outcomes.
**Results:** Of the 141 patients screened, a total of 97 patients (mean age 73.8 ± 10.3; 47.4% male, NIHSS at admission 7 [interquartile range (IQR) 4–12]) was included in this analysis. TMT was measured at 5.8 [IQR 3.2–9.7] days prior to the initiation of comprehensive rehabilitation, and mean TMT of the patients was 5.46 ± 1.73 mm. At discharge, patients had an MBI of 48.0 ± 32.9. Among included patients, 47 (48.0%) had a good functional outcome at 3 months and patients with a good functional outcome had a thicker TMT compared to those with a poor functional outcome (5.94 ± 1.91 mm vs. 4.98 ± 1.39 mm, $p < 0.01$). In multivariable regression analysis adjusting for age, sex, NIHSS, body mass index, and recanalization therapy, thicker TMTs were associated with higher MBI scores at discharge ($\beta = 5.90$, $p < 0.01$), and were also associated with better functional outcome at 3 months (adjusted odds ratio 1.08 [95% confidence interval 1.01–1.14], $p = 0.02$).
**Conclusions:** TMT, a pragmatic surrogate marker of sarcopenia measured at the initiation of the comprehensive rehabilitation program, was associated with functional outcomes at discharge and at 3 months after ischemic stroke. Strategies to prevent muscle wasting during acute stroke care, including early rehabilitation, may help improve functional outcomes in patients with stroke.

**Topic:** Neurointensive care

## 001537

### A retrospective cross-sectional study to analyse the outcomes of in-hospital cardiac arrest patients in a tertiary care hospital

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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001537

**Introduction:** In-Hospital Cardiac arrest (IHCA) encompasses an area that are frequently encountered, with a better survival rate as compared to out-of-hospital cardiac arrest (OHCA). Nonetheless, they are associated with higher poor neurological outcomes. According to the ACLS guidelines which classify the causes of cardiac arrest as 5H/5 T, unlike broadly, the most common aetiology of OHCA is an acute coronary syndrome (cardiac cause), while the cause of IHCA is varied. The survival rate and neurological outcome of IHCA in Lower middle-income countries (LMIC) remains under-studied. Healthcare professionals in LMICs practicing in resource-limited settings have lower awareness and skills about ACLS as compared to their Western counterparts. This study was undertaken to study the incidence of IHCA and their outcomes in a tertiary-level hospital.
**Objectives:** To study the incidence and neurological outcome of patient's with IHCA admitted to our hospital. The primary outcome was survival at the time of discharge. The secondary outcome evaluated the percentage of patients who achieved a return of spontaneous circulation (ROSC) and the neurological outcome at the time of discharge.
**Methods:***Study Design*: a cross-sectional retrospective analysis. *Study period*: duration of two years. *Inclusion criteria:* Adult patients who were admitted to our hospital and were being managed in out-of-intensive care units. *Exclusion criteria:* Patients who had 'Do Not Resuscitate' Status and those admitted to the intensive care unit were excluded.*Data Collection:* The data was obtained from the code blue forms that were filled at the time of cardiac arrest in patients. The medical records were accessed to complete the missing data. Institutional ethics committee approval was taken and a consent waiver was given. *Statistics:* Data was analysed using descriptive statistics.
**Results:** The total number of cardiac arrests with completed code blue forms was filled for 101 patients. The average age and gender were 53 years and males respectively, at the time of arrest. The incidence of ROSC in the IHCA was found to be 60%. The most common rhythm that was recorded in the patients who achieved ROSC was pulseless electrical activity [PEA] (60%) followed by asystole in 16% of patients.

Non-shockable rhythm was more commonly recorded (86%) in patients with ROSC. The etiology most commonly associated with cardiac arrest in our study was hypoxia (59%). Almost 70% of the patients did not suffer from acute kidney injury after ROSC in IHCA. The survival rate of IHCA in our study was 18% with shockable rhythm having a better survival rate as compared to non-shockable rhythm and around 53% of the total survivors had a favourable neurological outcome at the time of discharge (Glasgow Coma Score > 12). A high percentage of 43% (44) of the total patients withdrew medical care due to the futility of medical care or inability to bear medical expenditure.
**Conclusions:** In this study, although an incidence of 18% IHCA was associated with a good neurological outcome in half the patients who achieved ROSC, the burden on healthcare remains high. Mandatory ACLS training of healthcare personnel can help to reduce IHCA and hence burden on healthcare.

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**Topic:** Cardiac arrest

## 001538

### The inflammasome caspase-1 pathway promotes pulmonary fibrosis in direct ARDS

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001538

**Introduction:** Pulmonary fibrosis, a serious sequela of ARDS, significantly reduces life expectancy and quality. However, the mechanisms driving fibrosis in ARDS still remain elusive. ARDS can result from direct causes like bacterial, Influenza, and SARS-CoV-2 pneumonia, or indirect causes like non-pulmonary sepsis. Especially across direct ARDS etiologies lung inflammation and injury significantly involve inflammasome caspase-1 signaling, with IL-1β and IL-18 production. Moreover, inflammasome caspase-1 signaling also fosters lung fibrosis in other inflammatory lung diseases. Thus, we hypothesized a central role of inflammasome caspase-1 signaling in the fibrotic response of direct ARDS.
**Methods:** Bronchoalveolar lavage fluid (BALF) was collected from indirect ($n = 11$), SARS-CoV-2 ($n = 78$), Influenza ($n = 12$), and bacterial ($n = 17$) ARDS patients at 2 ARDS centers. Fibrosis-associated mediators, inflammatory cytokines, and caspase-1 were analyzed by multiplex immunoassay and immunoblotting. BALF cells were incubated ex vivo with the caspase-1 inhibitors tetracycline or VX-765 and examined after 16 h. K18-hACE2 mice were infected with SARS-CoV-2. Cytokine production and fibrosis were analyzed after 8d in lungs and BALF.
**Results:** Influenza, SARS-CoV-2 and bacterial ARDS patients exhibited increased pulmonary levels of profibrotic matrix metalloproteinases (MMP)-1, -2, -7 and -12, fibrosis-associated mediators including CC-chemokine ligand (CCL) -18, plasminogen activator inhibitor type 1 (PAI-1) and Fibroblast growth factor compared to indirect ARDS patients ($p \leq 0.05$). Indicating caspase-1 orchestrated inflammation, elevated pulmonary IL-1β and IL-18 levels and increased caspase-1 activation were found in direct ARDS patients ($p \leq 0.05$). Strong correlations between IL-18 and MMP-1, -2 as well as PAI-1 ($r \geq 0.72$; $p \leq 0.001$) indicate a significant association between caspase-1-mediated inflammation and pulmonary fibrotic response in direct ARDS patients. Tetracycline and VX765 treatment in SARS-CoV-2 infected mice decreased caspase-1 activation as well as IL-1β and IL-18 production and associated lung damage ($p \leq 0.039$). Notably, caspase-1 inhibition further reduced pulmonary production of the profibrotic mediators MMP-2, -8, -9, -12, CCL-12, PAI-1, and S100A9 ($p \leq 0.05$) and histological analysis showed reduced pulmonary fibrosis. BALF cells from direct ARDS patients continued producing IL-1β and IL-18 and profibrotic mediators like MMP-2, PAI-1 and Procollagen I ex vivo. Tetracycline and VX-765 inhibited IL-1β and IL-18 production as well as caspase-1 activation ($p \leq 0.03$). Of note, tetracycline and VX-765 also dose-dependently decreased the production of MMP-2, PAI-I, and Procollagen I ($p \leq 0.05$).
**Conclusions:** Our study establishes a link between caspase-1 activation and pulmonary fibrotic response in patients with direct ARDS. Caspase-1 inhibition reduced the fibrotic response in both murine and human ex vivo studies. It should therefore be considered as a treatable trait for lung fibrosis in direct ARDS.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001539

### Recommended dosages of analgesic and sedative drugs in intensive care result in a low incidence of potentially toxic blood concentrations

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001539

**Introduction:** Standard dosages of analgesic and sedative drugs are given to intensive care patients. It is not fully clear how best to determine dosage regimens of analgesics and sedatives in the clinical care of critically ill patients [1]. The resulting range of blood concentrations achieved with standard dosages administered to an ICU population can vary significantly between patients [2,3]. Historically, clinical studies have used plasma to determine drug concentrations, and therefore almost all reference values are from plasma [4]. In the field of postmortem toxicology, on the other hand, whole blood has been the sample material of choice. Plasma concentrations are not equivalent to whole blood concentrations [5].
**Objectives:** The purpose of this observational study was to describe daily dosages, measured blood concentrations and clinical responses in critically ill patients. The purpose was also to contribute to establishing whole blood concentration reference values of the drugs investigated.
**Methods:** A descriptive study of prospectively collected data from 302 admissions to a general intensive care unit (ICU) at a university hospital. We included all patients from age 16 and up. Ten drugs (clonidine,

fentanyl, morphine, dexmedetomidine, ketamine, ketobemidone, midazolam, paracetamol, propofol and thiopental) were investigated and daily dosages recorded. Blood samples were collected twice daily, and drug concentrations were measured. Clinical responses were registered using the Richmond agitation-sedation scale (RASS) and Visual analogue scale (NRS).
**Results:** Drug dosages were within the recommended dose ranges. Blood concentrations for all ten drugs showed a wide variation within the cohort, but only 3% (122 of 3827) were above the therapeutic interval. Clonidine (57 of 122) and midazolam (38 of 122) concentrations were the most common above therapeutic interval. RASS and NRS were not correlated to drug concentrations (Figs. 1 and 2).
**Conclusions:** Using recommended dose intervals for analgesic and sedative drugs in the ICU setting, combined with regular monitoring of clinical responses such as RASS and NRS lead to 97% of concentrations being below the upper limit in the therapeutic interval. This study contributes to whole blood drug concentration reference values regarding these ten drugs.

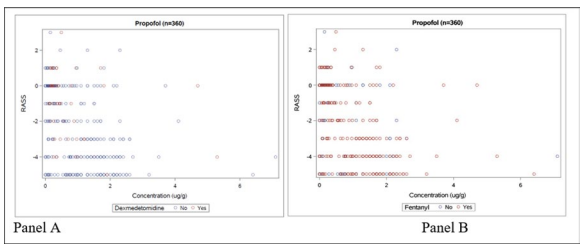


**Fig. 1 (abstract 0015394)** Propofol concentrations with corresponding RASS value within 4 h of sampling time. Panel A: with and without dexmedetomidine. Panel B: with and without fentanyl

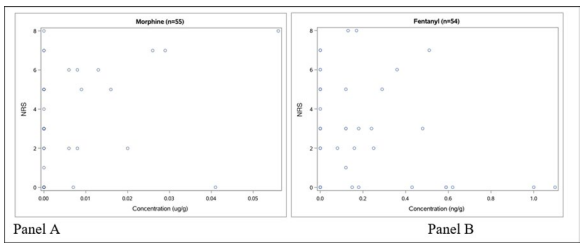


**Fig. 2 (abstract 001539)** Panel A: morphine concentrations with corresponding NRS value within 4 h of sampling time. Panel B: fentanyl concentrations with corresponding NRS value within 4 h of sampling time

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**Topic:** Sedation, analgesia and delirium

## 001541 3 months after intensive care unit: post-intensive care syndrome and quality of life

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**Introduction:** Post Intensive Care Syndrome (PICS) encompasses physical, cognitive, and mental health impairments that persist after the patient has been discharged from the Intensive Care Unit (ICU). The main factors related to the development of PICS are: duration of invasive mechanical ventilation (IMV) and ICU length of stay, severity of illness, age and pre-existing conditions, complications, degree of immobility, psychological stress and rehabilitation treatment.
**Objectives:** To characterize the population who developed PICS and identify the most important risk factors for the development of PICS in patients admitted for at least 3 days in the ICU.
**Methods:** All patients admitted for at least 3 days in the ICU between January and June of 2023 were evaluated approximately 3 months after ICU discharge by our follow-up team.
Patients who died before the consultation or who didn't show for the consultation were excluded from this analysis.
PICS and quality of life were determined based on clinical evaluation and through the application of several scales such as Hospital Anxiety and Depression Scale, Post-Traumatic Syndrome Scale-14, Minimental State Examination, Frailty Scale, Functional Independence Measure and EQ-5D.
The variables used in this analysis for the characterization of the population were age, gender, ICU and hospital length of stay, Frailty Scale, EQ-5D, IMV and delirium.
We calculated the odds ratio and $p$-value (considering $p$-value < 0.05 for positive hypothesis) for PICS considering IMV, delirium and length of ICU stay 7 or more days.
**Results:** Our population consisted of 117 patients, 32.5% of whom were females, the average age was 66.1 years old, the average ICU length of stay was 7.8 days, and the average hospital length of stay was 26.7 days.
The average initial Frailty Scale was 2.34, and at follow-up was 3.25. The average quantification of the quality of life according to the EQ-5D questionnaire was 65%.
Thirty-three patients (28.2%) were invasively ventilated. Delirium was identified in 45 patients (38.5%). PICS was present in 42 patients (35.9%).
Among patients that presented PICS, 22 of them were invasively ventilated (52.4%), 23 had delirium (54.7%), the ICU average length of stay was 10.3 days and the average hospital length of stay was 34.9 days. The average age was 65.5 in the PICS group and 28.6% were females.
The odds ratio for PICS and IMV was 6.4 and the $p$-value < 0.0001. The odds ratio for PICS and delirium was 2.9 and the $p$-value < 0.0075. Considering a length of stay of 7 or more days the odds ratio was 2.3 and the $p$-value < 0.032.
**Conclusions:** The risk of PICS is higher for invasively ventilated patients, for those who developed delirium and for those with an ICU length of stay of 7 or more days.
There was an increase on Frailty Scale after the ICU stay.
To reduce PICS and/or intervene sooner in this patient's recovery, risk factors should be taken into account.

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**Topic:** Health Services Research and Outcome

## 001542

### Effects of artificially-induced iPEEP and post-inspiratory pause on dead space and slope of capnographic phase III in acute respiratory failure

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001542

**Introduction:** According to a previous report (Brandolese et al., 1993), artificially induced intrinsic positive end-expiratory pressure (iPEEP) causes a deterioration of gas exchange in mechanically ventilated patients with acute respiratory failure, presumably because of a less homogeneous distribution of inspired gas.
**Objectives:** This hypothesis was investigated indirectly by measuring the slope of phase III, anatomic and physiologic dead space using volumetric capnography.
**Methods:** Measurements were obtained in 11 sedated, mechanically ventilated paralyzed acute respiratory failure patients with iPEEP < 3 cmH2O assessed at zero end-expiratory pressure, and without a known diagnosis of chronic obstructive pulmonary disease. In all experimental conditions, respiratory rate, ventilation and total PEEP (PEEPtot) were the same, but the same PEEPtot was obtained either by applying external PEEP (ePEEP condition) or by shortening the duration of expiration to produce iPEEP. iPEEP was induced either by reducing the inspiratory flow (Fins) and increasing the duration of the inflation (TI) (iPEEP with long TI, iPEEPlongTI condition), or by keeping constant Fins and TI, and introducing a long post-inspiratory pause (pIp) (iPEEP with a long pause, iPEEPlongP condition).
**Results:** PEEPtot was not significantly different in the three experimental conditions (6.6 ± 1.3, 6.4 ± 1.5 and 6.4 ± 1.2 cmH2O, $P = 0.474$, for ePEEP, iPEEPlongTI and iPEEPlongP, respectively), as was the corresponding end-expiratory volume above equilibrium volume, measured during deflation to ZEEP ($P = 0.158$). iPEEP was not different between iPEEPlongTI and iPEEPlongP (4.9 ± 1.1 and 5.1 ± 0.9 cmH2O, $P = 0.453$, respectively), but substantially greater than in the ePEEP condition (0.6 ± 0.3 cmH2O, $P < 0.001$). PaO2 was not significantly different among the three conditions ($P = 0.262$), while PaCO2 was lower at iPEEPlongP (35.2 ± 4.7 mmHg) than at ePEEP (38.4 ± 5.2 mmHg, $P < 0.001$) and iPEEPlongTI (38.3 ± 4.2 mmHg, $P = 0.019$). Relative to ePEEP, slope of phase III, anatomic, physiologic and alveolar dead space were not different at iPEEPlongTI (Δ − 0.7 ± 1.8%CO2/L, $P = 0.655$; 1 ± 7 ml, $P = 1.000$, 2 ± 22, $P = 1.000$ and 1 ± 17 ml, $P = 1.000$, respectively). In contrast, the same parameters were significantly lower at iPEEPlongP (Δ − 1.6 ± 1.1%CO2/L, $P < 0.002$, − 18 ± 9 ml, $P < 0.001$, − 32 ± 19 ml, $P < 0.001$, and − 14 ± 13 ml, $P = 0.017$, respectively).
**Conclusions:** In these patients, no difference in slope of phase III, anatomic and physiologic dead space were detected between ePEEP and iPEEPlongTI, suggesting that during iPEEPlongTI the effect of iPEEP-induced alterations of ventilation distribution, if any, were completely compensated by the increase of inspiratory duration (Åström et al., 2008). In contrast, the prolongation of pIp led to a significant reduction of heterogeneity as indexed by the slope of phase III in the iPEEPlongP condition, despite the presence of iPEEP.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001543

### Diagnostic efficacy of cerebrospinal fluid lactate and procalcitonin in Healthcare-associated ventriculitis or meningitis: a single-center prospective study

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001543

**Introduction:** Healthcare-associated ventriculitis or meningitis (HCVM) is a difficult-to-distinguish infection in neurocritical care. Conventional cerebrospinal fluid (CSF) parameters and classical microbiology are the mainstay for establishing diagnosis, while various factors decrease their diagnostic value. Recent guidelines propose using CSF lactate and procalcitonin (PCT), but their diagnostic value remains controversial.
**Objectives:** To evaluate and compare the performance of lactate and PCT in HCVM diagnosis.
**Methods:** This prospective observational study was conducted from January 2019 to March 2024. We enrolled all consecutive adult patients with suspected HCVM after neurosurgical procedures. We excluded patients with recent intracranial infection, immunocompromised, and pregnant women. The diagnosis of HCVM was based on the definition of the IDSA guidelines 2017. Demographics, indications for neurosurgical procedures, and the following blood and CSF parameters for each patient were recorded: white blood cell count (WBC), protein content, glucose, lactate, and PCT as well. Blood and CSF samples collected from an EVD were analyzed at the same time. Patients were allocated into two groups (group 1 = HCVM/group 2 = non-HCVM). Chi-square, Student's $t$, and Mann-Witney $U$ test were used as appropriate. The $p$-value was set at 0.05. ROC curves were constructed, and the best cut-off points were determined. Statistical analyses were performed using R statistical software.
**Results:** A total of 60 patients were included, predominantly males (55%), with a median age of 60 (IQR:50–67). The main reasons for ICU admission were ruptured aneurysm and intracerebral hemorrhage (43,3%). HCVM was diagnosed in twenty patients (33,3%), with the majority of pathogens being Gram-negative bacteria (Acinetobacter baumannii 47,6%, Klebsiella pneumoniae 33,3%, Enterobacter aerogenes 4,8%). Age and gender did not significantly differ between the two groups ($p > 0.05$). The differences in CSF glucose, CSF/Serum glucose, CSF PCT, CSF lactate, CSF/Serum Lactate, CSF WBC, and CSF albumin between the groups were statistically significant ($p < 0.05$). There was no association between CSF/Serum PCT and HCVM in our cohort ($p = 0.113$). Based on the ROC curves, the CSF lactate measurement had the best diagnostic accuracy for HCVM (AUC: 0,936, 95%CI: 0.841 to 0.983) with a cut-off point > 4.4. The AUC values for CSF glucose, CSF/Serum glucose, CSF/Serum lactate, CSF PCT, CSF WBC, and CSF albumin were 0,786, 0,819, 0,809, 0,834, 0,769, and 0,715, respectively. Hence, CSF lactate is classified as an excellent test, CSF/Serum lactate, CSF/Serum glucose, and CSF PCT as a good test, while CSF glucose, CSF WBC, and CSF albumin are classified as fair tests.
**Conclusions:** Based on our findings, all parameters measured except CSF/Serum PCT showed a significant correlation with the HCVM diagnosis. Among the assessed biomarkers, CSF lactate had the best predictive performance. Our results extend knowledge and shed light upon the diagnostic dilemma of HCVM.

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2. None.

**Topic:** Neurointensive care

**001544**

**Extensive-drug-resistant A. baumannii bacteremias in critically ill patients: a retrospective study focusing on the effect of treatment on outcome**

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001544

**Introduction:** Bacteremias from Acinetobacter baumannii (A. baumannii) are associated with high mortality in critically ill patients.
**Objectives:** We pursued to investigate risk factors for mortality-related A. baumannii bacteremia.
**Methods:** Retrospective, single-center study of critically ill patients with A. baumannii bacteremia during a period of a four-year period Patients were divided in two groups according to their 28-day mortality related to A. baumannii. Mortality related to A. baumannii was defined as the patient dying from septic shock caused by the A. baumannii bacteremia.
**Results:** Overall, 120 patients were analyzed, and 28-day mortality related to A. baumannii was 49.2% (59/120). Patients were divided into two subgroups. There was no difference in baseline characteristics between the two groups. Patients that died from A. baumannii had worse 7 day outcomes: lower rate of microbiological cure or resolution of sepsis and lower rate of being off vasopressors. Multivariate logistic regression analysis showed that intravenous colistin was associated with increased survival (OR 0.170, 95%CI 0,034–0.847) while sepsis (OR 19.994, 95%CI 1.40–285.552) and septic shock (OR, 25.556, 95%CI 2.618–269.334) were risk factors for mortality. Multivariate regression analysis performed only in colistin-resistant A. baumannii cases showed a similar survival benefit for iv colistin treatment ( OR 0.020, 95%CI 0.001–0.339).
**Conclusions:** Intravenous colistin treatment appears to offer a survival benefit in critically ill patients with A. baumannii bacteremia. This benefit persists among patients with colistin-resistant strains.

**Topic:** Infections and prevention

**001545**

**Establishing an in vitro model for cholesterol replenishment in cardiomyocyte membranes**

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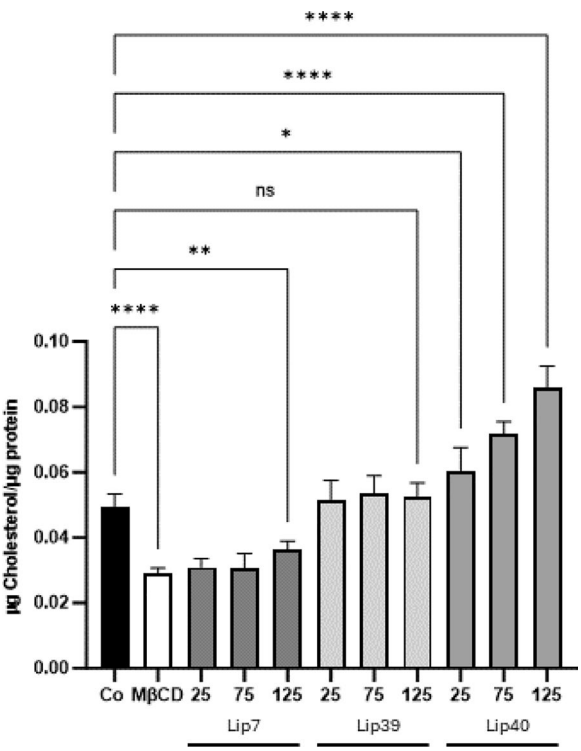
***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001545

**Introduction:** Sepsis-induced cardiomyopathy (SIC) is a well-recognized complication of sepsis, however, its underlying mechanisms are complex and incompletely understood. In a rat sepsis model, we have shown that SIC is accompanied by a fall in cardiomyocyte membrane cholesterol. Given the critical role of membrane cholesterol for adrenergic signalling and contractility, this may be a key mechanism. An in vitro model can aid mechanistic studies and the identification of potential therapeutic interventions. We therefore established a cellular model using an H9C2 rat cardiomyocyte cell line that recapitulates the sepsis-induced cholesterol decrease in cardiomyocytes. This model utilises the chemical depletion of membrane cholesterol by methyl-ß-cyclodextrin (MßCD). The current study investigates whether different cholesterol formulations (modified cholesterols and specific carriers) can restore membrane levels.
**Objectives:** To test the ability of different cholesterol formulations to replenish plasma membrane cholesterol after chemical depletion in a rat cardiomyocyte cell line.
**Methods:** Cells were incubated with 5 mM methyl-ß-cyclodextrin (MßCD) for 30 min and treated with 25, 75 or 125 mM of three different liposomal cholesterol solutions for 1 h. Cell cholesterol concentration was measured by enzymatic Amplex Red assay and normalised to protein, measured by BCA assay. *p*-values were calculated using one-way ANOVA with multiple comparisons (PRISM Version 9.5.1). Data are presented as mean ± SD. Groups were considered statistically different if $p$ values $< 0.05$.
**Results:** Significant variation was seen in the ability of the different liposomal formulations to elevate cholesterol levels in cholesterol-depleted H9C2 cells. The Lip7 formulation was ineffective at all doses tested. The Lip39 formulation restored cell [cholesterol] to normal levels but was dose-independent. The Lip40 formulation, however, achieved supranormal levels even at the lowest dose (25 mM cholesterol), and this increased further with increased dose (Fig. 1).
**Conclusions:** The ability of liposomal formulations to restore depleted cholesterol levels in cardiomyocytes depends on their composition. Further investigations are needed to explore the therapeutic potential of such formulations in sepsis-induced cardiomyopathy.




**(abstract 001545)** .

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**Topic:** Translational biology

## 001546

### Intravenous N-acetylcysteine versus intravenous theophylline in the prevention of contrast-induced nephropathy in critically ill patients

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001546

**Introduction:** Contrast-induced nephropathy (CIN) is defined as an acute deterioration in renal function after exposure to, and as a result of, contrast media (CM) [1]. However, acute renal failure (ARF) occurring after procedures associated with contrast administration may be caused by several different factors including volume depletion, atheroembolic disease, and congestive heart failure. Because it is not always possible to clinically differentiate the cause of the renal dysfunction, it may be more appropriate to term this condition ascontrast-associated nephropathy [2].
**Objectives:** Despite the use of several agents for prophylactic agents, contrast-inducednephropathy (CIN) remains a crucial clinical problem. The aim was to compare the efficacy of intravenous N-acetylcysteine (NAC) and intravenous theophylline in the prevention of CIN in critically ill patients.
**Methods:** A total of 90 patients were admitted to the ICU with at least one risk factor for CIN and randomly divided into three groups. All patients received the regular management of renal protection with good hydration, to maintain adequate intravenous volume expansion with isotonic crystalloids (normal saline: 1–1.5 ml/kg/h) 3–12 h before the procedure, and it was continued for 6–24 h afterward. In the first group, patients received 6 mg of theophylline intravenously over 30 min as a loading dose, followed by a maintenance dose of 0.5 mg/kg/h intravenously, to be started after the loading dose (group T). In the second group, patients received the full course of treatment with NAC (group A), which comprised three consecutive intravenous infusions: first infusion as an initial loading dose of 150 mg/kg body weight infused in 200 ml over 1 h, followed by the second infusion of 50 mg/kg in 500 ml over the next 4 h, followed by the third infusion of 100 mg/kg in 1 l over the next 16 h (to be completed on the day of the examination). Control group: in this group, 30 patients received no additional drug before the administration of radio contrast medium. They only received the regular management of renal protection with good hydratio.
**Results:** Despite the inclusion of ICU patients at high risk for CIN, we found a significant lower incidence of CIN and a lower incidence of patients requiring dialysis among patients under prophylaxis of intravenous NAC and intravenous aminophylline, as creatinine concentration was elevated by 25% in only four patients in the NAC group and only in three patients in the aminophylline group, and the incidence of CIN and patients requiring dialysis were significantly lower ($P < 0.045$) than that in the control.
**Conclusions:** We concluded that the administration of intravenous NAC or intravenous theophylline around the time of contrast administration prevents renal injury inequal efficacy compared with patients receiving no additional drugs at the time of contrast administration as regards incidence of nephropathy and incidence of dialysis among study patients.

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**Topic:** Imaging in intensive care

## 001547

### Presepsin as a valuable prognostic biomarker of severe sepsis and predictor of outcome

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001547

**Introduction:** Sepsis is one of the leading causes of morbidity and mortality worldwide. Early and accurate diagnosis is crucial. Procalcitonin (PCT), is widely reported as a useful biomarker for the diagnosis of septic patients and a reliable predictor of mortality. Presepsin (sCD14-ST) is supported to be a novel sepsis biomarker and a good prognostic indicator. High levels seem to be associated with a worse prognosis and a more complicated clinical course. Presepsin may be valuable when used in association with other commonly used prognostic evaluators to better identify patients at risk of severe infection.
**Objectives:** We aimed to evaluate Presepsin in ICU septic patients with abnormal PCT and high SOFA score (Sequential Organ Failure Assessment score) and correlate them with sepsis severity and outcome.
**Methods:** Adult ICU patients treated for suspected or confirmed bacterial infection were studied retrospectively, over one year period. PCT and Presepsin levels were evaluated at the onset of the infection. PCT > 2 ng/mL and Presepsin > 1000 pg/mL were defined as cutoff values of severe sepsis and septic shock (according to Sepsis-3 definitions) and were correlated with SOFA score > 10 and mortality.
**Results:** In our study, 89 septic patients were included, 28 females and 61 males with a median age of 61 years (range 18–83 years) and a median ICU LOS of 16 days (range 5–93 days). The mortality rate for the total of the included patients was 40.4%, out of which 3/4 (77,36%) due to septic shock. 40 (44.9%) patients were diagnosed with severe sepsis or septic shock. High levels of PCT and Presepsin were associated with septic shock (66.7% and 69.4%, respectively) and mortality (66.7% and 63.3%, respectively), which was statistically significant ($p < 0.05$). Clinical assessment of SOFA score > 10 was also associated with septic shock and mortality (85.7% and 71.4%, respectively), ($p < 0.05$). Further statistical analysis showed that Presepsin > 1000 is positively associated with the diagnosis of septic shock (OR = 12.84, $p < 0.01$). Multivariable analysis showed that Presepsin > 1000 and SOFA > 10 were independent variables strongly correlated to septic shock, whereas PCT > 2 did not show statistical significance when adjusted for the other two variables.
**Conclusions:** According to our study, Presepsin is a valuable prognostic biomarker that can evaluate the severity of sepsis. Moreover, high levels are associated with more unfavorable outcomes. Correlation with other commonly used markers, such as SOFA score and PCT, may further determine the severity of the infection and the outcome.

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**Topic:** Sepsis

## 001548

### The outcome of high-frequency oscillatory ventilation in pediatric patients with acute respiratory distress syndrome in an intensive care unit

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001548

**Introduction:** In adults with acute respiratory distress syndrome (ARDS), high-frequency oscillatory ventilation (HFOV) has been associated with higher mortality rates. Therefore, its use in children with ARDS is still controversial.
**Objectives:** Evaluate the overall mortality of HFOV in children with ARDS and explore mortality-related risk factors; compare the outcome of using HFOV post-endotracheal intubation early ($\leq$ 24 h) versus late ($\leq$ 24 h).
**Methods:** Retrospective chart review of all pediatric patients with ARDS aged one week to 14 years, who were admitted to the Pediatric Intensive Care Unit (PICU) at the King Faisal Specialist Hospital and Research Centre in Riyadh, Saudi Arabia, from January 2016 to June 2019 and who required HFOV. Data were analyzed using STATA software.
**Results:** 135 ARDS patients including 74 females (54.8%), and 61 males (45.2%), with a median age (interquartile range) of 35 (72) months. The overall mortality rate was 60.0% (81/135), and most died in the first 28 days in the PICU (91.3%, 74/8). Of non-survivors, 75.3% (61/81) were immunocompromised, and 24.7% (20/81) were immunocompetent patients, 52 (64.2%) received inotropic support, 40 (49.4%) had a bone-marrow transplant (BMT) before HFOV initiation. Although the prone position was used in 20.7% (28/135) to improve the survival rate post-HFOV ventilation, only 28.6% (8/28) survived. In addition, altered code status or chemotherapy reported a significant association with mortality ($P < 0.05$). Interestingly, early HFOV initiation ($\leq$ 24 h) did not seem to have a high impact on survival compared to late initiation (> 24 h); (57.4% vs. 42.6%, $P = 0.721$).
**Conclusions:** Immunocompromised and oncology patients, including post-BMT, reported poorer outcomes, and neither the prone position nor early use of HFOV improved outcomes. However, it is recommended to replicate the study in a larger cohort to generalize the results.

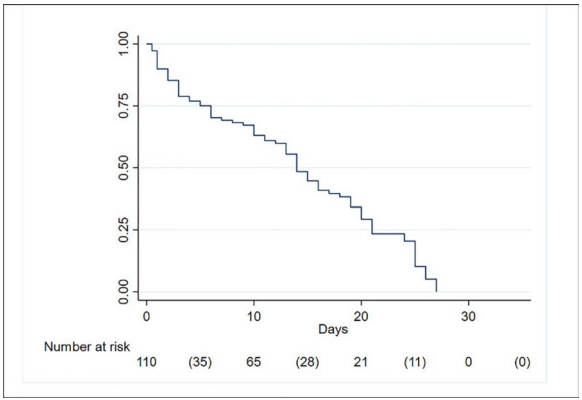


**Fig. 1 (abstract 001548)** Kaplan–Meier curve of patients who expired within 28 days of the PICU stay. The number in parentheses represents the number of deaths for each time period

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11. The authors would like to extend their apprecia-tion to King Saud University for funding this work through the Researchers Supporting Project Number (RSPD2023R649), King Saud University, Riyadh, Saud Arabia.

**Topic:** Acute respiratory failure and mechanical ventilation.

## 001549

### Prevalence of multi-drug resistant organisms (MDROs) in heart transplantation (HT) patients and their impact on HT outcome

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001549

**Introduction:** Transplant recipients commonly harbor multidrug-resistant organisms (MDROs), as a result of frequent hospital admissions and increased exposure to antimicrobials and invasive procedures.
**Objectives:** We investigated the impact of patient demographic and clinical characteristics on MDRO acquisition, and the impact of MDRO acquisition on ICU & hospital length of stay, and on ICU and 1-year mortality post heart transplantation (HT).
**Methods:** This retrospective study analyzed 98 consecutive HT patients over a ten-year period (2013–2022) in a single transplantation center. Data was collected regarding MDROs commonly encountered in critical care.
**Results:** In 98 patients (70% male) *Acinetobacter baumannii* (14.3%), *Pseudomonas aeruginosa* (12.2%) and *Klebsiella pneumoniae* (11.2%) prevailed. Compared to MDRO-free patients, the MDRO group had significantly greater BMI ($p=0.002$), higher rates of renal failure ($p=0.017$), primary graft dysfunction (10% vs 4.5%, $p=0.001$), surgical re-exploration (34% vs 14%, $p=0.017$), mechanical circulatory support ( 47% vs 26% $p=0.037$) and renal replacement therapy (28% vs 9%, $p=0.014$), as well as longer extracorporeal circulation time (median 210 vs 161 min, $p=0.003$). Median ICU and hospital stay were prolonged (15.5 vs 9 days, $p=0.001$ and 38 vs 28 days, $p=0.006$, respectively) compared to the MDRO-free group, while 1-year mortality was higher (28% vs 7.6%, log-rank- × 2: 7.34).
**Conclusions:** Following heart transplantation, a predominance of Gram-negative MDROs was noted (south-eastern Europe pathogen resistance pattern). MDRO acquisition was associated with higher complication rates, prolonged ICU and total hospital stay, and higher late post-transplantation mortality.

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**Topic:** Brain death, organ donation and transplantation

## 001550

### Is there weakness in wisdom?

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**Introduction:** The increased genetic load allowing antibiotic resistance may also translate into a reduction of the virulence of bacteria, a phenomenon named loss of fitness. This rationale was contested and is not so easily applied to the immunosuppressed patient. The kinetics of the infection are determined by factors from both the infectant and host. If the influence of the host is reduced then the microorganisms' is decisive.
**Objectives:** This study aims to determine the relationship between resistance profile and infected critical hematological patients.
**Methods:** Retrospective cohort with 89 patients with hematologic malignancies who were admitted to an ICU from January 2016 to August 2023 with bacterial infection. They were divided into 2 groups: group 0 with a low resistance profile (sensitive to amoxicillin-clavulanic acid) and group 1, which included those with more significant resistance patterns (resistant to amoxicillin-clavulanic acid). The latter was subdivided into intermediate resistance (group 3: sensitive to piperacilin-tazobactam); ESBL positive and Carbapenemase positive (group 4). The population was characterized by their baseline characteristics, hematological cancer, their profile of resistance, organ failure scores and ICU e in-hospital mortality.
**Results:** There were 89 patients presented with infection at admission. Median age was 61 years. The most prevalent hematologic malignancy was acute myeloid leukemia (44.9%), non-hodgkin's lymphoma (13.2%) and multiple myeloma (10.1%). Median ICU and in-hospital mortality was 69.2% and 79.4%. The most common infection was pneumonia (63%), followed by spontaneous bacteriemia (24%) and neutropenic colitis (8%).
Hospital mortality was similar between patients with infection agent isolation vs those without microorganism isolation (77.4% vs 73.1%, *p*-value 0.624).
When analyzing the severity scores we found that the median sofa 48h before admission was similar between groups 0 and 1 (5 vs 5, $p=0.120$), 24h before admission was higher in group 1 (6 vs 5, $p=0.026$). At admission, the scores were similar (SOFA 8 vs 10, $p=0.184$; APACHE 16 vs 18, $p=0.396$; SAPS II 57 vs 60, $p=0.704$). Hospital mortality between these two groups was similar (75% vs 75.8%, *p*-value 0.624).
When subdividing in the type of resistance, we found that the four study groups were similar in terms of SOFA score 48h before admission (group 0: score 5; group 1: score 5; group 2: score 6; group 3: score 5, *p*-value 0.420) and at admission (group 0: score 12, group1: score 11, group 2: score 13; group 3: score 10, *p*-value 0.135). Apache at admission was also similar (group 0: score 17, group1: score 21, group 2: score 18; group 3: score 17, *p*-value 0.414) as well as the SAPS II ( (group 0: score 54, group1: score 60, group 2: score 55; group 3: score 58, *p*-value 0.713). Hospital mortality was similar (group 0: 81%, group 1: 69%, group 2: 75%; group 3: 70%, *p*-value 0.980).
**Conclusions:** There is a complex interplay of forces in the infection in the critical hematological patient. The loss of fitness in more resistant microorganisms doesn't seem to be predominant in this type of immunosuppression. It may point that the characteristics of the host are more determinant.

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**Topic:** Haematologic-oncologic issues in the ICU

## 001552

### Mortality risk factors in patients with spontaneous intracerebral hemorrhage admitted to intensive care unit

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001552

**Introduction:** Spontaneous intracerebral hemorrhage (ICH) is a common neurological emergency that is associated with high rates of disability and mortality, and is a frequent reason for admission to Intensive Care Units (ICU).
**Objectives:** The purpose of this study was to identify risk factors related to mortality in patients with spontaneous intracerebral hemorrhage admitted to Intensive Care Units.
**Methods:** Retrospective, observational, study performed on patients with ICH admitted to the ICU of H.G.*U* Gregorio Marañón (Madrid, Spain), between 2022 and 2023 years. Epidemiological data, ICH risk factors, comorbidities, severity scores (APACHE II, GCS and ICH score), hemorrhage characteristics (location, volume, intraventricular involvement (IVH) and midline displacement), patient clinical characteristics, organic support and outcome were collected during ICU stay.
Descriptive data were expressed as means with standard deviation for normally distributed continuous variables, medians with interquartile range (IQR) for non-normally distributed variables, and percentages for categorical data. The continuous variables were categorised according to the maximum discrimination point by the AUROC. A univariate and multivariate analysis was performed using logistic regression to determine the factors related to mortality.
**Results:** Eigthy-nine patients, 63% male. Age 62 yrs (51–72). Charlson Comorbidity Index 0 pts (0–2). Severity scores: APACHE II 22 pts (16–26), ICHS 3 pts (2–4), GCS 10 pts (5–14). Neutrophil-to-lymphocyte ratio 5 (3–11). Hemorrhage characteristics: brainstem location 14.6%, hematoma volume 36 cc (15–80), midline displacement 57% and IVH 66%. 25% of patients received surgical treatment (hematoma evacuation and/or decompressive cranectomy). During ICU stay, 85% of patients needed mechanical ventilation and 80% presented some complication. Overall mortality was 55%.
The results of the univariate analysis were: Age > 70 yrs (OR 3.59; CI 95% 1.27–10.16), Charlson Index > 2 pts (OR 4.83; 95% CI 1.61–14.45), GCS > 9 pts (OR 0.22; 95% CI 0.08–0.53), APACHE > 24 pts (OR 7.42; 95% CI 2.62–21.11), Neutrophil-to-lymphocyte ratio (OR 1.08; 95% CI 1.01–1.16), brainstem location (OR 6.50; 95% CI 0.76–55.25), hematoma volume (10cc) (OR 1.21; 95% CI 1.07–1.37), midline displacement (OR 2.52; 95% IC 1.06–5.97), IVH (OR 3.13; 95% CI 1.25–7.79), surgical treatment (OR 0.28; 95% CI 0.10–0.77), complication ICU stay (OR 1.71; 95% CI 0.60–4.84) and mechanical ventilation (OR 8.91; 95% CI 1.84–43.108).
In the multivariate analysis, on a maximum model including the previously described, the Charlson Index > 2 pts (OR 11.44; 95% CI 1.56–83.74), brainstem location (OR 51.56; IC 95% 1.28–2073.92), hematoma volume (10cc) (OR 1.32; IC 95% 1.03–1.69), mechanical ventilation (OR 17.48; IC 95% 1.02–299.33) and neutrophil-to-lymphocyte ratio (OR 1.10; IC 95% 1.01–1.21), were the factors independently associated with mortality.
**Conclusions:** In our experience, the factors independently related to mortality in patients with spontaneous intracerebral hemorrhage were the presence of comorbidities, hemorrhage location, hematoma volume, neutrophil-to-lymphocyte ratio and need for mechanical ventilation.

**Topic:** Health Services Research and Outcome

## 001553

### Acute Kidney Injury (AKI) in patients treated with Veno-Arterial Extracorporeal Membrane Oxygenation (VA ECMO) in the Intensive Care Unit (ICU) of a Cardiac Surgery Center

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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001553

**Introduction:** ECMO is a cardiopulmonary support system used to assist patients with cardiovascular and/or respiratory failure. AKI has been reported to be one of the most common complications in patients receiving extracorporeal membrane oxygenation and is strongly associated with high mortality rates.
**Objectives:** To assess the incidence of AKI and AKI that requires renal replacement therapy (AKI-RRT) as well as mortality rates, in patients treated with VA ECMO in a single-center study.
**Methods:** Patients admitted consecutively to the Cardiac thoracic ICU of a Cardiac Surgery Center from January 2015 until June 2023 were retrospectively studied. The clinical data, duration and mode of ECMO, details of inotropic support, mode of RRT and length of stay in the ICU and the ward, were recorded. AKI was defined as per KDIGO criteria.
**Results:** The study included 108 patients, with a mean age of 59 (42–69) years; 59 (55%) were males. All patients recorded were supported with VA ECMO due to cardiogenic shock, 87 of them (81%) following cardiac surgery. Forty-eight patients underwent central VA ECMO. Eighty-two patients (76%) on ECMO died either in the ICU or in the ward; 55 out of them (67%) were complicated with AKI during hospitalization.
**Conclusions:** AKI occurs frequently in patients supported with VA ECMO and is associated with poor outcomes.

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**Topic:** Cardiovascular issues in ICU

## 001555

### Fostering teamwork for resilient staff and safe care in ICU: a multi-site ethnographic study (FEARLESS ICU)

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**Introduction:** Teamwork in healthcare has long been linked with improved outcomes for staff (wellbeing), organisations (staff retention), and patients (safety). However, teamwork within the UK NHS remains problematic with negative consequences for patients and staff. Alarmingly, the recent NHS Staff survey shows a national decline in teamwork; with unexplained disparities across professions.
The post-pandemic landscape reflects significant pressures on clinical teams, especially in intensive care units (ICUs), with demands for more flexible and cross-boundary working in ad hoc teams with redeployed staff and new role developments. Early data show a negative impact on staff, with a lack of clarity on new ways of working, leading to stress, turnover, and patient safety concerns. The lasting consequences of the nature and shape of teamwork in ICUs post the pandemic remain unknown. This hinders efforts to strengthen clinical and system resilience.
**Objectives:** A) Examine the changing nature of teamwork in ICUs post-pandemic; B) Refine current teamwork frameworks given the changing context; and, C) Co-develop with staff a toolkit for strengthening ICU teamwork capacity moving forward.
**Methods:** Multi-method study over four stages. Stage 1: high-quality quantitative and qualitative evidence syntheses; and statistical analysis of the NHS Staff survey. The evidence syntheses will follow best practice guidance for publication in the Cochrane Library. Survey analysis to examine factors influencing teamwork utilising regression and modelling. Stage 2: fieldwork in five purposively selected (size, geography) ICUs, including non-participant observation, semi-structured interviews, and document analysis. Fieldnotes will be kept in a digital journal and interviews recorded and transcribed. Analysis will follow standard ethnographic principles of thematic coding, categorisation, and abstraction. Stage 3: reflexive workshops with staff and

toolkit development. To utilise design approaches and tools, such as quality circles, brainstorming, voting and creative conversations. Stage 4: dissemination and networking to identify potential sites for a future cluster-randomised trial, for which a protocol will be developed during the study in readiness for a successive funding application.
**Results:** Exploratory and confirmatory factor analysis of the NHS staff survey teamwork scale alongside inferential and descriptive statistics on teamwork, staff engagements, and burnout. Initial findings from the in-person fieldwork in two ICUs.
**Conclusions:** Project outputs will be disseminated widely through videos, blogs, a project website and newsletter; as well as policy briefs, news pieces, conference presentations and academic publications; and, a final project multistakeholder symposium bringing together clinicians, service users and policymakers. By generating an in-depth, evidence-based understanding of teamwork in ICU, and offering a toolkit to ICU teams across the NHS, the project can have a direct impact on the teamwork practice of ICU staff, improvement of which has long been linked with a better patient, staff and organisational outcomes.

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2. AX, BW, and SC are part-funded by an NIHR Advanced Fellowship (NIHR302958, FEARLESS ICU). The views expressed are those of the authors and not necessarily those of the NIHR or the Department of Health and Social Care.

**Topic:** Health Services Research and Outcome

## 001559

### Both essential and nonessential amino acids in nutrition are needed to attenuate post-sepsis muscle fatigue and stimulate activity in a new pig model of ICU-acquired muscle weakness (ICU-AW)

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001559

**Introduction:** Sepsis leads to long-term muscle weakness, fatigue, and reduced physical activity (ICU-AW). We developed an acute sepsis-recovery ICU-AW pig model to study whether meals with only essential (EAA) or all amino acids (TAA) improve ICU-AW symptoms.
**Methods:** In 49 pigs (±25 kg), sepsis was induced by i.v. live *Pseudomonas Aeruginosa* bacteria (5*10e8 CFU/hour). At $t=9$ h, recovery was initiated with i.v. gentamicin. Post sepsis, twice daily food was provided starting at 25% at Day 1 to 100% during Day 4–7. The 100% meals contained per kg BW: 15.4 gr CHO and 3.47 gr fat per kg BW, and a balanced free TAA (reflecting muscle) or EAA mixture (0.56 gr N: EAA or TAA group). We measured involuntary, isometric pelvic limb muscle strength and activity prior to and at Day 4–7 post sepsis. Peak force and downslopes of the fatigue curves were obtained from tetanus stimulations of the tibiotarsal muscles. Daytime homecage activity was video-tracked with Ethovision XT17 software (Noldus) and a unified score for weakness was used. Postabsorptive plasma amino acid (AA) concentrations by LC–MS/MS and two-way RM-ANOVA (time (sepsis recovery), intervention (nutrition), and interaction) ($\alpha=0.05$).
**Results:** Body weight reduction was found after sepsis in both groups, which was restored on Day 7 post-sepsis. Muscle Flexion. Strength: no ($p>0.2$) time, intervention or interaction effects. Fatigue increased over time ($p=0.0008$) and more in the EAA group ($p=0.0045$). TAA group had 30% less fatigue on Day 7 ($p<0.0001$) whereas the EAA group had more fatigue on Day3 and 7 ($p<0.0002$). Activity: General activity, maximum gait speed, and acceleration to start walking decreased below baseline in both groups at Day 6 post sepsis ($p<0.01$, all groups). Interactions with cage enrichments decrease over time in comparison with Day 2 (time effect: $p<0.0001$). The overall weakness score was lower in the TAA group vs EAA group ($p=0.031$), especially on Day 4–5 ($p=0.0461$, $p=0.0024$).
**Plasma** EAA changes were related to meal AA composition, whereas in response to the TAA meal, the plasma non-essential AA (NEAA) ARG ($p<0.0001$) and CIT ($p=0.0009$) were higher, and GLN ($p<0.0001$), GLU ($p<0.0001$) and TAU ($p<0.0001$) lower. In the EAA group, lower ARG ($p=0.0095$) and TAU ($p=0.0021$; more in EAA: $p<0.0001$), unchanged GLN ($p=0.97$) and increased CIT ($p<0.0001$; more in EAA: $p<0.0008$) were found. Tau-methylhistidine, a product of myofibrillar protein breakdown, increased by 56% in the EAA group (Day 3&7; $p<0.004$).
**Conclusions:** We conclude that providing an incremental TAA meal (EAA + NEAA) to our innovative sepsis-recovery pig ICU-AW model attenuates muscle fatigue and improves homecage physical activity more than the EAA meal and possibly reduces protein breakdown. We hypothesize that providing certain NEAA with EAA may play a key role in attenuating ICU-AW.

**Topic:** Sepsis

## 001560

### The ketone body β-hydroxybutyrate reduces endothelial dysfunction following inflammatory activation

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001560

**Introduction:** The postoperative systemic inflammatory response syndrome is often accompanied by endothelial dysfunction characterized by increased endothelial leukocyte adhesion and permeability (1). The resulting oedema and hyperinflammation significantly contributes to organ failure in critically ill patients and substantially worsens patient outcomes. Previous studies have demonstrated an anti-inflammatory effect of the ketone body beta-hydroxybutyrate (BHB) on T-cell immunity (2).
**Objectives:** Therefore, we investigated the protective influence of BHB pre-incubation on endothelial cell function during acute inflammation and in a translational in-vitro model of postoperative endothelial dysfunction.
**Methods:** Primary endothelial cells (HUVEC) were subjected to shear stress at 10 dyn/cm$^2$ and incubated with or without BHB (NC vs. BHB) for 24 h. Subsequently, the cells were further activated for 24 h with 10 ng/ml TNF or with inflammatory serum obtained from patients after cardiopulmonary bypass. Metabolic activity was assessed using Seahorse Flux Analysis, and the inflammatory response was characterized using flow cytometry and ELISA. Following perfusion of calcein-labeled monocytes over the inflamed endothelium, monocyte adhesion was quantified using fluorescence microscopy. Endothelial barrier function was evaluated using electric cell-substrate impedance sensing (ECIS).
**Results:** We demonstrate that pre-incubation with BHB induced a fundamental reprogramming of the metabolic profile in inflamed endothelial cells: the TNF-induced increase in glycolysis was significantly reduced (Fig. 1A, GlycoPER − 19.6%, $p<0.05$). Additionally, BHB stabilized mitochondrial membrane potential (Fig. 1B, JC1 + 13.7%, $p<0.05$) and reduced mitochondrial reactive oxygen species (Fig. 1C, mROS − 22.7%, $p<0.01$). The elevated secretion of cytokines (IL-6

− 21.4%, $p < 0.05$), chemokines (Fig. 1D, CCL2 − 35.0%, $p < 0.05$), and the surface expression of endothelial cell adhesion molecules were markedly decreased by BHB pre-incubation (Fig. 1E, ICAM-1 − 12.9%, $p < 0.05$). Consistent with these findings, endothelial monocyte adhesion following TNF stimulation was significantly reduced in BHB-pretreated endothelium (Fig. 1F, Monocytes − 18.2%, $p < 0.05$), while barrier function was strengthened (Fig. 1G, ECIS + 5.6%, $p < 0.05$). Pre-incubation with BHB also resulted in markedly decreased endothelial inflammation following stimulation with postoperative serum from cardiac surgery patients (Monocytes − 33.1%, $p < 0.05$; ECIS + 9.1%, $p < 0.05$). At the molecular level, BHB pre-incubation led to reduced activation of pro-inflammatory NFκB and ERK pathways (Fig. 1H, I, *p*-IκB − 26.4%, $p < 0.05$; *p*-ERK − 20.8%, $p < 0.01$).

**Conclusions:** BHB-mediated reprogramming of the metabolic profile in human endothelial cells results in a reduction of endothelial dysfunction during the acute inflammatory response. These findings highlight the anti-inflammatory potential of BHB supplementation as a possible preventive measure to reduce postoperative complications in the ICU by preserving endothelial function.

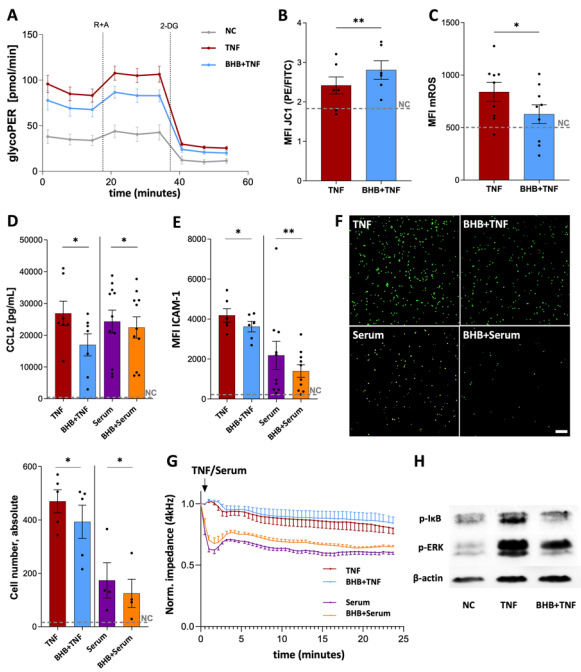


**Fig. 1 (abstract 001560)** Metabolic and inflammatory activation of HUVEC under basal, stimulated, and BHB-supplemented conditions
HUVEC were cultured under shear stress with or without BHB for 48 h and stimulated with TNF or inflammatory serum from postoperative cardiac surgery patients for an additional 24 h. (A) Glycolytic Proton Efflux Rate (GlycoPER) as a measure of glycolysis over time, calculated using Seahorse Glycolytic Rate Assay Report Generator, $n = 5$. (B) Flow cytometric analysis of mitochondrial membrane potential using the PE/FITC ratio of JC1 dye, $n = 6$. (C) Measurement of mitochondrial reactive oxygen species using MitoSox in flow cytometry, $n = 9$. (D) Concentration of CCL2 in cell culture supernatant using ELISA, $n = 7/11$. (E) Flow cytometric quantification of surface expression of endothelial leukocyte adhesion molecule ICAM-1, $n = 6/9$. (F) Fluorescence microscopy images and quantification of adhesion of calcein-labeled monocytes to inflamed endothelium, $n = 5/4$. (G) Endothelial barrier function over time using electric cell-substrate impedance sensing, $n = 6/5$. (H) Analysis of pro-inflammatory signaling pathways NFκB and ERK using Western blot detection of *p*-IκB and *p*-ERK. 2DG = 2-Deoxy-D-glucose, BHB = β-Hydroxybutyrate, CCL2 = CC-Chemokine Ligand-2, ICAM-1 = Intracellular Adhesion Molecule 1, MFI = mean fluorescence intensity, NC = negative control, R + A = Rotenone + Antimycin A.

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3. This work was supported by the intramural grant of the Support Association WiFoMed of the Medical Faculty of LMU Munich.

**Topic:** Translational biology

## 001561

## Evaluating the quality of systematic reviews on the use of balanced crystalloids versus saline in fluid resuscitation of critically ill patients

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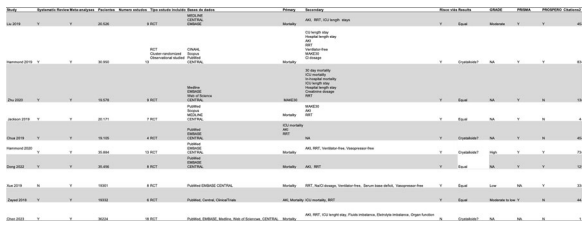
***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001561

**Introduction:** Intravenous fluid therapy remains a cornerstone in the management of critically ill patients, with the debate between the use of balanced crystalloid solutions and saline continuing to garner significant clinical attention. The choice of resuscitative fluid can profoundly impact patient outcomes, particularly in critically ill populations where fluid balance and composition are pivotal. Recent systematic reviews have endeavoured to synthesize available evidence, comparing the efficacy and safety of balanced crystalloids to saline, yet the quality of these reviews varies, potentially influencing the strength of their conclusions and recommendations. This study aims to dissect and appraise the methodological rigour and quality of these systematic reviews to provide clarity on the implications of their findings for clinical practice. By assessing the quality of systematic reviews, we can better understand the landscape of evidence guiding fluid therapy in critically ill patients and ensure that healthcare decisions are informed by robust, high-quality research.
**Objectives:** This study employed a comprehensive meta-research approach, systematically evaluating the methodological quality of published systematic reviews that compared balanced crystalloids with saline for fluid resuscitation in critically ill patients.
**Methods:** We meticulously searched databases including MEDLINE, EMBASE, Web of Science, and the Cochrane CENTRAL Register of Controlled Trials up to December 2019, ensuring a broad capture of relevant literature.
Stringent inclusion criteria, requiring studies to be systematic reviews with or without meta-analysis, focusing on adult critically ill patients, and comparing balanced crystalloids to saline. The primary outcomes of interest were mortality and renal replacement therapy (RRT), while secondary outcomes included ICU length of stay and incidence of acute kidney injury (AKI).
Each systematic review's quality was assessed using the AMSTAR (A Measurement Tool to Assess Systematic Reviews) tool, and the certainty of the evidence was evaluated using the GRADE (Grading of Recommendations Assessment, Development, and Evaluation) approach.
**Results:** Our analysis included a total of six studies, with sample sizes ranging from 19,105 to 35,456 participants, and encompassing various critical care scenarios.
We synthesized and presented the extracted data in a tabular format, summarizing key aspects such as the number of randomized controlled trials (RCTs) included, the quality of evidence, and the consistency of the findings across the reviews. The table also denotes whether each study reported on specific outcomes of interest, providing a clear and concise comparison of the evidence base.
This methods section is tailored to fit the context of the abstract and aligns with the information provided in the table.

**Conclusions:** The necessity for rigorous methodological standards in conducting systematic reviews and meta-analyses is underscored by our findings. It is evident that the variability in review quality can significantly impact clinical decision-making. To enhance the reliability of conclusions drawn from systematic reviews, adherence to established protocols such as PRISMA guidelines, thorough risk of bias assessments, and the use of the GRADE approach for grading the quality of evidence should be considered mandatory.
It is imperative that future reviews incorporate these stringent methodological practices to ensure that healthcare professionals can base their decisions on the highest quality evidence. This will foster better clinical outcomes and strengthen the confidence of the medical community in the synthesized findings of systematic reviews and meta-analyses in the field of critical care medicine.
**(abstract 001561) Summary of findings from studies.**



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**Topic:** Health Services Research and Outcome

## 001562

## Septic patient serum demonstrates impaired antimicrobial and immunosuppressive effects

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**Introduction:** A complementary approach to the management of bacterial infections is the use of host-directed therapies that can interfere with host cell factors required by a pathogen for replication or persistence [1].
Therapies targeting the humoral immune response in bacterial sepsis remain relatively unexplored, however, early work demonstrates that trimodulin (human polyvalent immunoglobulin) and plasma exchange may be of benefit in patients with septic shock [2–3].
The need for host-directed therapies in sepsis is of particular relevance given many patients succumb to persistent and/or secondary infections that are generally associated with impaired immune function (sepsis-induced immunosuppression).
**Objectives:** Identify whether serum isolated from septic patients has impaired antimicrobial and immunomodulatory properties compared to serum isolated from volunteers.
**Methods:** The antimicrobial effect of serum was assessed by incubating serum from healthy volunteers (HV) and ICU patients (both survivors and non-survivors) with or without heat treatment (to denature proteins), for 24 h with gram-negative bacteria (Acinetobacter, E. coli, Klebsiella and Pseudomonas) in the presence or absence of antibiotics (meropenem, ciprofloxacin, and gentamicin). The effect on bacterial growth was assessed using optical densities and a number of colony-forming units and the co-effect with meropenem was assessed using minimum inhibitory concentration.
The immunomodulatory effect of serum was assessed by incubation of HV peripheral blood mononuclear cells (PBMCs) for 24 h (monocytes, with and without heat-killed E coli [HKB]) or 72 h (lymphocytes, with or without CD3/ CD28 beads) with pooled serum from volunteers, ITU survivors and non-survivors. The effect on the immune function of monocytes (chemokine receptor expression, phagocytosis, antigen presentation, cytokine release, and T-cell suppression) and lymphocytes (activation, proliferation, cytokine release, and cell death) was assessed by flow cytometry.
**Results:** The growth of Gram-negative bacteria is inhibited by HV ($n=5$) serum in vitro. Heat treatment of the serum to denature proteins resulted in the loss of antimicrobial properties. (Fig a.i. example with actinobacteria) This ability to inhibit bacterial growth was impaired in serum taken from critically ill septic patients ($n=3$), but not in serum taken from patients with milder infections. (data not shown) Additionally, healthy volunteer serum had a synergistic effect with antibiotics in preventing the growth of bacteria in vitro. (Fig a.ii. example with meropenem).
In PBMCs co-incubated with HKB or beads and pooled serum from volunteers ($n=6$), ICU survivors ($n=6$) or non-survivors ($n=3$), monocyte phagocytosis was decreased; the effect was more pronounced in the presence of serum from patients with sepsis (Fig b.i.). Serum from patients with sepsis resulted in a reduction in monocyte HLA-DR expression compared to serum from HV. This was more pronounced in serum from sepsis non-survivors. (data not shown) Serum from patients with sepsis resulted in an increase in CTLA-4 compared to HV serum (Fig b.ii.) and a reduction in CD4 + lymphocyte CD28 (data not shown) indicative of an immunosuppressive phenotype. Similar effects were seen in CD8 + lymphocytes (data not shown).
**Conclusions:** Healthy volunteer serum has antimicrobial properties and has a synergistic effect with antibiotics in preventing the growth of bacteria in vitro. This effect is progressively lost with increasing severity of illness.
Serum from patients with sepsis induces an immunosuppressive phenotype when incubated with volunteer immune cells.
This effect may be related to depletion, inhibition or augmentation of putative factors. Identification of these factors would enable the development of a therapeutic intervention to replenish responsible serum component (s) and improve outcomes from sepsis.

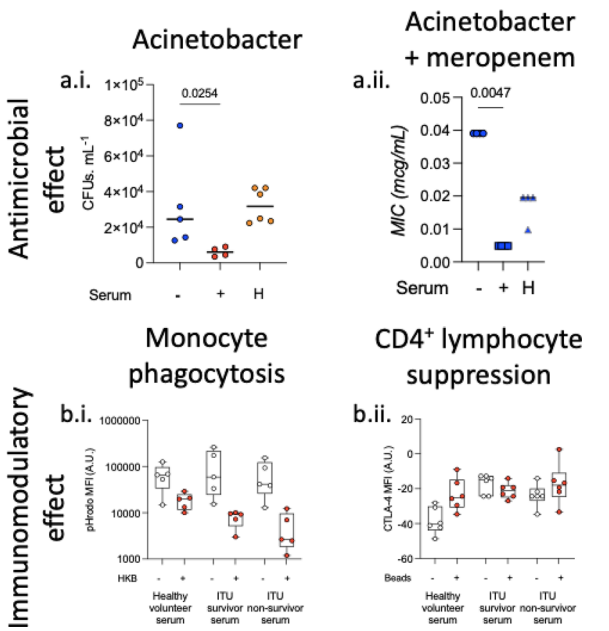


**Fig. 1 (abstract 001562)** Healthy volunteer serum has antimicrobial properties against gram-negative bacteria (a.i.) and enhances the antimicrobial effect of antibiotics (a.ii.) This effect is lost after heat treatment. Septic patient serum has immunosuppressive effects, reducing monocyte phagocytosis (b.i.) and increasing CD4 + lymphocyte suppression (b.ii.)

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4. Medical Research Council (NA)

**Topic:** Sepsis

## 001564

### Severe trauma patients: does time before ICU admission matter?

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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001564

**Introduction:** Time is vital in trauma since delay in its management carries high morbimortality. After initial stabilization in the Emergency Department (ED), severe trauma patients are frequently admitted to the ICU. Since the outcome of these patients is often dependent on time-sensitive care intervention, the timing of transfer to the ICU may be extremely important.

**Objectives:** To evaluate the impact of time spent in the ED before ICU admission on the outcome of critically ill trauma patients.
**Methods:** Retrospective single-center study of all trauma patients admitted between June and December of 2023 to an ICU of a Tertiary University Hospital. Time spent in the ED before ICU admission was divided into 3 groups: ≤ 3 h (group I), 3 to 6 h (group II) and ≥ 6 h (group III). Besides demographic data, we collected severity scores, serum lactate, arterial pH level and systolic blood pressure on ED admission, Shock Index (SI), the need for emergency surgery, length of stay (LOS) and ICU and hospital mortality. SPSS was used for statistical analysis.
**Results:** During this period, 89 trauma patients were admitted, mainly male (76.4%), median age of 56y (IQR 38.5–65) and 33.7% had ≥ 1 comorbidity. Most of the patients were polytrauma with brain injury (BI) (46.1%), 14.6% had isolated BI and 19.1% had monotrauma. Median time in ED was 4.74 h and 53.9% were submitted to emergent surgery. Median ICU and hospital LOS were 5 (IQR 2–10) and 13 (5–29.5) days, respectively. ICU mortality was 11.2% which increased to 12.4% regarding hospital mortality.
Groups I, II and III included 26 (29.2%), 36 (40.5%) and 27 (30.3%) patients, respectively. No difference between groups was observed regarding gender, age, presence of comorbidities and SAPS II. Although not statistically significant ($p = 0.067$), patients in group I had, more frequent, monotrauma (38.5%) while patients in group II and III had more frequent polytrauma with BI in 50% and 59.3% patients, respectively. However, patients in group I were more frequently submitted to emergent surgery (80.8 vs 41.7 vs 44.4%; $p = 0.005$).
No significant differences were observed regarding median serum lactate, arterial pH and SI on admission to ED (Table 1).
Both ICU (19.2 vs 8.3 and 7.4%, respectively; $p = 0.306$) and hospital (19.2 vs 11.3 and 7.4%, respectively; $p = 0.407$) mortality were higher in group I but not reaching significant differences.
No differences between the 3 groups were found regarding ICU LOS (4.5 vs 5 vs 5 days; $p = 0.733$) but patients in group II (21.5 days) had a significantly longer hospital LOS compared to group I (8 days) and III (8 days) ($p = 0.043$).

**Table 1 (abstract 001564)** Median SI, pH level and lactate level (mmol/L) within each group in the ED

| | Group I | Group II | Group III | *p* = |
|---|---|---|---|---|
| SI | 0.75 | 0.84 | 0.69 | 0.139 |
| Arterial pH | 7.34 | 7.36 | 7.37 | 0.603 |
| Lactate (mmol/l) | 1.58 | 2.21 | 1.87 | 0.106 |

**Conclusions:** Time spent in the ED before ICU admission did not significantly impact the outcome of trauma patients, except on hospital LOS. The constant presence of an intensivist in the ED, leading the initial approach to these patients may be one of the determinants of the lack of impact of time in the ED pre-ICU on most outcome variables.
For most of the severe trauma patients, the Intensive Care Unit is the first hospital service they are admitted to after emergency admission. Furthermore, trauma carries high morbidity and mortality, and the treatment must be carried out without delay. Efforts have been made to study the impact of time spent in ED on patient's outcome.

**Topic:** Trauma

## 001565

### Preoperative carbohydrate loading to maintain normothermia in children under anaesthesia: A prospective randomised controlled trial

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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001565

**Introduction:** Infants and children are prone to develop hypothermia under anaesthesia. The consequences of hypothermia contribute to adverse outcomes such as bleeding as well as altering the pharmacokinetics and pharmacodynamics of various drugs administered. Maintenance of normothermia is therefore of paramount importance.
**Objectives:** The present study is designed to evaluate the efficacy of preoperative oral carbohydrate administration in reducing intraoperative hypothermia.
**Methods:** After taking institutional ethical approval and consent from parents/legal guardian children of ASA PS 1 and 2 between the age group 2–10 years, posted for urogenital surgeries under general anaesthesia (GA) lasting for more than 30 min were screened for randomized allocation. Group Oral Carbohydrate (group A) patients received 5 ml/kg of oral carbohydrate solution (glucon-D) prepared as 12.6% solution. The solution was prepared by adding 0.7 gm/kg of glucon-D to water. Group B children were administered 5 ml/kg of plain water. Both solutions were administered 2 h prior to surgery as per the group. Before induction of anaesthesia baseline tympanic infrared temperature (TB) was recorded. The operation theatre temperature was monitored and maintained at 25–27 degree Celsius. Any intraoperative temperature recording < 36 degree Celsius (tympanic infrared, recorded every 15 min) was labelled as hypothermia. The temperature at the end of surgery and before extubation was recorded, i.e. final temperature (TF). The difference between TB and TF was calculated and compared in the two groups.
**Results:** Hundred and sixteen patients were recruited between November 2021 and December 2023. There was no imbalance in the baseline parameters. Preoperative oral carbohydrate administration (group A) changed the incidence of intraoperative hypothermia by − 21% [95% CI, − 39 to − 2.1%, $p = 0.032$]. The incidence of postoperative shivering was also lower in the oral carbohydrate group − 17% [− 30 to − 4.9%, $p = 0.006$]. There was no difference in the total intraoperative fluid administered or blood loss. There was no difference in the intraoperative blood glucose levels.
**Conclusions:** Preoperative oral carbohydrate administration can reduce the incidence of intraoperative hypothermia and postoperative shivering in children aged 2–10 years presenting for urogenital surgeries.

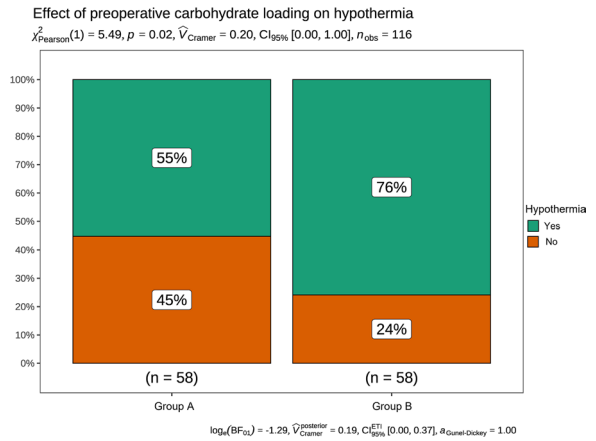


**Fig. (abstract 001565)** Incidence of hypothermia in each group; Group A—preoperative oral carbohydrate group, Group B—Placebo group

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**Topic:** Perioperative care

## 001566

### Complete blood count ratios interest in diagnosis of pulmonary embolism

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**Introduction:** White blood cells (WBC) subtypes have been associated with many several inflammatory diseases such as pulmonary embolism (PE). The neutrophil–lymphocyte ratio (NLR), monocyte-lymphocyte ratio (MLR), and platelet-lymphocyte ratio (PLR) are easily assessable and continue to hold significance today. These parameters have been identified as potentially beneficial biomarkers for assessing the prognosis of patients with PE.
**Objectives:** To study the interest of WBC subtypes ratios in predicting the diagnosis of PE in patients admitted for acute respiratory failure.
**Methods:** It was a retrospective study including patients admitted for the management of acute respiratory failure in the absence of radiographic findings. The study took place in the medical intensive care unit at Abderrahmen Mami Hospital in Ariana, Tunisia between January 2023 and December 2023. Demographic, clinical and outcome data were collected. The NLR, MLR, PLR, eosinophil-lymphocyte ratio (ELR) and basophil-lymphocyte ratio (BLR) were calculated at Day 1 of care. Two groups were individualized using CT scan angiography: G1 = EP + and G2 = EP−. The correlation between the ratio and PE was investigated using the student test T.
**Results:** Eighty-three patients were included. The mean age was 55.5 ± 19.3 years with a gender ratio of 0.9. Median APACH II score was 8 [5–14] and mean IGS2 score was 28 ± 18. Forty-seven patients were admitted for the management of hypercapnic acute respiratory failure, and 37 for non-hypercapnic acute respiratory failure. The diagnosis of PE was made in 28 patients (34%). The NLR, MLR, PLR, and BLR were not associated with the occurrence of PE (respectively $p = 0.2$; 0.4; 0.3; 0.2). However, the ELR was significantly lower in patients of EP + comparatively with those of EP− (respectively, 0.08 vs 0.15; $p = 0.01$).
**Conclusions:** Our study findings demonstrated that the analysis of the ELR ratio on day one of hospitalisation may predict the occurrence of PE. Larger studies are required to confirm our results.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001567

### Retrospective evaluation of cerebral Near-Infrared Spectroscopy (NIRS) monitoring in patients undergoing venoarterial extracorporeal membrane oxygenation (V-A ECMO) treatment

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001567

**Introduction:** Extracorporeal membrane oxygenation (ECMO) provides advanced bridge therapy for refractory cardiopulmonary failure and perioperative support, including refractory cardiopulmonary resuscitation (1), improving survival and neurological outcomes (2). Despite advancements, ECMO remains associated with high morbidity, especially neurological complications like seizures, intracranial hemorrhage, and ischemic stroke, more prevalent in V-A ECMO than V-V

ECMO (4), and in extracorporeal cardiopulmonary resuscitation (ECPR) (5). Adequate neurological monitoring, including clinical examination and tools like bispectral index (BIS) and near-infrared light spectroscopy (NIRS) (6,7), is crucial. This study aims to assess functional, clinical, and neurological changes during V-A ECMO and their correlation with cerebral NIRS regional oxygen saturation (rSO2).

**Objectives:** To evaluate the correlation between rSO2 levels verified by cerebral NIRS of patients on V-A ECMO and the Modified Rankin functional assessment scale (mRS) within a period of up to 28 days after the start of monitoring. Secondary objectives include the correlation of rSO2 levels with length of stay in the ICU, mechanical ventilation time, neurological complications and other clinical features.

**Methods:** This was a single-center, retrospective cohort study of patients who received support with V-A ECMO and neurological monitoring with cerebral NIRS treated at the Critical Care Department of Hospital Israelita Albert Einstein (HIAE) in São Paulo, SP, during the period from January 2015 until July 2023. Data was extracted from the electronic medical record, EPIMED database of HIAE and ECMO-related database of the Critical Care Department of HIAE. This study was approved by the Research Ethics Committee of Hospital Israelita Albert Einstein (CAAE: 73,955,623.7.0000.0071; # 6.433.403). Informed consent was waived due to retrospective design. Adults between 18 and 70 years old treated with V-A ECMO and monitored with cerebral NIRS were included.

**Results:** Twenty-three out of 55 V-A ECMO patients (aged 47 [18–70] years) were included. The mean SAPS-3 score on admission was 46.35 ± 12.77. 15 individuals (65.2%) were male, and 8 individuals (34.8%) were female. 15 patients (65.2%) survived, and 8 patients (34.8%) died. 1 patient (4.3%) had chronic kidney disease requiring dialysis. 6 patients (26.1%) were hypertensive. 7 patients (30.4%) had diabetes. 1 patient (4.3%) was a smoker. 1 patient (4.3%) was an alcoholic. 18 patients (78.3%) were diagnosed with septic shock. 9 patients (39.1%) were cannulated due to cardiogenic shock, 6 (26.1%) due to ECPR, and 8 (34.8%) due to heart or lung transplantation. The mean duration of V-A ECMO treatment was 7.04 days ± 7.125, with a minimum of 1 day and a maximum of 26 days. The most frequent treatment duration was 4 days (21.7%). The mean mRS after 28 days of ECMO initiation was 3.26 ± 2.43, with 0 being the most frequent result (30.4%), 8 patients with a score of 0–2, and 15 patients with a score of 3–6. The mean ECMO flow was 3.15 ± 0.76. The mean membrane oxygen fraction (FmO2) was 57.29% ± 18.35. The mean mean arterial pressure (MAP) was 71.59 ± 11.28. The mean left cerebral rSO2 was 52.53 ± 10.41, and the right cerebral rSO2 was 52.925 ± 10.45. Multivariate regression analysis showed that mean arterial pressure (MAP) was significantly associated with NIRS levels in both the right ($p < 0.033$) and left ($p < 0.008$) cerebral hemispheres.

**Conclusions:** In conclusion, our retrospective analysis emphasizes the critical need for neurological monitoring in venoarterial extracorporeal membrane oxygenation (V-A ECMO) patients due to the persistent risk of neurological complications. Particularly, the observed correlation between mean arterial pressure (MAP) and NIRS levels underscores the importance of effective hemodynamic management in maintaining cerebral perfusion during V-A ECMO therapy.

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2. This research would not have been possible without the generous support of the Critical Care Department of Albert Einstein Israelite Hospital which enabled the conduct of comprehensive data analysis. Additionally, we acknowledge the invaluable contributions of our colleagues and collaborators who provided expertise, guidance, and resources throughout the duration of this study.

**Topic:** Neurointensive care

## 001569

### PCT/PCR index as a predictor of mortality in pulmonary sepsis

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001569

**Introduction:** C-reactive protein (CRP) and procalcitonin (PCT), the cheapest and most readily available, are by far the most routinely used biomarkers for sepsis (1). A study conducted on patients with abdominal sepsis, the PC/CRP index showed better performance than PCR and PCT alone (2). We postulate that the utilization of the PCT/CRP index in pulmonary sepsis would show the same results as abdominal sepsis.

**Objectives:** Examine the predictive efficacy of the PCT/PCR index for mortality in patients with pulmonary sepsis.

**Methods:** Prospective cohort of adult patients admitted to an ICU in Mexico, continuous and categorical variables were described as mean/standard deviation and percentages, respectively, and compared with student *t* test or chi-squared as appropriate.

**Results:** 19 patients were included, all with pulmonary sepsis, male/female $n = 9/10$, mean age 55 years (± 17), BMI 29.4 kg/m2 (± 8.6), 21% had a stroke ($n = 4$), coronary heart disease 10% ($n = 2$), heart failure 10% ($n = 2$), hypertension 53% ($n = 10$), COPD 16% ($n = 3$), chronic kidney disease 26% ($n = 5$), T2DM 37% ($n = 7$), vasopressor 89% $n =$ (17), mechanical ventilation 95% ($n = 18$), oliguria defined as uresis < 30 ml/hr 79% ($n = 15$), admission origin ER 36% ($n = 5$), Ward 68% ($n = 13$), OR 5% ($n = 1$). Clinical measurements as HR was 107 bpm (± 26), RR 27 rpm (± 7), MAP 89 mmHg (± 20), SBP 125 mmHg (± 29), DBP 70 mmHg (± 16), SO2 95% (± 4). Laboratory variables total leukocyte count was 16150cel/mm3 (± 7581), neutrophil count 14357cel/mm3 (± 7400), lymphocyte count 926cel/mm3 (± 479), NL ratio 19.9 (± 16.7), haemoglobin 11.3gr/dl (± 3), hematocrit 34.4% (± 9.4), paO2 92 mmHg (± 49.3), paCO2 46.4 mmHg (± 12.7), lactate 2.3 mmol/l (± 2), HCO3- 39.4 mEq/l (± 58.2), creatinine 1.6 mg/dl (± 1.3), albumin 2.9gr/dl (± 0.6), C-reactive protein 0.21 mg/ml (± 0.11), CRP/albumin ratio 77.2 (± 47.4), procalcitonin 8.1 (± 17.3), PCT/CRP ratio 42 (± 92), prognostic scores SOFA 8 (± 3) SAPS 50 (± 24), mechanical ventilation days 10 (± 8). Renal replacement therapy 26% ($n = 5$), and mortality

was 42% ($n=8$). AUC ROC was elaborated (Fig. 1) CRP/albumin ratio 0.53, PCT/CRP ratio 0.69, SOFA 0.76 SAPS 0.5. PCT/CRP ratio cutt-off value 9.4 had a sensitivity of 75%, specificity 64%, PPV 60% NPV 78%. Statistical difference was found in creatinine between both groups (< 9.4/ > 9.4) $p=0.006$, RRT 0% vs 26% with odds ratio 2.8 (CI 95% 1.38–5.6, $p=0.01$) (Fig. 2). No statistical difference was found between both groups in mortality 21% vs 36% with an odds ratio 5.2 (CI 95% 0.69–39.4, $p=0.09$).

**Conclusions:** Statistically, the PCT/CRP index demonstrates moderate predictive value, while SOFA and SAPS II stand out as predictors of mortality among patients with pulmonary sepsis. Notably, a cut-off value of 9.4 in the PCT/CRP index proves valuable in identifying pulmonary sepsis patients who are less likely to require acute kidney injury assessment or renal replacement therapy.

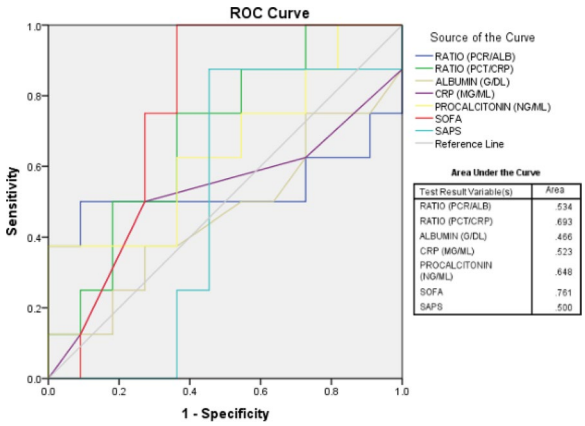


**Fig. 1 (abstract 001569)** AU ROC with different mortality scores, ratio and biomarkers

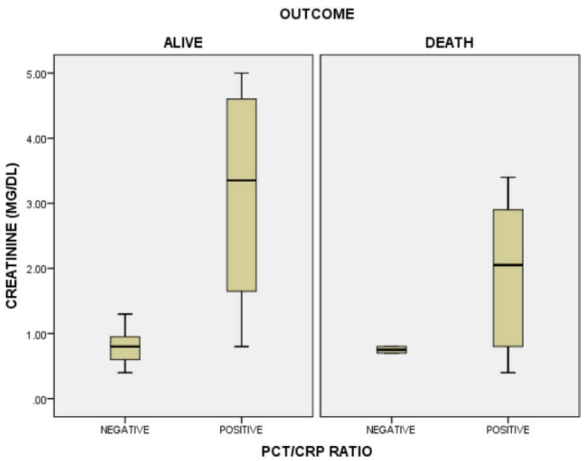


**Fig. 2 (abstract 001569)** Box and whisker plot for PCT/CPR ratio and creatinine values

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**Topic:** Sepsis

**001570**

**Interhospital transports and mortality in critically ill COVID-19 patients: a single center cohort study**

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001570

**Introduction:** Interhospital transports and mortality in critically ill COVID-19 patients: a single center cohort study.

**Objectives:** Interhospital transport (IHT) is relatively common in intensive care, the main reasons for IHTs are either the need for specialized care, diagnostics, or treatment or due to resource constraints in the current hospital. While IHT can offer benefits to patients, it also comes with inherent risks associated with the transport process itself, as well as potential delays in diagnosis, treatment, and prolonged ICU stays. During the COVID-19 pandemic, the influx of critically ill patients led to a notable increase in IHT cases. Studies exploring the risk of IHT during this period have presented conflicting results. Some research suggests that IHT is linked to prolonged mechanical ventilation, more extensive

treatments, and longer hospital stays, while others have found no association with hospital duration or mortality rates.
**Methods:** The aim was to compare mortality rate and hospital length of stay among patients with critical COVID-19 in Sweden who were transferred to another hospital and those who remained in the hospital where they were initially admitted to.
**Results:** In total, 651 SARS-CoV-2 ICU-treated patients were included in the study, of which 133 (20%) underwent IHT. Compared with non-IHT patients, a smaller proportion of IHT patients were deceased within 30 days of ICU admission (19% versus 25%) and for 90 days (26% versus 29%). IHT was associated with a decreased risk of mortality at 30 days (HR 0.50, 95%CI: 0.31–0.80) as well as for 90 days (HR 0.54, 95%CI: 0.36–0.81). The transferred patients spent longer time in the hospital and had fewer days alive free of ICU during 30 days of ICU admission and 90 days. For 30-day survival, patients with IHT had fewer days alive and free of ICU (median: 5, IQR: 0–18) than non-transferred patients (median: 22, IQR: 0–27, $p < 0.001$).
**Conclusions:** In this study, transfer because of a lack of intensive care capacity during the COVID-19 pandemic was associated with a reduced risk of short-term mortality among critically ill ICU patients with severe SARS-CoV-2 infection. However, transferred patients had longer ICU stays compared to patients who remained in the admitting ICU. Sensitivity analyses confirmed the results.

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**Topic:** Health Services Research and Outcome

## 001571

### Risk factors for multiresistant bacteria in critically ill children: the creation of the MDR-score


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**Introduction:** Healthcare-associated infections (HAI) are among the most important global health concerns, as they increase morbidity and mortality. Multidrug-resistant (MDR) bacteria imply a higher mortality, related to the delay in an adequate treatment.
Many researchers have studied risk factors related to MDR HAIs, but the majority of the knowledge is based on adults.
**Objectives:** The main aim was to identify specific risk factors for MDR infections in critically ill children and to create a risk score to predict MDR infections.
Secondary objectives were to analyse the outcomes of patients depending on the microorganisms' sensitivity.
**Methods:** This was a single-centre, prospective and observational study. Patients < 18 years, admitted to the Paediatric Intensive Care Unit (PICU) between 2015 and 2022, with device-associated HAI (DA-HAI) diagnosis (ventilator-associated pneumonia (VAP), catheter-associated urinary tract infections (CAUTI) and central line-associated bloodstream infections (CLABSI)) were included.
Variables that were significantly associated with MDR infections in the univariate analysis, were entered into multiple forward stepwise logistic regression models. The regression coefficients of each independent risk factor were used to build the risk score for MDR: MDR-score.
**Results:** 257 patients were included:106 VAP (41.2%), 91 CAUTI (35.4%), and 60 CLABSI (23.3%). The median age was 7 months (IQR 2–30).
Risk factors for MDR infection were: comorbidity ($p = 0.002$), previous colonization ($p = 0.002$), previous MDR colonization ($p < 0.001$), previous surgery ($p = 0.018$) and previous antibiotic treatment ($p = 0.009$). Days from device insertion and PICU admission to infection were longer in patients with MDR (14 vs. 12.5 days and 12 vs. 9 days, respectively, $p < 0.005$).
In the multivariate analysis, independent risk factors for MDR DA-HAI were comorbidity (OR 2.201), MDR previous colonization (OR 5.149), and length of stay (LOS) in PICU > 9 days (OR 1.782). With them, the MDR-score was created, and patients were divided into risk groups: low (0–2 points), intermediate (3–7 points), and high (8–12 points).
Then, 79 (30.7%) patients were classified as low risk, 131 (51.0%) as intermediate risk, and 47 (18.3%) as high risk for MDR.
From patients with MDR infections, 71 (82.6%) were classified in the intermediate or high-risk group. Also, the high-risk group showed a great specificity (91.8%). But 81.0% of patients stratified in the low-risk group had non-MDR infections, thus they were correctly classified.
Patients with MDR infections were treated with an incorrect empiric antibiotic (40.7% vs. 6.8%, $p < 0.001$), had a longer LOS in PICU (25.5 vs. 21.0%, $p = 0.021$) and a higher mortality (11.6. vs 6.4%, $p = 0.151$).
**Conclusions:** The MDR-score includes three main risk factors related to MDR DA-HAI: comorbidity, previous MDR colonisation, and LOS in PICU > 9 days. This score might be useful to guide the empirical therapy election, providing an early optimization and avoiding delays in the establishment of an appropriate treatment.

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**Topic:** Infections and prevention

## 001572

### Memories from intensive care medicine—how significant are they?


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**Introduction:** Patients who experience an admission to Intensive Care Medicine (ICM) are likely to need sedation and may present no memories about that period after discharge. Those who remember present a huge variety of memories. Therefore, it is important to analyze further information about them.
**Objectives:** To characterize memories from ICM hospitalization and understanding which factors can have more influence in developing delusional memories.
**Methods:** Patients admitted to an ICM department between June and November 2023 were included in this retrospective study. We selected those observed in our follow-up clinic who have reported any type of memory. They were asked to fill an Intensive Care Unity Memory Tool (ICUMT) with a checklist of possible items to remember. Considering this group, it has been evaluated the presence of delirium, sepsis, and the need for invasive mechanical ventilation (IMV).
**Results:** From a total of 130 patients, 57 (44%) were included. Median age was 65 years old, 81% male. Sepsis was present in 75%. On average, the total duration of ICM stay was 9 days (5 days in level 3 of critical care) and IMV was performed in 32%, median of 3 days. Delirium was observed in 39%. Follow-up occurred, in average, 120 days after discharge. Admission to hospital was clearly remembered in 72%, and total staying in ICM in 67%. Factual memories were described in 82%: 65% remembered their family visit, 37% lights and alarms, 30% voices, 35% having a breathing tube and 16% darkness. Emotional memories such as confusion (30%), feeling down (33%), anxiety and fear (21%) and discomfort (32%) were observed in 51%. Delusional memories were reported in 33%, including dreams or nightmares (30%), hallucinations (7%) and feeling that someone was trying to hurt them (5%). Patients submitted to IMV presented 2,7 times higher probability of claiming delusional memories—odds ratio (OR) 2,7; those with sepsis had a probability 2,4 times higher (*OR* 2,4) and in the case of delirium the OR was 1,5. Pittsburgh Sleep Quality Index above 5 was more prevalent in the group of patients with delusional memories compared to patients who did not have these memories (75% vs 49%). Higher median EuroQol five-dimension five-level questionnaire score was observed in the group of patients with delusional memories (10 vs 8). Psychological post-intensive care syndrome was identified in 14% of patients and 50% of these described delusional memories.
**Conclusions:** Although this study includes a small sample, it showed that there is a great percentage of critical care survivors who do not remember their ICM stay. Factual memories were the most recalled, followed by emotional ones. Presence of sepsis or delirium showed a higher probability of developing delusional memories as well as the need for IMV. Patients with this type of memories also might present less quality of sleep and health-related quality of life. Nevertheless, there is still few evidence about ICM memories which deserves further exploration.

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**Topic:** Health Services Research and Outcome

## 001573

## Evaluating heterogeneity in the response to surviving sepsis campaign guidelines

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**Introduction:** The Surviving Sepsis Campaign [1] (SSC) published recommendations for the management of sepsis that provide guidance to clinicians on a wide range of topics including resuscitation, treatment of infection, hemodynamic management, ventilation, and other relevant therapies. While some recommendations are based on high-quality evidence, many others are based on low or very low-quality evidence. Thus, for some of the recommendations, the true treatment effect remains unknown or poorly estimated.
Furthermore, sepsis is increasingly being recognized as a heterogenous disease, with large amounts of variability in the individual response to treatment. Little progress has been made thus far to advance precision medicine for sepsis. [2] While the SSC recognizes that for weak recommendations, "different choices are likely to be appropriate for different patients and therapy should be tailored to the individual patient's circumstances," there is no guidance on how to tailor therapy or which patients may benefit most from a given recommendation.
**Objectives:** Our aim is to estimate the average treatment effects (ATE) and the individual treatment effects (ITE) for SSC recommendations to assess for heterogeneity in treatment response.
**Methods:** We used the MIMIC-IV database [4,5] and included patients with sepsis and septic shock between 2008 and 2019. For each SSC Recommendation, the binary exposure was defined as following vs. not following the recommendation. The outcome was death at 28 days from hospital admission. Baseline covariates included demographics, medical history, vital signs, lab values, and mortality risk scores. All analyses were stratified by sepsis vs. septic shock.
We first identified which recommendations had sufficient variability in adherence to estimate treatment effects. We proceeded if there was $\geq$ 5% variation in adherence to the recommendation. We used targeted maximum likelihood estimation (TMLE) [7] to estimate the ATE. Heterogeneity of the treatment effect was quantified by estimating the standard deviation of the ITE using TMLE.
**Results:** We included 19,643 with sepsis and 2861 with septic shock. Out of 23 recommendations, 12 recommendations had $\geq$ 5% treatment variability in sepsis patients and 18 did in septic shock patients. ATEs vs. standard deviation of the ITE are illustrated in Figs. 1 and 2. Two recommendations for sepsis and four for septic shock had statistically significant heterogeneity in the ITE (Table 1). In sepsis patients, the recommendation with the most variability was the recommendation for ICU admission within 6 h of sepsis; in shock patients, it was the recommendation to start steroid supplementation if norepinephrine > 0.25ug/kg/min for more than 4 h.
**(abstract 001573)**

| | Average treatment effect | | | Variance of the individual treatment effect | | | |
|---|---|---|---|---|---|---|---|
| **Recommendation** | **Treatment effect** | **95% CI** | | **Root (Variance)** | **Variance** | **95% CI** | |
| *Sepsis* | | | | | | | |
| ICU admission | − 0.04 | − 0.04 | − 0.03 | 0.03 | 0.0007 | 0.0004 | 0.0010 |
| Lactate within first hour | 0.00 | 0.00 | 0.01 | 0.02 | 0.0003 | 0.0000 | 0.0005 |
| *Septic shock* | | | | | | | |

| Recommendation | Average treatment effect | | | Variance of the individual treatment effect | | | |
|---|---|---|---|---|---|---|---|
| | Treatment effect | 95% CI | | Root (Variance) | Variance | 95% CI | |
| ICU admission | 0.01 | − 0.01 | 0.04 | 0.04 | 0.0019 | 0.0006 | 0.0031 |
| Antibiotics within first hour | − 0.05 | − 0.07 | − 0.03 | 0.04 | 0.0019 | 0.0006 | 0.0031 |
| Steroids | − 0.19 | − 0.21 | − 0.17 | 0.07 | 0.0049 | 0.0013 | 0.0086 |
| MAP goal ≥ 65 mmHg | 0.00 | − 0.02 | 0.02 | 0.02 | 0.0006 | 0.0000 | 0.0012 |

**Conclusions:** The response to several SSC recommendations is highly variable. While following certain SSC guidelines may be very beneficial to some patients, but only somewhat beneficial or potentially even harmful to others. Identify subsets of recommendations and patients for which this is true, we could better prioritize care to maximize survival benefits for septic patients.

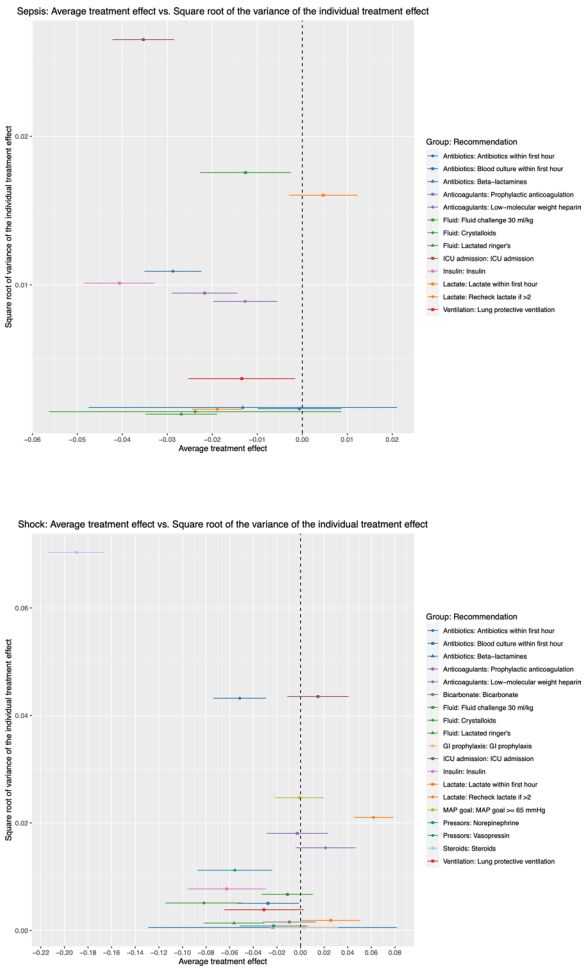


**Fig. 1 (abstract 001573)** Average treatment effect vs. Standard Deviation of the individual treatment effect (upper panel: Sepsis; lower panel: Septic Shock)
Horizontal lines are the 95% confidence intervals for the average treatment effect. The dashed vertical line represents no treatment effect.

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2. Haodong Li, PhD for his statistical expertise

**Topic:** Sepsis

## 001575

### Use of POCUS to predict fluid responsiveness in hemodynamic management of shock: a systematic review

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**Introduction:** Volume repositioning is crucial in the management of circulatory and septic shock, but half of patients do not respond to fluid therapy. Therefore, early detection of this profile is necessary to prevent cardiac overload. In this context, point-of-care ultrasound (POCUS) has emerged as a promising tool for assessing fluid status, tolerance, and responsiveness.
**Objectives:** To evaluate the use of POCUS to predict fluid responsiveness in the hemodynamic management of shock.
**Methods:** A systematic review was performed using the following combination of MESH terms and Boolean operators: "Fluid Responsiveness" AND "POCUS" AND "Fluid therapy" on the databases MEDLINE (PubMed), LILACS, and CENTRAL (Cochrane Library). Following PRISMA guidelines included studies from 2019 to 2024 in English or Portuguese.
**Results:** Six of the seven articles found in Pubmed, one of the three in Cochrane, and the article from Lilacs were selected, with a duplication in Pubmed and Cochrane. The exclusion criteria were narrative reviews, duplicate articles, animal tests, and theme fugue, resulting in seven articles to constitute this scope. Evidence has shown that parameters assessed by POCUS can predict the response to fluid therapy. Passive leg raising and static parameters, such as Inferior Vena Cava (IVC) diameter and systolic volume variation, assist in the decision to infuse fluids at the bedside. Although the Inferior Vena Cava Distensibility Index (ΔIVC) > 18% is a good indicator, it is only predictive in a specific subgroup of patients, similar to the variation in pulse pressure and systolic volume. Cavity dimension can also guide protective ventilatory measures and the interruption of fluid administration. Studies have shown that ΔIVC and ΔVpeak (respiratory variation in aortic blood flow peak velocity) are potential predictors of fluid response in children with septic shock under mechanical ventilation. In contrast, in spontaneously breathing children, only ΔVpeak was reliable. POCUS-guided fluid therapy in sepsis reduced the positive fluid balance at 72 h, preventing fluid overload and reducing the need for dialysis and invasive ventilation compared to empirical fluid therapy, but with no statistically significant change in 30-day mortality. In addition, POCUS identifies diastolic dysfunction and hypovolemia in patients with hypertrophic and thickened ventricles, preventing the use of inotropic drugs that could aggravate the obstruction and lead to cardiac arrest.
**Conclusions:** POCUS offers parameters for assessing responsiveness to fluid therapy, but defining cut-off points is challenging. Integration of clinical information, hemodynamic parameters, and POCUS guides resuscitation in shock. More research is needed to validate its use, especially in spontaneously breathing children.

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8. No financial support.

**Topic:** Imaging in intensive care

## 001577

### Detection of fluid responsiveness by changes of the plethysmographic oxygen saturation signal during passive leg raising in spontaneously breathing patients

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**Introduction:** Volume expansion is a common initial treatment for circulatory failure. (1) Predicting fluid responsiveness (FR) is crucial, (2,3) as only about half of patients respond to volume expansion by enhancing cardiac output (CO). (4) Static parameters are unreliable predictors (5) and the use of dynamic tests is recommended to predict FR. (1,6) As such, the passive leg raising (PLR) test induces a reversable preload challenge and reliably predicts FR. (7) Assessing its effects, however, requires direct measurement of stroke volume (SV) or CO. SV and CO are typically obtained through methods with significant limitations such as invasiveness, availability and costs. (8) The perfusion index (PI) and pleth variability index (PVI) are non-invasive, readily available and inexpensive metrics derived from oxygen saturation signals and PI has been shown to be related to CO. (9,10).
**Objectives:** The primary objective was to evaluate the predictive capability of PI and PVI for predicting FR in post-surgical, spontaneously breathing patients undergoing a PLR test.
We hypothesized that in fluid responders the PI would increase and the PVI decrease.
**Methods:** This prospective interventional study was conducted in the intensive care unit of Merano Hospital, Italy, from April 2018 to March 2019.We enrolled adult spontaneously breathing patients following major abdominal surgery.
The FloTracTM system (uncalibrated pulse contour cardiac output monitor) was used for SV and CO determination. The Radical 7® monitor was employed for monitoring peripheral oxygen saturation (SpO2), PI, and PVI. Baseline values were recorded in a semi-recumbent position. Subsequently, a PLR test was conducted. Measurements of SV, CO, PI and PVI were recorded at 60-, 90-, and 120-s during PLR, as well as 3 min after the maneuver. Responders were defined as patients exhibiting an SV increase of ≥ 10% from baseline to 60 s into the PLR test measured with FloTracTM. Generalized linear mixed models were used and a receiver operating characteristics (ROC) curve was

generated to detect an increase of at least 10% in SV by the percentage changes in PI and the Youden index was used to determine the diagnostic threshold.

**Results:** A total of 71 PLR tests were performed. 46.7% of patients were fluid responders.

The percentage increase from baseline to 60 s into the PLR maneuver was 31.8% (95% CI 20.1–44.7%) for responders and 12.4% (95% CI 3.3–22.3%) for non- responders (Fig. 1).

An increase in PI of ≥ 24% identified responders with a sensitivity of 61% and a specificity of 74% (Fig. 2). The area under the ROC curve was 0.68.

In contrast to the study's hypothesis, PVI did not show significant differences between fluid responders and non-responders.

**Conclusions:** This study provides evidence supporting the use of PI as a non-invasive metric for predicting fluid responsiveness during PLR in spontaneously breathing post-surgical patients.

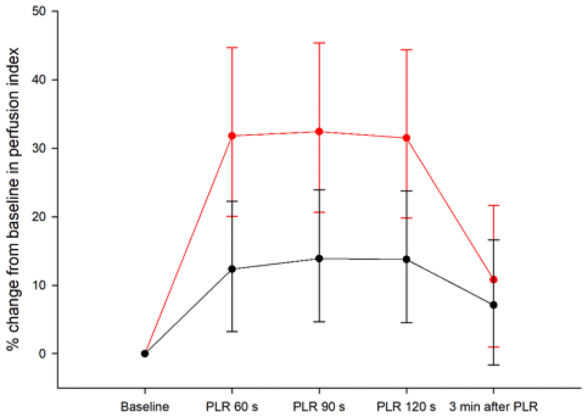


**Fig. 1 (abstract 001577)** Percentage changes from baseline in perfusion index (PI) during (at 60 s, 90 s and 120 s) and three minutes after the passive leg raising (PLR) test, subdivided between responders (red colour) and non-responders (black colour)

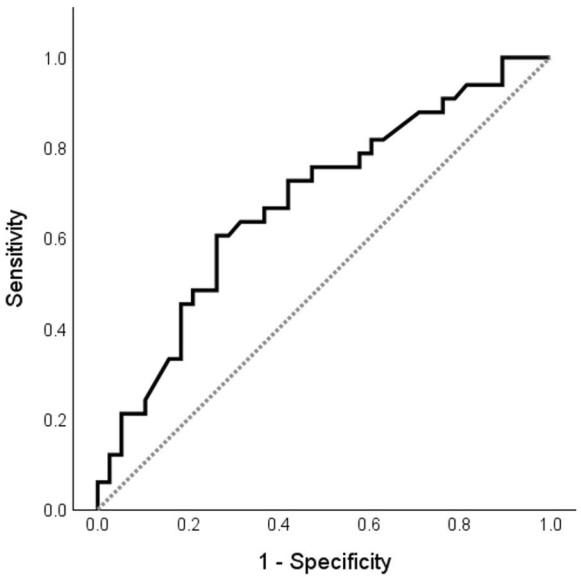


**Fig. 2 (abstract 001577)** Area under the receiver operating characteristics (ROC) curve generated to detect an increase of at least 10% in stroke volume by the relative changes in perfusion index

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11. No funding was received for this study.

**Topic:** Cardiovascular issues in ICU

## 001579

### Findings from the 'Inpatient adoption of Cystatin C eGFR in guiding patient management' (InCyst) study

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001579

**Introduction:** As with so many aspects of modern medicine, the equations used to estimate glomerular filtration rate (eGFR) were not derived with critically ill patients in mind. Fundamental issues influencing the handling of creatinine in critical illness (fluid resuscitation, loss of muscle mass, systemic inflammation) mean intensive care physicians must remain cognizant of the limitations of creatinine-derived eGFR. Cystatin C is increasingly recognised as an alternative for GFR estimation on ICU [1].
Perhaps one of the biggest implications of inaccurate GFR estimation is upon medication dosing. Antibiotics and anticoagulants are examples of common medications frequently dosed with respect to kidney function in the ICU.
**Objectives:** We undertook a proof-of-concept study to compare the performance of creatinine and cystatin C-derived eGFR equations against gold-standard iohexol-measured GFR (mGFR) in adult ICU patients where creatinine may be unreliable.
**Methods:** '*In*patient adoption of *Cyst*atin C eGFR in guiding patient management' (InCyst study) (REC: 22/LO/0560) had the following inclusion criteria for ICU patients:

- serum creatinine below the lower limit of the reference range
- body mass index < 18 kg/m$^2$
- mechanical ventilation with > 10% fall in creatinine (in the absence of AKI recovery)
- AKI recovery where eGFR-dependent changes to drug dosing could be required

Timed blood collections were taken over the course of 24 h following a 5ml bolus of iohexol to determine mGFR. In addition, serum creatinine and cystatin C were measured and eGFR was calculated using multiple validated equations including MDRD, CKD-EPI 2021 (creatinine), CKD-EPI 2021 (cystatin C) and CKD-EPI 2021 (combined).
Bland–Altman bias (mean of differences) and precision (standard deviation of differences) was calculated for each equation to assess performance. The proportion of results within 30% (p30) and 10% (p10) of mGFR was also determined.
**Results:** Twenty patients were recruited in total, 12 were male. Mean age was 54 (± 14)years, mGFR was 76 (± 32)mL/min/1.73m$^2$, BMI 25.7 (± 6)kg/m$^2$, and length of stay 9 (± 6)days.
The best-performing eGFR equation against mGFR was CKD-EPI 2021 (cystatin C): bias − 0.71 mL/min/1.73m$^2$, precision 27mL/min/1.73m$^2$ and p30 61%. All creatinine equations performed badly, the currently internationally recommended equation CKD-EPI 2021 (creatinine) having a bias of 114mL/min/1.73m$^2$, precision 120mL/min/1.73m$^2$ and p30 of just 17%. Full performance of all equations is found in Table 1, illustrated in Fig. 1.
InCyst also reiterated the heterogenous, non-linear relationship between creatinine, BMI and GFR in ICU, demonstrated graphically in Fig. 2.
**Conclusions:** Within the limitations of a small sample size, this study demonstrates that creatinine is not a reliable biomarker of kidney function in the ICU. More accurate biomarkers must be sought to ensure accurate drug dosing. Cystatin C is a more viable candidate and there may yet prove to be a role for mGFR in high-risk cases, perhaps with the use of finger prick iohexol analysis, which has shown promise in the outpatient setting [2].

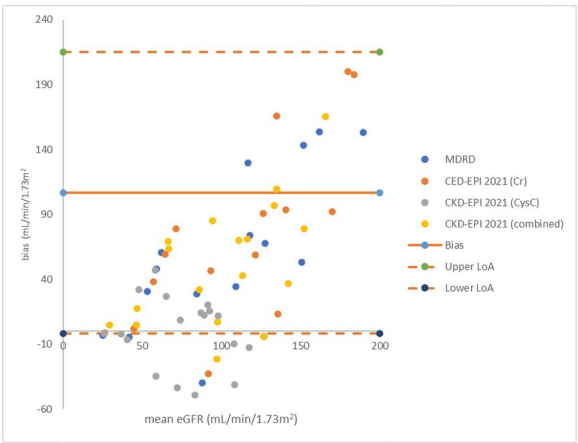


**Fig. 1 (abstract 001579)** Bland–Altman plot assessing the performance of different GFR estimating equations

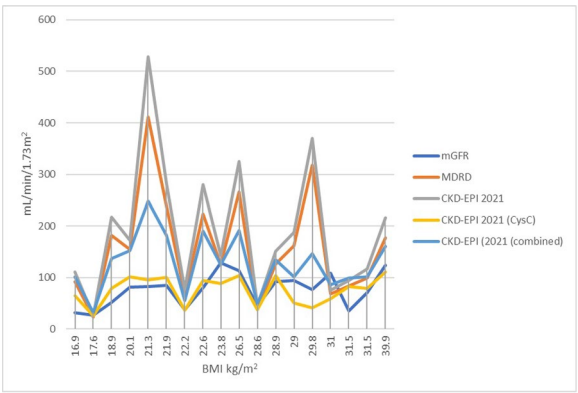


**Fig. 2 (abstract 001579)** Graphical comparison of mGFR and eGFR against different patient BMI values in InCyst

**Table 1 (abstract 001561)** Bias, precision, p30 and p10 of GFR estimating equations compared against iohexol mGFR.

| Equation | Bias (mL/min/1.73m²) | Precision (mL/min/1.73m²) | p30 (%) | p10 (%) |
|---|---|---|---|---|
| CKD-EPI 2021 (cystatin C) | -0.71 | 27 | 61 | 17 |
| CKD-EPI 2021 (creatinine) | 114 | 120 | 17 | 11 |
| CKD-EPI 2021 (combined) | 52 | 47 | 33 | 11 |
| MDRD | 83 | 94 | 17 | 6 |

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**Topic:** Health Services Research and Outcome

## 001581

### Psychosocial support on ICU: a post-discharge patient survey

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001581

**Introduction:** Psychological, cognitive and functional difficulties are common post intensive care unit (ICU) admission, with up to 50% of patient's experiencing long-term psychological morbidity [1]. Adequate social support in ICU is associated with improved mental health and long-term outcomes [2]. In our ICU there is a psychosocial team (P-S team), comprising a psychiatrist, two psychologists and one social worker. Their primary aim is to support patients and their families with psychological and social (including accommodation and financial) issues encountered during intensive care admission.
**Objectives:** To evaluate patients' experience of the P-S team during ICU admission, as well as their self-reported psychological, social and physical support needs post-ICU discharge.
**Methods:** Over 2 separate 7-day periods, patients discharged from ICU were screened for eligibility, excluding patients admitted for < 72 h. Reason for admission, discharge specialty, length of ICU stay, discharge GCS and any recorded P-S team input were recorded. Patients were reviewed on the ward within 48 h of discharge and if appropriate were asked to complete a 6-part questionnaire, evaluating the input of the P-S team, and their psychological and physical support needs post ICU discharge.
**Results:** Of the 71 patients discharged during the study period, 35 were excluded (9 deceased, 26 admitted < 72 h). Demographic data of the 36 included patients are shown in Table 1. 14 patients (39%) had P-S team input prior to ICU discharge. The follow-up questionnaire was completed by 25/36 patients (69%), of which 9 received input in ICU; 6 out of those 9 patients (67%) reported finding this input helpful. Further support post-ICU discharge was desired by 11/25 patients (44%), predominantly psychological support (7 patients). 88% of patients (22/25) experienced at least 1 of low mood, mood swings, anxiety, fatigue, intrusive thoughts or feelings of hopelessness post discharge. Of those, 5 patients (23%) felt that further P-S team input would be helpful. Only 10 patients (10/25, 40%) were self-caring post discharge and 21/25 (84%) reported a change/reduction in their mobility since ICU discharge. Reduced satisfaction with medical and nursing staff communication post discharge was reported by 8/25 patients (32%). The majority (22/25, 88%) reported good social support from friends/family.

**Table 1 (abstract 001581)** Demographics

| | All | Completed questionnaire |
|---|---|---|
| | ***n*** **(%)** | ***n*** **(%)** |
| *Gender* | | |
| Male | 18 (50) | 10 (40) |
| Female | 18 (50) | 15 (60) |
| *Age (years)* | | |
| | Median 58.5 | Median 59 |
| | Range 16–89 | Range 16–89 |
| *Admission type* | | |
| Medical | 21 (58) | 15 (60) |
| Surgical | 10 (28) | 9 (36) |
| Trauma | 2 (6) | 1 (4) |
| Neurosurgical | 3 (8) | 0 |
| *Length of stay (days)* | | |
| | Median 11 | Median 11 |
| | Range 4–49 | Range 4–42 |

**Conclusions:** Psychosocial team input in the ICU was welcomed by the majority of the patients surveyed. More than 80% reported a

physical decline and approximately half had ongoing unaddressed psychological and physical support needs. Given the current financial constraints, a way to continue supporting patient recovery following ICU admission is needed.

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**Topic:** Health Services Research and Outcome

## 001582

### Beta-lactam antibiotics exacerbate features of sepsis-induced immunosuppression in vitro

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001582

**Introduction:** Antibiotics are known to modulate the immune system. [1, 2] We hypothesised that beta-lactam antibiotics may exacerbate features of sepsis-indued immunosuppression. This may indeed paradoxically increase the risk of secondary infections.

**Objectives:** To identify if amoxicillin, cefuroxime, meropenem or piperacillin alter the response of monocytes and lymphocytes to a bacterial stimulus in vitro.

**Methods:** Blood was collected and peripheral blood mononuclear cells (PBMCs) were isolated from patients presenting to the emergency department with infections ($n = 10$). PBMCs were incubated with LPS for 24 h (to assess monocyte function) or CD3/ CD28 beads for 48 h (to assess lymphocyte function) in the presence or absence of either amoxicillin, cefuroxime, meropenem or piperacillin-tazobactam. Clinically relevant doses of antibiotics were selected to represent the lower and higher levels of antibiotics measured in patients with critical illness. [3] We assessed the immunophenotype of cells using multicolour spectral flow cytometry. Data are presented as relative change (ratio) of median intensity fluorescence (MFI) between antibiotic-treated stimulated PBMCs and stimulated PBMCs without antibiotics.

**Results:** Broad-spectrum beta-lactam antibiotics were associated with more changes than narrow-spectrum beta-lactams. There were few changes consistent with a pro-inflammatory phenotype in classical monocytes (increased TLR-4 and CD80), although most changes were consistent with immunosuppression (reduction in NOX-2 and antigen presentation pathway proteins (CIITA, HLA-DR, HLA-DP, HLA-DM, CD74) NLRP3, NF-κB, and IL-1β). Similarly, in CD4 + lymphocytes, a phenotype consistent with immunosuppression (increased IL-4, CTLA-4, IL-10 and reduced IL-2, IL-17A) with reduced chemotaxis markers (CD194 and CD196) were induced by beta-lactam antibiotics. Similar changes were seen in CD8 + lymphocytes.

**Conclusions:** We show ex vivo evidence of beta-lactam-induced immunosuppression in monocytes and lymphocytes from patients presenting to the emergency room with infections. The in vivo effect in ICU patients needs to be determined. This highlights the potential merits of therapeutic drug monitoring, and antimicrobial stewardship (including limiting the duration of antimicrobial therapy and use of broad-spectrum antibiotics) in critically ill patients.

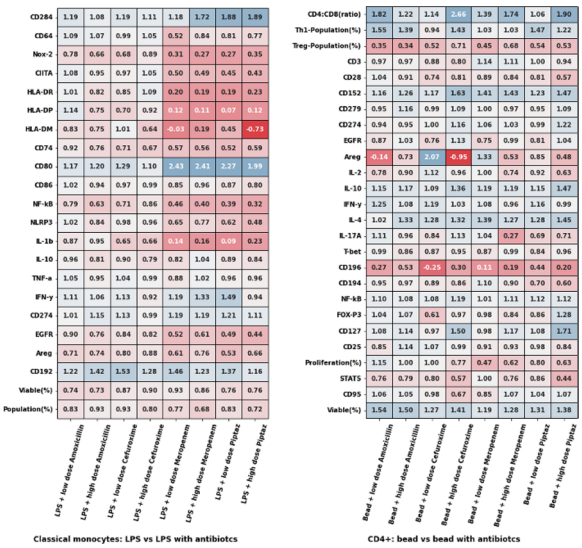


**Fig. (abstract 001582)** Beta-lactam antibiotics induce a broad immunosuppresive phenotype in stimulated classical monocytes (left) and CD4 + lymphocytes (right). Data expressed as ratio change

**Reference(s)**

1. 2. Miller, M., et al., Antibiotics, Sedatives, and Catecholamines Further Compromise Sepsis-Induced Immune Suppression in Peripheral Blood Mononuclear Cells. Crit Care Med, 2024. 52 (4): p. 596–606.
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3. UCL Precision AMR Seed Funding Grant (TS, MS, NA)
4. MRC (NA)
5. ESICM Next Start Up Award (NA)
6. Arulkumaran, N., et al., Antimicrobial-associated harm in critical care: a narrative review. Intensive Care Med, 2020. 46 (2): p. 225–235.
7. Intensive Care Society New Investigator Award (TS)

**Topic:** Sepsis

## 001584

### Setting optimal positive end-expiratory pressure based on lung ultrasound and static measurements of mechanical ventilation

**in critically ill patients with acute respiratory distress syndrome and acute brain injury**

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001584

**Introduction:** A common complication of patients with severe acute brain injury (ABI) is acute respiratory distress syndrome (ARDS) associated with increased mortality and poor neurological outcome. The application of positive end-expiratory pressure (PEEP) during mechanical ventilation (MV) has been recognized as beneficial in patients with ARDS. In addition to static measurements of MV, lung ultrasound (LUS), a non-invasive imaging method of lung parenchymal abnormalities, could help in determining the optimal PEEP.
**Objectives:** To investigate the utility of LUS and static measurements of MV in determining optimal PEEP in critically ill patients with ARDS and ABI.
**Methods:** A preliminary, interventional, prospective clinical study was performed in a Greek ICU, including 16 patients with ABI (6 TBI, 3 SAH, 7 ICH) and ARDS. GCS on admission, APACHE II and LISS score were recorded. The intervention included a gradual increase in PEEP level from 5 to 8, 12 and 16 cmH2O. After each PEEP level change we performed LUS in 6 regions in each lung and calculated the LUS score. Simultaneously, static MV parameters [plateau pressure (Ppl), driving pressure (ΔP), static compliance (Cst)] and PaO2/FiO2 ratio (PFR) were recorded. During these maneuvers, we ensured normal ICP and adequate CPP in all patients, as measured via an intraparenchymal catheter.
**Results:** Included 16 patients had a mean age of 56.3 (0SD ± 17.5) years, mean ICU admission GCS of 6.8 (SD ± 2.83), mean APACHE II score of 20.1 (SD ± 3.77) and mean LIS score of 2.02 (SD ± 0.42). There was a statistically significant difference in LUS score regarding all PEEP pairs (Table 1).

**Table 1 (abstract 001584)** LUS score comparison between PEEP levels

| PEEP level pairs | *p* value |
|---|---|
| PEEP 5/PEEP 8 | 0.031 |
| PEEP 8/PEEP 12 | 0.004 |
| PEEP 12/PEEP 16 | 0.004 |
| PEEP 5/PEEP 12 | 0.003 |
| PEEP 5/PEEP 16 | 0.003 |
| PEEP 8/PEEP 16 | 0.003 |

As PEEP level increased, a progressive decrease in LUS score (Fig. 1) and a continuous increase in PFR (Fig. 2) were observed, whereas we could not detect a uniform pattern of change in ΔP or Cst value (Figs. 3,4). The lowest PEEP level with the lowest LUS score was compared with the lowest PEEP level with the best PFR, and there was no significant difference in PEEP according to LUS or PFR (Table 2).

**Table 2 (abstract 001584)** Comparison of optimal PEEP according to LUS and PFR

| Variable | PEEP (LUS) | PEEP (PFR) | *P* value |
|---|---|---|---|
| Median (IQR) | 16 (IQR 16–16) | 16 (IQR 15–16) | 0.134 |

We also explored the relationship between PEEP with maximum PFR and PEEP with the safest ΔP or Ppl. The difference between safe PEEP levels according to ΔP or Ppl and PEEP with the best oxygenation was not significant (Tables 3,4).

**Table 3 (abstract 001584)** Comparison of selected PEEP according to PFR and ΔP

| Variable | PEEP (PFR) | PEEP (Δ*P*) | *P* value |
|---|---|---|---|
| Median (IQR) | 16 (IQR 15–16) | 16 (IQR 16–16) | 0.41 |

**Table 4 (abstract 001584)** Comparison of selected PEEP according to PFR and Ppl

| Variable | PEEP (PFR) | PEEP (Ppl) | *P* value |
|---|---|---|---|
| Median (IQR) | 16 (IQR 12–16) | 12 (IQR 12–16) | 0.621 |

Maximum oxygenation could be achieved without worries about exceeding Δ*P* or Ppl safety limits. When comparing the lowest PEEP level—lowest LUS score with the maximum PEEP level—lowest Δ*P* or Ppl, we found that LUS can be used to set the PEEP level without reaching unsafe Δ*P* values, in contrast to Ppl. Finally, there was a significant deviation in PEEP according to lung ultrasound and Cst.
**Conclusions:** LUS could be used to set the PEEP level that ensures the best oxygenation, i.e. the optimal PEEP, in patients with ABI and ARDS. In contrast, static measurements of MV did not appear to be helpful in this field, except in terms of safety.

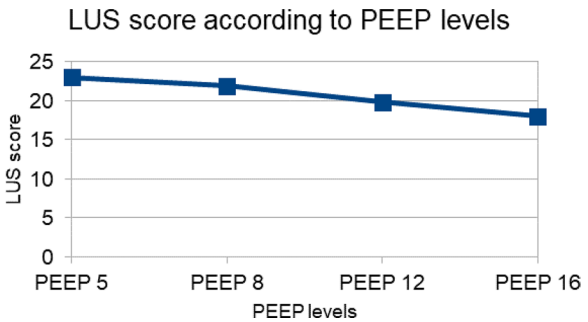


**Fig. 1 (abstract 001584)** LUS score according to PEEP levels

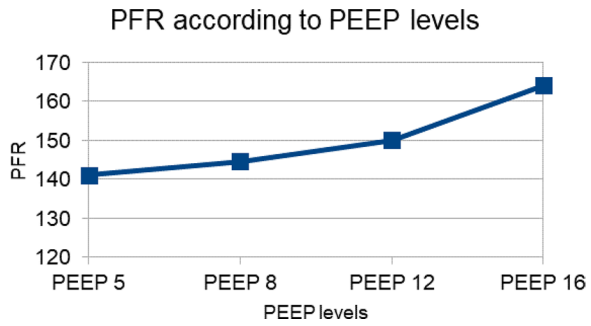


**Fig. 2 (abstract 001584)** PFR according to PEEP levels

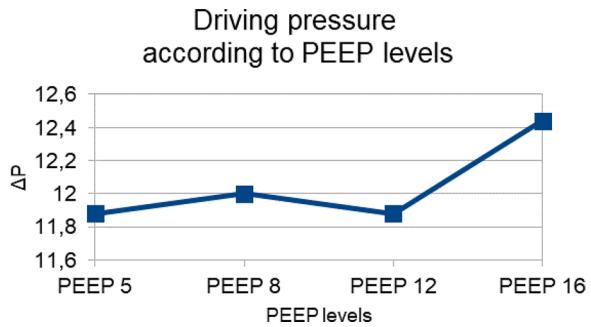


**Fig. 3 (abstract 001584)** ΔP according to PEEP levels

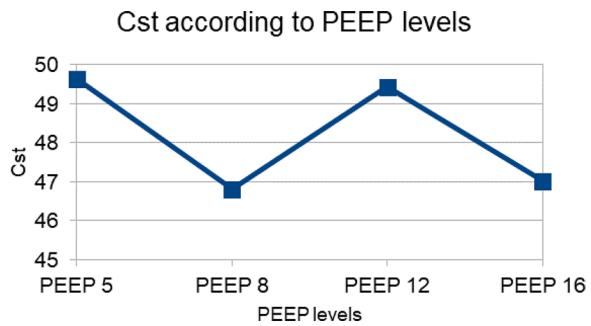


**Fig. 4 (abstract 001584)** Cst according to PEEP levels

**Reference(s)**

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3. None.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001585

### Comparison of multiplex PCR and conventional culture method in intensive care units

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001585

**Introduction:** Early microbiologic diagnosis and appropriate antibiotic initiation increase survival in intensive care unit infections and sepsis. The basic approach in treatment is to initiate empirical antibiotic therapy after cultures are obtained. Considering the prevalence of multidrug resistance, rapid microbiologic diagnosis and selection of antibiotic therapy according to the resistance pattern is of vital importance. In this context, it is possible to contribute to the treatment process by rapid microbiological diagnosis and resistance gene analysis with m-PCR (multiplex PCR) rapid diagnostic tests. In this study, the diagnostic compatibility and speed of the m-PCR method compared to the conventional method were investigated.
**Methods:** After obtaining ethics committee approval, the data of patients followed up in the intensive care unit between October 2022 and October 2023 due to infection were analyzed retrospectively. Blood cultures and m-PCR from the patients were designed and the data of the patients who were interned in the General Intensive Care Unit of Yeditepe University were used in the study. The results of blood cultures and m-PCR tests, signal and notification times, blood culture and m-PCR results, compatibility, and resistance genes, if any, were recorded. The results were statistically evaluated and $P < 0.05$ was considered statistically significant.
**Results:** Data from a total of 40 patients were used in the study. The gender distribution of these patients was 57.5% male (23) and 42.5% female (17). The median age was 63.5 years and the microorganism distribution in the m-PCR results was as follows: s.epidermidis 42%, e.faecalis 15%, *p*.aurogineosa 12.5%, a.baumanii 19%, streptococcus spp 10%, e. coli 7.5%, stapylococcus spp 7.5%, k.pneumonia 5%, c.albicans 2.5%, c.tropicalis 2.5%, *p*.vulgaris 2.5%, e.clocae 2.5%, k.oxytoca 2.5 2.5%. The concordance of the rapid test with the culture result was 97.5%. The median rapid test result time was 77.5 min, the median culture result time was 4.91 days and the mean was 4.37 days.
**Conclusions:** The results of m-PCR and blood culture were found to be highly compatible in this study. In this context, it can be predicted that the m-PCR test is safe to use and can be used safely due to its rapid results, which is useful both for the rapid initiation of appropriate antibiotherapy and for the prevention of multiple antibiotic resistance. Further studies on the subject should be conducted and the test should be widely used.

**Topic:** Infections and prevention

## 001586

### The role of intermediate care unit in patient management: insights from a five-year analysis

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001586

**Introduction:** The intermediate care unit bridges conventional hospitalization and the intensive care unit (ICU), acting as a step-up and step-down facility and serving as a strategic ICU in crises. This unit is distinguished by its intensive nursing care, monitoring equipment, respiratory support, and the expertise of its healthcare professionals.
**Objectives:** The study aims to better understand the evolution of the intermediate care unit and its implications on patient care.
**Methods:** Retrospective descriptive study of the activity in a multipurpose intermediate care unit managed by the Intensive Care Department of a university hospital. Patient records from 2018 to 2023 were collected and analyzed, including demographic variables (sex and age) and activity-related variables (origin, length of stay, diagnosis, and discharge destination).
**Results:** During the study period, 10,119 patients were admitted to the Intensive Care Department, of which 7382 (72.9%) were admitted directly to or stayed in the intermediate care unit. The majority were males (63.9%) with an average age of 58.42 ± 15.30 years. 28.9% of admissions came from the ICU. The diagnostic groups at admission included postoperative patients of neoplastic processes (24.9%), followed by cardiac cases (19%) with a predominance of acute coronary syndromes (86.8% of cardiac cases), septic processes (7.5%), and traumatic patients (6%), predominantly those with associated traumatic brain injury (54.8% of the group). The semi-critical care unit was the final discharge unit for 1839 patients (24.9% of those admitted), with 20 voluntary discharges/evasions, 134 deaths, and 1684 final discharges (35.4% transferred to other centers and 1087 discharged home with follow-up care).
**Conclusions:** The variety of patients treated and discharged with follow-up care underscores the complexity and highlights the need for a wide range of resources and knowledge to provide adequate care. Multipurpose intermediate care units play a strategic role in the healthcare system.

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**Topic:** Health Services Research and Outcome

## 001587

### Comparison of two fluid management strategies in a porcine model of refractory cardiac arrest supported by veno-arterial extracorporeal membrane oxygenation

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**Introduction:** Extracorporeal cardiopulmonary resuscitation (ECPR) is a rescue therapy for refractory cardiac arrest. The initial phase of ECPR requires fluid loading and vasopressor support to provide adequate blood flow and optimal tissue perfusion. The present study aimed to compare two different fluid resuscitation strategies in a porcine model of refractory cardiac arrest supported by veno-arterial extracorporeal membrane oxygenation (ECMO).
**Methods:** Fourteen pigs were submitted to 15 min of untreated ventricular fibrillation followed by 30 min of ECPR in normothermia. Defibrillations were then delivered until the return of spontaneous beating (ROSB). Animals were followed for 120-min after ROSB with ECMO flow set at 35 mL/kg/min and the sweep gas flow titrated to maintain normocapnia. At the beginning of ECPR, we randomly assigned pigs into two groups: restrictive strategy (group R, $n = 7$) or liberal strategy (group L, $n = 7$). In both groups, the same mean arterial pressure (MAP) was targeted at the value of 65–70 mmHg with different fluid loading strategies. In the R group, pigs were given fluid (Ringer's lactate) at 15 mL/kg during ECPR followed by 15 ml/kg/h after ROSB. In the L group, fluids were administered to target the minimal MAP value, while maintaining right atrial pressure (RAP) below a safety limit of 18 mmHg. If ECMO alone was not able to reach the MAP value, epinephrine bolus and norepinephrine infusions were administered during ECPR and after ROSB, respectively. Measurements included intracranial pressure (ICP), cerebral vascular resistances (CVR), native cardiac output measured by echography and intra-abdominal pressure (IAP) monitored by bladder pressure. After the experiment, organs were sampled and edema was measured using the wet/dry (W/D) weight ratio for brain, heart, lungs, kidneys and small bowel.
**Results:** During this study, MAP target was maintained adequately throughout the follow-up and, as expected, the R group received a significantly lower cumulative volume of fluid as compared to the L group (44 ± 2 ml/kg vs 157 ± 3 ml/kg, respectively). This was associated with a significantly higher heart rate and a trend toward higher vasopressor dose throughout the follow-up in the R group, as compared to the L group. Intra-abdominal pressure was also significantly lower in the R group at the end of the follow-up (10 ± 1 vs 19 ± 5 mmHg in R and L groups, respectively). R group presented a significantly lower RAP and ICP values throughout the ROSB period, a trend toward a lower CVR and a lower native cardiac output as compared to the L group. Regarding organ edema, there was a trend to decreased W/D ratio measures in the R group compared to the L group for lung, heart and small bowel (27.5 ± 5.2% vs 36.7 ± 11.8%, 27.3 ± 3.5% vs 33.4 ± 3.9% and 19.6 ± 3.0% vs 26.1 ± 3.9%, for each organs, respectively).
**Conclusions:** During early ECPR, liberal fluid resuscitation resulted in a detrimental increase in cerebral vascular resistance, ICP and RAP with tissue edema potentially leading to organ damage.

**Topic:** Cardiac arrest

## 001588

### Characterisation of cardiovascular function in intensive care unit survivors of sepsis (CONDUCT-ICU): Early pilot phase results

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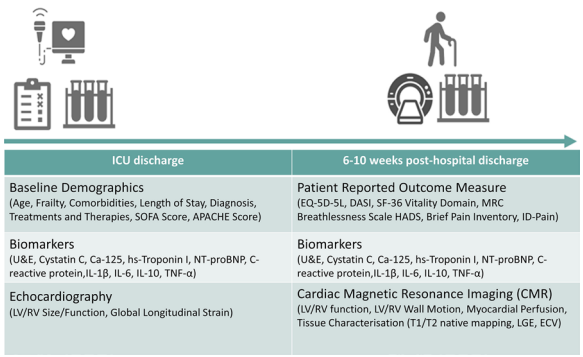
**Introduction:** Sepsis is one of the leading causes of Intensive Care Unit (ICU) and hospital admission worldwode. It is now increasingly recognised that admission with sepsis is associated with a long-term risk of adverse cardiovascular events.1 Many survivors of critical illness are burdened with significant functional impairments following admission.2 It is not clear whether cardiac dysfunction might play a role in these impairments and if so, what mechanisms might mediate this phenomenon. Here we present some early results from CONDUCT-ICU, a pilot, prospective observational cohort study combining cardiac magnetic resonance (CMR) imaging, biomarkers and functional outcome measures in ICU survivors of sepsis.

**Objectives:** To assess the prevalance of left ventricular systolic dysfunction following ICU admission with sepsis and the relationship with biomarkers of cardiovascular dysfunction and patient-reported functional outcome measures.
**Methods:** Patients recovering from sepsis with no prior history of cardiovascular disease are approached and consented around the point of discharge from intensive care. Cardiac and inflammatory biomarkers were collected at recruitment and if not undertaken already, a focused echocardiogram was performed. Patients are followed up 6–10 weeks following discharge from the hospital where CMR imaging is undertaken in addition to the collection of patient-reported outcome measures and inflammatory and cardiac biomarkers (Fig. 1). The primary outcome of the study is the prevalence of abnormal left ventricular systolic dysfunction (LVSD). After the successful follow-up of 15 patients, we conducted an interim analysis to ensure the operational integrity of the methodology.
**Results:** 20 survivors of sepsis were recruited for CMR follow-up and 15 attended their follow-up visit. Of those that underwent CMR scanning, a high proportion (4/15 (26%)) of patients had LV systolic dysfunction. Patients with LVSD had a median LV ejection fraction (LVEF) of 39% (IQR 36–42). Median NT-pro BNP on discharge was 1474 pg/ml (IQR 190–6326) and Trop T value of 18 pg/mL (IQR 13–50), which reduced on the follow-up visit, but remained abnormal at 126 pg/ml (IQR 78–185) and 14 pg/ml (IQR 8–20), respectively. Patients with LVSD had a higher median NT-proBNP in comparison to those without (169 pg/ml (IQR 37–158) vs 126 pg/ml (IQR 115–448) $p$ 0.4) and rated their overall health as worse when measured in EQ-5D-5L visual analogue scale (28 vs (24–39) vs 60 (IQR 54–90)). Patients with diabetes had a significantly lower ejection fraction vs those without (40% vs 57%, $p$ 0.05).
**Conclusions:** Early interim analysis of participants in CONDUCT-ICU demonstrated the feasibility of our research protocol. In the first 15 participants, admission with sepsis was associated with a high prevalence of LV dysfunction that persists weeks beyond discharge from the hospital. The study will give key pilot data to inform larger studies and give insights into mechanisms of adverse cardiovascular risk following ICU admission with sepsis.




**(abstract 001588)** Observations planned in CONDUCT-ICU

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**Topic:** Sepsis

## 001589

## The prognostic value of the Charlson comorbidity index, Glasgow coma scale on admission and APACHE II score in critically ill patients with acute brain injury

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**Introduction:** Acute brain injury (ABI) of any etiology is associated with significant mortality and disability worldwide. Depending on the severity of the injury, the patient with ABI may require intubation and hospitalization in the intensive care unit (ICU). Various prognostic indices, such as the Charlson comorbidity index (CCI), Glasgow coma scale (GCS) on ICU admission and APACHE II score, could be used to predict the outcomes in this patient population.
**Objectives:** To investigate the relationship of CCI, ICU admission GCS and APACHE II score with mortality and 6-month neurological outcome in patients with ABI.
**Methods:** A retrospective data analysis was performed in a Greek level 3 ICU. We collected data from a total of 94 critically ill patients with ABI of any etiology (40.4% traumatic brain injury, 27.7% subarachnoid hemorrhage, 28.7% intracerebral hemorrhage, 3.2% ischemic stroke). Demographic and baseline data, ICU admission GCS, CCI and APACHE II score during the first 24 h were calculated and recorded. Simultaneously, we recorded in-ICU mortality, mortality at 28 days, 3 and 6 months, and neurological outcome at 6 months using the Glasgow outcome scale extended (GOS-E).
**Results:** Included 94 patients were males in 61.7%, had a median age of 61 (IQR 49.25–67.75) years, median CCI 2 (IQR 1.00–3.75), median ICU admission GCS 7 (IQR 4.25–9.75) and mean APACHE II score 18.77 (SD 6.11). The mortality rate in ICU, at 28 days, 3 and 6 months was 28,7%, 35.1%, 48.9% and 55.3%, respectively. We observed that a higher CCI score was related to increased mortality and this was more pronounced in long-term follow-up (Fig. 1). It was evident that a higher GCS on ICU admission significantly favored survival at all time points ($p < 0.001$) (Fig. 1). Higher mortality was observed in patients with increased APACHE II score at all time points, particularly in long-term follow-up (Fig. 1). Regarding neurologic outcome, we found that a higher GCS on ICU admission was moderately associated with better GOS-E at all time points ($p < 0.001$) (Fig. 2). An increased comorbidity burden based on CCI showed a moderate association with worse recovery at follow-up ($p < 0.001$) (Fig. 2). Finally, increased APACHE II score was moderately associated with lower GOS-E at follow-up ($p < 0.001$) (Fig. 2).
**Conclusions:** CCI, ICU admission GCS and APACHE II score are useful predictors of outcome in critically ill patients with ABI. Increased CCI or APACHE II score and decreased GCS seem to be associated with both increased mortality and worse neurological outcomes in this patient population.

**CCI**

| Variable | Survivors | Non-survivors | P-value |
|---|---|---|---|
| In-ICU mortality | 2 (IQR 0-2) | 3 (IQR 1-4) | 0.009 |
| 28-day mortality | 2 (IQR 0-2) | 3 (IQR 1-4) | 0.003 |
| 3-month mortality | 1 (IQR 0-2) | 2.5 (IQR 2-4) | <0.001 |
| 6-month mortality | 1 (IQR 0-2) | 2.5 (IQR 2-4) | <0.001 |

**GCS**

| Variable | Survivors | Non-survivors | P-value |
|---|---|---|---|
| In-ICU mortality | 8 (IQR 6-11) | 6 (3.5-7) | <0.001 |
| 28-day mortality | 8 (IQR 6-11) | 6 (IQR 4-7) | <0.001 |
| 3-month mortality | 9.48 (SD 3.48) | 6 (IQR 4-7) | <0.001 |
| 6-month mortality | 9.64 (SD 3.61) | 6 (IQR 4-7) | <0.001 |

**APACHE II score**

| Variable | Survivors | Non-survivors | P-value |
|---|---|---|---|
| In-ICU mortality | 17.61 (SD 6.0) | 21.63 (SD 5.5) | 0.003 |
| 28-day mortality | 17.23 (SD 6.08) | 20 (IQR 19-24) | 0.002 |
| 3-month mortality | 15.77 (SD 5.53) | 21 (IQR 19-24) | <0.001 |
| 6-month mortality | 15.55 (SD 5.78) | 20.5 (IQR 18-24) | <0.001 |

**Fig. 1 (abstract 001589)** CCI, GCS and APACHE II score according to mortality of ABI patients at consecutive time points

**CCI**

| Variable | τ co-efficient | 95% CI | P-value |
|---|---|---|---|
| 28-day GOS-E | -0.34 | -0.489, -0.195 | <0.001 |
| 3-month GOS-E | -0.37 | -0.51, -0.221 | <0.001 |
| 6-month GOS-E | -0.44 | -0.562, -0.302 | <0.001 |

**GCS**

| Variable | τ co-efficient | 95% CI | P-value |
|---|---|---|---|
| 28-day GOS-E | 0.44 | 0.32, 0.55 | <0.001 |
| 3-month GOS-E | 0.53 | 0.43, 0.621 | <0.001 |
| 6-month GOS-E | 0.5 | 0.367, 0.609 | <0.001 |

**APACHE II score**

| Variable | τ co-efficient | 95% CI | P-value |
|---|---|---|---|
| 28-day GOS-E | -0.38 | -0.512, -0.231 | <0.001 |
| 3-month GOS-E | -0.44 | -0.576, -0.297 | <0.001 |
| 6-month GOS-E | -0.41 | -0.548, -0.247 | <0.001 |

**Fig. 2 (abstract 001589)** CCI, GCS and APACHE II score associations with GOS-E of ABI patients at consecutive time points

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**Topic:** Neurointensive care

## 001590

### Agreement between central venous catheter and pulmonary artery catheter-derived perfusion markers in a swine model of cardiogenic shock

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001590

**Introduction:** Venous oxygen saturation and veno-arterial CO2 pressure gradient are pivotal variables to guide resuscitation in cardiogenic shock patients and thus are routinely measured in experimental models (1). Initially, these variables were described from coupled arterial and pulmonary artery catheter (PAC) samplings. However, clinicians increasingly compute these variables using a less invasive central venous catheter (CVC), rather than a PAC, although the agreement between the two sampling sites remains elusive.
**Objectives:** To assess the agreement between CVC and PAC-derived measures of venous oxygen saturation and veno-arterial CO2 pressure gradient pre-, per- and post-experimental acute myocardial infarction-related cardiogenic shock (AMI-CS).
**Methods:** In adult swine under deep general anesthesia, AMI-CS was induced by critical endovascular sub-occlusions of proximal left anterior descending and mid-circumflex coronary arteries for two hours. Animals were then resuscitated for a total of 9h30 by several therapeutic regimens (vasoactive drugs, and/or veno-arterial extracorporeal membrane oxygenation [VA ECMO], and/or an anti-DPP3 antibody). Instrumentation included an arterial catheter, a CVC with the tip positioned at the level of the superior vena cava-atrial junction, and a PAC. At each time point, samples extracted from these catheters within a 5 min delay from each other's, were used to compute venous oxygen saturations (ScvO2/SvO2) and veno-arterial CO2 pressure gradients (Pcv-aCO2/Pv-aCO2). Spearman rank correlation and agreement according to the Bland–Altman method between paired measurements were evaluated.
**Results:** Data from 11 pigs including 55 paired measures of both venous oxygen saturation and veno-arterial CO2 pressure gradient were included in this preliminary analysis. Induction of myocardial ischemia was associated with a reduction of cardiac output (− 43% from 6.9 to 3.9 L/min), mean arterial pressure (− 23% from 71 to 55 mmHg) resulting in perfusion impairment reflected by ScvO2/SvO2 decrease and Pcv-aCO2/Pv-aCO2 increase (Fig. 1A/B). Good correlation was observed for ScvO2/SvO2 ($rs = 0.82$; $p < 0.0001$), whereas moderate correlation was reported for Pcv-aCO2/Pv-aCO2 ($rs = 0.51$; $p < 0.0001$) (Fig. 1C/D). The ScvO2 overestimated the SvO2 by a mean bias of 6.35% ± 7.15% while the 95% limits of agreement were wide, from − 7.65 to 20.36%. The Pcv-aCO2 overestimated the Pv-aCO2 by a mean bias of 1.71 mmHg ± 3.69 mmHg with 95% limits of agreement from − 5.52 mmHg to 8.93 mmHg. Similar results were found independently of the resuscitation strategy (notably animals treated by VA ECMO or not) or the timepoint considered.
**Conclusions:** In a large animal model of AMI-CS the agreement between the venous oxygen saturations or veno-arterial CO2 pressure gradients computed with venous samples extracted from CVC or PAC was poor. Therefore, these two sites cannot be used interchangeably, and the use of PAC-derived measurements should be preferred as they depict the whole body oxygen delivery adequacy (1).

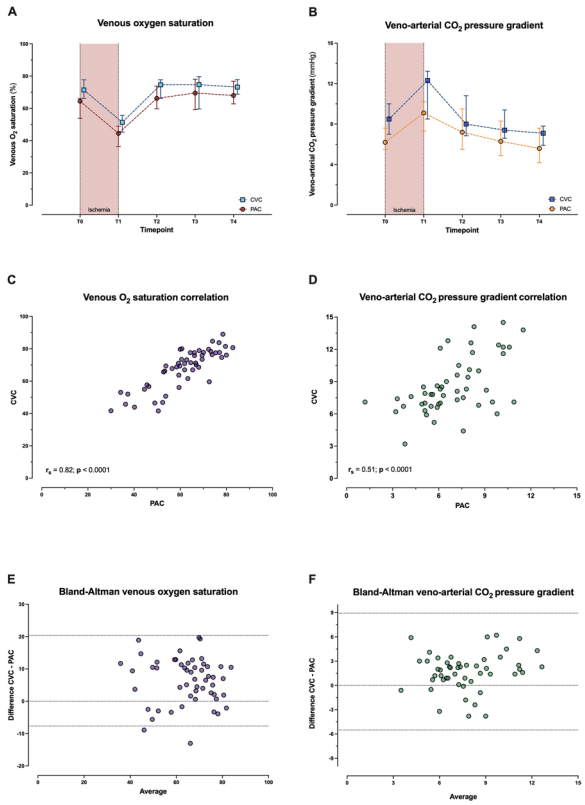


**Fig. 1 (abstract 001590)** Timecourse of venous oxygen saturation (A) and veno-arterial CO2 pressure gradient (B), correlation (C and D), and Bland–Altman agreement between values measured from CVC and PAC (E and F). CVC: central venous catheter; PAC: pulmonary artery catheter. T0: baseline, T1: end of ichemia; T2: after 1h30 of resuscitation; T3: after 5h30 of resuscitation, T4: after 9h30 of resuscitation

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**Topic:** Translational biology

## 001591

## Ventilation-perfusion distribution in pulmonary and extrapulmonary experimental hypoxemic acute lung injury

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**Introduction:** During acute lung injury, ventilation-perfusion (V/Q) mismatching drives hypoxemia (1). Hypoxic pulmonary vasoconstriction (HPV) plays a crucial role in modulating the V/Q ratio to sustain oxygenation. The effect of HPV depends on the local oxygen tension in the lungs as well as the constriction capability of the pulmonary vasculature, which may vary between direct lung injury from the alveolar side and indirect lung injury from the endothelial side (2,3). Electrical impedance tomography (EIT) enables bedside monitoring of regional ventilation and perfusion, facilitating the investigation of their response to different lung injury models. Additionally, it helps to explore the interaction between regional perfusion and ventilation dynamics, as well as variations in oxygenation (4).
**Objectives:** To compare the effects of pulmonary injury induced by intratracheal hydrochloric acid (HCl) and extrapulmonary injury induced by intravenous oleic acid (OA) on ventilation and perfusion distribution in acute lung injury animal models.
**Methods:** In a prospective study (ethics No. 20/3464), nineteen experimental hypoxemic acute lung injury pigs were divided into HCL ($n=11$) and OA ($n=8$) groups. EIT, gas exchange, and ventilator settings were assessed before and after lung injury. Detailed methods can be found in a previous article (5). Dynamic changes in EIT ventilation and perfusion percentages were evaluated in three lung regions according to gravity (dependent, middle, non-dependent).
**Results:** Detailed results are summarized in Fig. 1 and Table 1. Following lung injury induction, both groups demonstrated decreased ventilation in the dependent and middle regions, alongside increased ventilation in the non-dependent region. Notably, the HCL group exhibited pronounced ventilation impairment in the dependent regions compared to the OA group. Furthermore, in both models, perfusion distribution mirrored ventilation changes rather than gravity, with the HCL group showing more significant increases in the non-dependent and middle regions, resulting in a higher proportion of areas with V/Q match and a higher PF ratio.
**Conclusions:** In the hypoxemic animal model, perfusion changes aligning with ventilation distribution post-injury, independent of gravity, suggest the involvement of HPV. Specifically, HCL induced a focused alveolar impact in the dependent region, whereas OA caused a more diffuse and homogeneous endothelial injury. Consequently,

the endothelial damage or less severe regional hypoxemia in the OA group may compromise HPV function, thereby exacerbating V/Q mismatch and deteriorating hypoxemia.

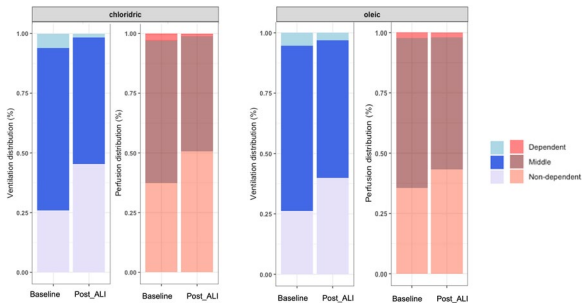


**Fig. 1 (abstract 001591)** Changes in regional ventilation (blue) and perfusion (red) distribution percentages in pulmonary (chloride) and extrapulmonary (oleic) hypoxemic experimental animal models. "Baseline" refers to values measured before lung injury, "Post_ALI" refers to values after lung injury induction

**Table 1 (abstract 001591)** Gas exchange, mechanical ventilation, and EIT analysis values according to different lung injury models

| ALI_model | Chloridric | | | Oleic | | |
|---|---|---|---|---|---|---|
| Time_point | Baseline | Post_ALI | *P* value | Baseline | Post_ALI | *P* value |
| Gas exchange | | | | | | |
| $PaO_2/FIO_2$, mm Hg | 494.36±31.55 | 154.36±12.40 | 0.000 | 518 (475,525.75) | 120.5±22.13 | 0.000 |
| $PaO_2$, mm Hg | 199.27±10.12 | 60.18±4.77 | 0.000 | 203.63±10.85 | 59±6.14 | 0.000 |
| $PaCO_2$, mm Hg | 44(44,51.5) | 59.911±6.41 | 0.000 | 45.88±3.23 | 58±4.60 | 0.000 |
| Mechanical Ventilation | | | | | | |
| VT per IBW, kg/m² | 7.71±0.33 | 6.06(5.87,6.11) | <0.001 | 7.97±0.53 | 5.99±0.15 | <0.001 |
| Respiratory rate, beats/min | 14.18±1.60 | 27.27±3.93 | <0.001 | 14±1.69 | 29.5(27,32) | <0.001 |
| PAW , cm $H_2O$ | 7 | 18.5(18, 19.25) | <0.001 | 7(7,7.25) | 17.00±1.41 | <0.001 |
| PEEP, cm $H_2O$ | 4 | 10 | <0.001 | 4 | 10 | <0.001 |
| EIT analysis | | | | | | |
| VQ match Aera% | 80.4 (76.9,81.05) | 75.75 (69.55,79.475) | 0.748 | 82.2± 5.94 | 74.6 ± 8.11 | 0.087 |
| Ventilation distribution% | | | | | | |
| dependent | 6.14± 3.81 | 0(0,2.605) | 0.004 | 5.44±4.07 | 1.87(1.12,4.52) | 0.282 |
| Middle | 67.84± 4.39 | 54.9(43.15,64.5) | 0.001 | 68.4± 4.61 | 56.78± 10.81 | 0.046 |
| non_dependent | 26± 6.34 | 44.9 (34.55,56.85) | 0.000 | 26.15±7.29 | 40± 11.86 | 0.036 |
| Perfusion distribution% | | | | | | |
| dependent | 1.73 (1.20,3.14) | 1.82(0.55,3.00) | 0.065 | 2.29± 2.19 | 1.96± 1.78 | 0.758 |
| Middle | 59.52± 6.57 | 47.96± 10.89 | 0.008 | 62.04± 9.98 | 54.72± 8.96 | 0.176 |
| non_dependent | 37.51± 9.17 | 50.75± 11.97 | 0.009 | 35.66± 11.09 | 43.28 ± 9.48 | 0.192 |

Abbreviations and Definition：PAW=airway pressure, V/Q Match Area: Ventilation and perfusion matching area, defined as the percentage receiving both ventilation and perfusion out of the total ventilated and perfused aera.
Data are reported as mean ± SD or median (Q1, Q3) depending on their distribution. Variables recorded at baseline and after lung injury were compared within groups using Student's t-test or the Wilcoxon-Mann-Whitney test.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001595

## Prognostic value of estimated plasma volume status in patients with septic shock, a retrospective cohort study

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**Introduction:** Assessing and managing fluid status is a central challenge in caring for critically ill patients, especially those with septic shock. Estimated plasma volume status (ePVS) has recently emerged as a potential noninvasive method to assess volume status in the intensive care unit (ICU) and has been proposed as a biomarker associated with excess fluid balance and poor prognosis in acute heart failure, ARDS and septic shock. We aimed to assess the prognostic value of ePVS in septic shock patients admitted to the ICU.
**Methods:** Retrospective observational study conducted at a tertiary university hospital, including critically ill patients diagnosed with septic shock between September 2018 and February 2019. To estimate PVS Duarte's formula was applied at different time points in the first 96 h of ICU stay. Descriptive statistical analysis, including non-parametric tests, and regression analysis were performed as appropriate. Statistical significance was defined as a $p$-value < 0.05.
**Results:** We included 182 patients (114 males, 68 females) with a median age of 69 years (interquartile range [IQR]: 59–78) and a median SAPS II score of 62 (IQR: 46.2 − 76.0). ICU mortality was 49.5%. Patients who did not survive had higher mean ePVS during the first 48 h compared to survivors (day 0: 7.02 ± 2.67 dL/g vs. 6.23 ± 1.8 dL/g, $p = 0.02$; day 1: 7.20 ± 2.54 vs. 6.32 ± 1.86, $p = 0.01$). A sensitivity analysis determined a cut-off point above 6dL/g to be associated with ICU mortality (OR 1.9, 95% CI 1.02–3.41), $p = 0.04$). The cumulative fluid balance in the first three days was 2.4 (− 1.5–15.3), 1.8 (− 2.9–10.9), 1.0 (− 2.3–4.8) and 0.7 (− 3.3–4.7) liters. The ePVS was correlated with fluid balance only on the third day of ICU admission ($p = 0.03$).
**Conclusions:** ePVS in the first 2 days of ICU admission was associated with increased in-hospital mortality in this cohort of critically ill septic shock patients. Moreover, there was a correlation between ePVS measured at day 3 and the amount of intravenous fluid resuscitation administered in the first 48 h. Our study suggests a role for ePVS as an easy-to-calculate prognostic marker in patients admitted to the ICU with septic shock. Fluid overload is increasingly recognized as a decisive risk factor for adverse outcomes in sépsis. ePVS association with cumulative fluid balance and mortality should be confirmed and further research is warranted to validate our findings in larger prospective cohorts.

**Topic:** Sepsis

## 001596

### SAPS II predictive performance in neurocritical patients: insights from a general mixed intensive care unit

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**Introduction:** Since its development in 1993, Simplified Acute Physiology Score II (SAPS II) has been widely used to assess illness severity and predict outcomes in intensive care unit (ICU) patients. Despite its widespread use and proven efficacy in diverse ICU populations, its utility in predicting outcomes for neurocritical patients remains uncertain.
**Objectives:** This study aims to analyze how accurately SAPS II predicts hospital mortality for acute neurocritical patients treated in a standard mixed ICU setting.
**Methods:** A retrospective analysis was conducted on data from 171 neurocritical care patients admitted to a single center, over an 18-month period. Mortality outcomes were assessed at hospital discharge. Logistic regression analysis was employed to ascertain the predictive strength of SAPS II for hospital mortality.
**Results:** The patient cohort had a median age of 64 years (IQR 50–74), a male predominance (63.28%, $n = 112$), with the majority requiring emergent neurointensive care. Hospital mortality was observed in 26.32% of cases, yielding a Standardized Mortality Ratio (SMR) of 0.71. Notably, SAPS II score exhibited significant differences between survivors and non-survivors (40 vs 60, IQR 30–51 vs 52–69; $U = 944.50$; $p < 0.001$). Furthermore, the score demonstrated very good discrimination (AUC = 0.833) and calibration power (Hosmer–Lemeshow chi-square = 3.722; $p = 0.881$), and the predictive power for hospital mortality in neurocritical patients was statistically significant ($p < 0.001$; adjusted odds ratio 1.117, CI 1.074–1.161).
**Conclusions:** While SAPS II has consistently shown a correlation with mortality at discharge in general ICU patients, its accuracy in neurocritical setting remains to be established. Our single-center study not only demonstrated very good discrimination and calibration power for SAPS II within a single-center neurocritical population, but also showed its significant predictive ability for mortality. These findings lay an important groundwork for future multicentric studies of higher quality, essential for further investigation and consolidate this relationship, bringing to discussion if SAPS II predictive power in neurocritical care is related to a specific type of patient.

**Topic:** Neurointensive care

## 001597

### Traumatic axonal injury and long-lasting neurobehavioral disorders in traumatic brain injury

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**Introduction:** Neurobehavioral disorders (NBDs) are frequently observed as long-term consequences of traumatic brain injury (TBI) and may hamper patients' functional recovery. The most common NBDs may include impulsivity, irritability, verbal aggression, socially inappropriate behavior, self-centeredness, lack of awareness, emotional lability, low frustration tolerance, and lack of drive [1]. In literature, demographic (i.e., gender, age and education) and clinical variables (i.e., Post-traumatic Amnesia duration and Glasgow Coma Scale severity) have been explored as predictors of NBDs. Despite its responsibility in the etiopathology of TBI however, the role of Traumatic Axonal Injury (TAI) has been scarcely studied.
**Objectives:** This study explored how different variables, including the occurrence of TAI, could be associated with the development of NBDs. Secondly, we explored the correlation between the NBDs, patients' functional outcome, and community life participation measured by the Glasgow Outcome Scale Extended (GOSE) and the Community Integration Questionnaire (CIQ).
**Methods:** We included 54 patients (12 F, 42 M; mean age 46.1). All the patients underwent a neuropsychological, behavioral and psychological assessment. We collected clinical measures in the acute/subacute phase and functional measures in the chronic phase.
**Results:** The most frequent NBDs observed by the caregivers were anger/ difficulty controlling temper, impulsivity and irritability. The best predictors of these disturbances were: education, post-traumatic amnesia (PTA) and TAI and explained about one-third of the variability of NBDs (adjusted $R2 = 0.35$). A significant moderate negative correlation emerged between NBDs and GOSE ($r = -0.64$) and CIQ ($r = -0.71$), both $p < 0.001$.
**Conclusions:** We should closely monitor patients with lower education, longer PTA, and TAI because they will likely develop long-lasting NBDs that could be more manageable when a timely addressed.

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2. This work has been supported by Brembo SpA (Curno, Bergamo, Italy). The founder was not involved in the study design, collection, analysis, interpretation of data, the writing of this article or the decision to submit it for publication

**Topic:** Neurointensive care

## 001598

### Contribution of electrocardiogram and echocardiography in severe cardiotoxic agent poisoning

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**Introduction:** The frequency of acute poisoning by cardiotropic agents has greatly increased in recent years. In severe cases, the mortality rate can be alarming and can exceed 10% [1]. Cardiotropic agents include not only anti-hypertensive treatments and conventional anti-arrhythmics but also other medicinal and non-medicinal substances [2]. Transthoracic echocardiography, coupled with a good interpretation of the electrocardiogram, could be an alternative method to invasive explorations for the investigation of haemodynamic failure in cases of serious cardiotropic intoxication.
**Objectives:** To evaluate the contribution of Transthoracic echocardiography in patients suffering from cardiotoxic agent poisoning and in whom the electrocardiogram has detected abnormalities.
**Methods:** This was an observational study with prospective data collection including all cases of serious intoxication with a cardiotropic product managed in an intensive care unit over the 6-month period (October 2023–March 2024). Serious cardiotropic intoxication was based on the circumstances of the accident (ingestion or exposure to a cardiotropic product), clinical signs presented by the patient and electrocardiographic abnormalities on admission.

**Results**: Fifty patients were included. The mean age was 32.5 ± 15.6 years, with a sex of 0.3. Sixteen patients (32%) were being treated for depression and eight patients (16%) had a history of drug addiction.
According to the Poisoning Severity Score, intoxication was severe in 28 (56%) and fatal in three (6%).
Drugs were involved in 35 cases (70%), mainly psychiatric treatments in 22 cases and antihypertensive treatments in 12 cases. One case involved theophylline intoxication. A non-drug substance was noted in 15 cases.
The average time between consultation and exposure to the toxic agent was 5 ± 3.8 h.
The mean heart rate was 89.8 ± 28.8 bpm, systolic blood pressure (111 ± 27.1 mmHg) and diastolic blood pressure (64.4 ± 19.7 mmHg). Shock was detected in fourteen cases (28%): it was cardiogenic ($n = 6$; 12%), vasoplegic ($n = 6$; 12%) and hypovolaemic in one case.
Sinus tachycardia was observed in 18 patients (36%), supraventricular tachycardia ($n = 3$), sinus bradycardia ($n = 7$; 14%), prolonged PR interval ($n = 6$; 12%), and Brugada syndrome in one patient.
Repolarisation disorders related to ST segment or T wave abnormalities were detected on 45 ECGs (90%) and a prolonged corrected QT was observed in thirteen cases (26%). Four patients had a membrane stabilising effect. Fifteen patients had elevated troponins on admission (30%).
Transthoracic echocardiography was performed at an average of 10.8 ± 4.25 h after intoxication. It was pathological in seven patients (14%), showing a collapsed LVEF and global hypokinesia consistent with toxic myocarditis.
Orotracheal intubation was indicated in 23 patients (46%) with an average intubation time of 3.4 ± 3.1 days, Norepinephrine in fourteen patients, combined with dobutamine in seven cases.
A follow-up ECG was performed at H24 after management, with normalisation ($n = 29$; 58%).
Follow-up of echocardiography, when it was abnormal, showed a significant improvement in LVEF and regression of global hypokinesia in 6 patients.
The analytical study showed that QT prolongation on electrocardiogram was associated with abnormalities on echocardiography ($p = 0.043$; OR = 5.03; 95%; CI = [0.95; 26.7]), elevated troponins were associated with a risk of having a pathological echocardiography ($p = 0.000$; OR = 1.87; 95%; CI = [1.17; 3.01]). The mortality rate was of 6% ($n = 3$).
**Conclusions:** According to our results, the electrocardiogram could play a key role in the initial diagnosis and monitoring of cardiac abnormalities. and that coupled with transthoracic echocardiography, these tools could optimise clinical outcomes and provide a better understanding of the aetiologies of a shock to reduce the associated morbidity and mortality.

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**Topic:** Poisoning/Toxicology/Pharmacology

**001599**

## Infectious complications in patients with cardiogenic shock and mechanical support with VA ECMO

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**Introduction:** ECMO mechanical support implantation is an increasingly widespread technique in the management of patients with cardiogenic shock (1). However, infectious complications associated with these devices are considered a poor prognosis sign and a negative predictor of survival in critically ill patients (2). Nosocomial infection is a common complication, but current studies report inconclusive results about its incidence and impact (3).
**Objectives:** To describe infectious complications in patients with cardiogenic shock and mechanical support with VA ECMO.
**Methods:** Descriptive, observational, retrospective study from 2011 to 2022. All patients admitted to the ICU with cardiogenic shock and ECMO VA support were included. Personal history, severity scales, infectious complications and evolution in the ICU are collected. Qualitative variables are described with frequencies; quantitative variables with median and interquartile range.
**Results:** 140 patients were included, 91 males (65%) with a median age of 55 (43; 63) years. Nine patients (6.5%) were immunosuppressed prior to implantation. The most prevalent infections were ventilator-associated pneumonia (VAP) developed by 78 patients (56.5%), bacteremia in 27 (19.6%) and ECMO surgical wound infection in 8 cases (5.8%). Multidrug-resistant (MR) bacteria caused 17.94% of VAP and 25% of ECMO access point infections. The rest of the personal history, reason for ECMO implantation, complications and evolution in the ICU are shown in Table 1.
**Conclusions:** VAP, bacteremia, and surgical wound infection are the most frequent infections in our cohort. MR bacteria caused less than 15% of infectious complications.

**Table 1 (abstract 001599)** History, scales, reason for ECMO implant, ECMO access, infections, MR etiology and ICU evolution. MR: Multidrug-resistant; CRB: Catheter-Related Bacteremia; VAP: Ventilator-Associated Pneumonia; SW: Surgical Wound.

| Variables<br>N (%) / Median (IQR) | Total<br>n=140 |
|---|---|
| History | |
| Male | 91 (65) |
| Age | 55 (43; 63) |
| Smoker | 45 (32,1) |
| Arterial hypertension | 64 (46) |
| Diabetes | 26 (18,7) |
| Chronic renal disease | 11 (7,9) |
| Previous cardiopathy | 68 (48,9) |
| Transplant | 3 (2,2) |
| Chemotherapy | 1 (0,7) |
| Corticosteroids | 5 (3,6) |
| Scales | |
| APACHE II | 17 (12;22) |
| SOFA | 10 (8;12) |
| **Reason for ECMO implant** | |
| Post-infarction shock | 48 (34,5) |
| Post-cardiotomy shock | 36 (25,9) |
| Acute myocarditis | 15 (10,8) |
| Primary graft failure | 12 (8,6) |
| Right Ventricular Dysfunction | 8 (5,8) |
| Other | 18 (12,9) |
| **ECMO access** | |
| Peripheral | 119 (85,6) |
| Central | 20 (14,4) |
| **Infections** | |
| SW ECMO infection | 8 (5,8) |
| VAP | 78 (56,5) |
| Bacteremia | 27 (19,6) |
| CRB | 10 (7,2) |
| Intra-abdominal | 3 (2,2) |
| Mediastinitis | 2 (1,4) |
| **MR etiology** | 20 (14,29) |
| SW ECMO infection | 2 (25) |
| VAP | 14 (17,94) |
| Bacteremia | 3 (11,11) |
| CRB | 1 (10,0) |
| **ICU evolution** | |
| Acute renal failure | 101 (73,7) |
| Invasive mechanical ventilation | 137 (99,3) |
| ICU stay (days) | 17 (8; 36) |
| Mortality | 70 (50) |

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**Topic:** Cardiovascular issues in ICU

## 001600

### Intracranial compliance in septic shock patients: a pilot study

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**Introduction:** Brain dysfunction in septic shock patients is a common condition among critically ill patients, and its presence is linked to heightened mortality rates and a greater likelihood of cognitive impairment among survivors. Although alterations in cerebral hemodynamics have been described in septic patients, the underlying cause remains poorly understood. We hypothesized that impairment of cerebral compliance might occur in patients with septic shock.
**Objectives:** To assess cerebral compliance in septic shock patients.
**Methods:** Prospective ongoing pilot study including septic shock patient's as defined by Sepsis-3 criteria, within 48 h from the diagnosis onset. Intracranial compliance was assessed by using a non-invasive tool (B4C: Brain4care Corp, São Carlos, Brazil), which provided the P2/P1 ratio and time-to-peak over 5-min recording. A P2/P1 ratio > 1.2 was considered altered, as well as a TTP > 0.3. Physiological and clinical data were also collected.
**Results:** Sixteen patients have been included so far. The median age was 66 (57–75) years, with 67% were male. The median sequential organ failure assessment (SOFA) at the time of examination was 10 (IQR, 7–13), the norepinephrine dose was 0.35 (0.15–0.48) mcg/kg*min, and 81% were on mechanical ventilation. The median value of the P2/P1 ratio was 1.16 (1.04–1.34); however, 6 patients (37.5%) presented altered P2/P1. In addition, the median TTP was 0.28 (0.19–0.28); 7 patients (43%) presented at least one altered value of these two indices.
**Conclusions:** During the early stages of septic shock, cerebral compliance was altered in almost 40% of patients. The association of such alterations with clinically relevant patients' outcome needs to be further evaluated.

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**Topic:** Neurointensive care

## 001601

## The role of nasopharyngeal microbiota to anticipate ventilator-associated pneumonia in children afflicted with acute bronchiolitis

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**Introduction:** Ventilator-associated pneumonia (VAP) is a major challenge in children with severe bronchiolitis who require mechanical ventilation. However, its risk factors and pathogenesis remain poorly understood. This study investigates the influence of nasopharyngeal microbiota on VAP development among children with bronchiolitis attended in Paediatric Intensive Care Units (PICUs).
**Methods:** This prospective cross-sectional study included children < 24 months with bronchiolitis requiring mechanical ventilation for ≥ 5 days at the PICU of a tertiary referral Children's Hospital between June 2020 and January 2023. Epidemiological, clinical, and microbiological data were collected at admission. Nasopharyngeal microbiota was characterized by sequencing the 16S rRNA gene (V3-V4 region). Analyses included alpha- and beta-diversity, and differential abundance at the genus level. A Random Forest model incorporating differential abundant genera was built using 5 k-fold cross-validation.
**Results:** A total of 40 children were included, however, only 35 nasopharyngeal aspirates met quality criteria for microbiota analysis (52.2%; median 1.4 months [IQR 0.95–2.1]; 57.1% male). Among these, 8 patients (22.8%; 75.0% male) subsequently developed VAP, while 27 did not (77.2%; 51.9% male), with no significant age differences observed (median 1.1 months [IQR 0.7–1.8] vs 1.4 months [IQR 1.0–2.5], respectively; $p = 0.220$).
Alpha-diversity analysis showed no significant differences (Chao1 $p = 0.195$; Shannon $p = 0.226$). However, children who developed VAP showed a different microbiota composition (Adonis $p = 0.007$, R2 = 11.8%), enriched in *Moraxella*, *Amniculibacterium*, *Enterobacter*, and *Streptococcus,* and *the* absence of *Prevotella*. The Random Forest model achieved a good discriminatory power for predicting VAP (mean AUC 0.80; accuracy 0.86).
**Conclusions:** The nasopharyngeal microbiota could be a VAP development significant predictor in paediatric patients with bronchiolitis requiring mechanical ventilation.

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**Topic:** Infections and prevention

## 001602

### Intra cranial pressure threshold in a tertiary center twelve years after sorrentino

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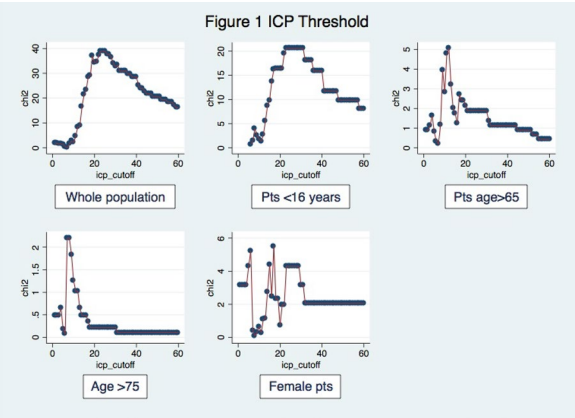
**Introduction:** The concept of goal-directed therapy moves from identifying a physiological variable that effectively discriminates a desired outcome from an undesirable one. In this context, the physician should direct therapy towards achieving that "number" to improve long-term outcomes.
Twelve years ago, a seminal paper from Sorrentino et al. [1] defined 22 mmHg of Intracranial Pressure (ICP) as the best-discriminating ICP threshold between Good and Bad Outcomes in traumatic brain injury (TBI) patients. Although the original paper did not aim to identify a cut-off for treatment, subsequent guidelines [2–4] suggested that threshold as a goal of therapy.
**Objectives:** This study aims to identify in a cohort of patients treated in our Institution the ICP threshold that maximally differentiates between Good and Bad Outcomes.
**Methods:** We retrospectively enrolled all consecutive adult and pediatric patients admitted to our Intensive Care Units (ICU) from January 2013 to June 2022 (Ethic Committee approval number 303/20) with a diagnosis of TBI and an ICP monitoring longer than 4 h. Informed consent was waived. We gathered demographic data, severity indicators upon admission (including Glasgow Coma Scale, pupillary reflex, hypoxia, and hypotension at the crash scene), initial imaging results (assessed using the Marshall and Rotterdam scales), length of hospital and ICU stays, incidence of decompressive craniectomy, Glasgow Outcome Scale Extended (GOSE) scores at hospital discharge and one-year post-injury.
Outcome was categorized into Good Outcome (GOSE > 3) and Bad Outcome (GOSE score < 4). We collected ICP data from intraparenchymal catheters whose readings were stored in our electronic health record (sample frequency 0.0033Hz). The time series were manually filtered and resampled on a minute-by-minute basis using linear interpolation. Time series shorter than 60 min were disregarded. For each patient, we calculated the mean ICP during the monitoring period. The optimal ICP threshold was determined using sequential chi-square methods [1], both for the entire population and for subgroups, including patients under 17 years old, over 65, over 75, and female patients.
**Results:** We enrolled 263 patients. Table 1 shows admission, treatment, and outcome data in the general population and in the predefined subgroup. Fig. 1 represents the distribution of chi-square values across the ICP cut-offs within the predefined groups. The ICP threshold was around 23–25 in the general population and slightly higher in the pediatric one. A lower threshold was identified for older patients, while a clear ICP threshold could not be identified for female patients.

| Variable | General population | Age < 17 years | Age > 65 | Age > 75 | Female patients |
|---|---|---|---|---|---|
| Patients, *n* | 263 | 46 | 75 | 22 | 58 |
| Age | 46 (23–69) | 8 (2–12) | 71 (69–73) | 78 (77–81) | 50 (24–69) |
| Gender (male) | 205 (78.0) | 34 (73.9) | 42 (79.3) | 17 (77.3) | 58 (100) |
| None pupile reactive | 47 (17.9) | 14 (30.4) | 10 (19.6) | 4 (18.2) | 10 (17.9) |
| GCS, at admission | 7 (3–11) | 5 (3–7) | 7 (4–13) | 11 (4–14) | 6 (4–10) |
| Marshal CT | 5 (3–5) | 5 (2–5) | 5 (5–5) | 5 (5–5) | 5 (5–5) |
| Rotterdam Scale | 4 (3–5) | 3 (2–3) | 4 (4–5) | 3 (3–5) | 3 (3–5) |
| ICU length of stay | 19.0 (8.0–31.0) | 13 (5–41) | 21 (10–31) | 13 (8–26) | 23 (12–39) |
| Hospital length of stay | 28.0 (13.0–43.0) | 19 (11–47) | 25 (10–39) | 19 (10–35) | 33 (18–50) |
| Good Outcome | 128 (48.7) | 27 (58.7) | 11 (20.8) | 2 (9.1) | 29 (50.0) |

**Conclusions:** Our results confirm the data found by Sorrentino [1] with an ICP threshold between 22 and 25. Moreover, our results indicate a greater resilience to ICP elevation in younger patients and an opposite trend in older ones.




**(abstract 001602)** Chi-square distribution of patients with Good Outcome vs patients with Bad outcome in the predefined populations

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**Topic:** Neurointensive care

## 001603

### Risk factors for acute kidney injury in patients undergoing ECMO therapy: a cross-sectional study comparing COVID-19 and non-COVID-19 cohorts

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**Introduction:** ECMO therapy has played a crucial role in managing patients with severe hemodynamic dysfunction or acute respiratory failure who have not responded to conventional treatment (1), during the COVID-19 pandemic. COVID-19, which has claimed millions of lives, over 6.9 million deaths (2). AKI represents a significant complication in both COVID-19 patients and those undergoing ECMO therapy, potentially limiting the benefits of this treatment.
**Objectives:** Assessing the risk factors associated with AKI between those patients with and without COVID-19, to enhance risk stratification and ultimately optimize the management of ECMO patients, improving clinical outcomes and reducing AKI-associated morbidity.
**Methods:** This is a cross-sectional study between 2019 and 2023. A total of 273 patients who received ECMO therapy were included in the study, 110 were excluded due to either a lack of AKI development ($n=95$) or incomplete data ($n=15$). The final analysis included 163 patients, who were divided into two groups: COVID-19 patients ($n=27$) and non-COVID-19 patients ($n=37$). Demographic, clinical, and laboratory data were collected from electronic medical records retrospectively. Variables of interest included age, sex, comorbidities, severity of illness scores, ECMO-related variables, laboratory parameters, and development of AKI.
**Results:** Among the 163 patients managed with ECMO, who developed acute kidney injury, we compared risk factors for AKI development between COVID-positive and COVID-negative cohorts. Among COVID-19 patients, a higher proportion were male (85%), experienced longer durations of invasive mechanical ventilation (18.1 vs. 14.3 days), and spent more time on ECMO support (15.9 vs. 7.5 days). Complication analysis showed notable discrepancies in neurological (6 COVID-19 vs. 1 non-COVID-19) and infectious complications (12 out of 62 COVID-positive vs. 24 out of 191 COVID-negative patients). We conducted univariable and multivariable logistic regression analyses separately to identify independent risk factors for acute renal injury in patients with COVID-19. The univariate analyses showed that only ECMO flow (OR, 2.45; 95% CI, 1.53–3.94; $p=0.001$) was a significant risk factor for acute renal injury. Multivariate analyses showed that masculine gender (OR, 3.7; 95% CI, (1.64–8.34); $p=0.002$), body mass index (OR, 1.16; 95% CI, (1.08–1.24); $p=<0.001$), days on ECMO (OR, 1.08; 95% CI, (1.04–1.12); $p=<0.001$), sodium pre-canulation (OR, 1.09; 95% CI, (1.03–1.16); $p=0.003$), PaCO2 pre-canulation (OR, 1.03; 95% CI, (1.01–1.04); $p=0.001$), PaO2 pre-canulation (OR, 0.97; 95% CI, (0.96–0.99); $p=0.021$), HCO3 pre-canulation (OR, 1.29; 95% CI, (1.18–1.4); $p=<0.001$), Lactate pre-canulation (OR, 0.67; 95% CI, (0.64–0.83); $p=<0.001$), base excess pre-canulation (OR, 1.16; 95% CI, (1.10–1.23); $p=<0.001$), APACHE II score (OR, 0.94; 95% CI, (0.9–0.99); $p=0.035$), DEOx (OR, 0.94; 95% CI, (0.92–0.96); $p=0.001$), red blood transfusion (OR, 10.94; 95% CI, (2.5–47.89); $p=0.001$), use of heparin (OR, 4.99; 95% CI, (1.94–12.62); $p=0.001$), ECMO Flow (OR, 3.17; 95% CI, (2.15-4.68); $p=<0.001$), respiratory frequence pre-canulation (OR, 1.14; 95% CI, (1.06–1.23; $p=<0.001$), PEEP pre-canulation (OR, 1.45; 95% CI, (1.27–1.67); $p=<0.001$), FiO2 pre-canulation (OR, 1.03; 95% CI, (1.01–1.04); $p=<0.001$), plateau pressure pre-canulation (OR, 1.10; 95% CI, (1.04–1.15); $p=<0.001$), Glomerular filtration (OR, 1.01; 95% CI, (1.01–1.02); $p=<0.001$) were significant risk factor for acute kidney injury after adjusting all variables. We evaluated model discrimination using the area under the receiver-operating characteristic (AUROC) curve which was 0.79 for base excess pre-canulation, 0.716 for BMI, 0.616 for red blood transfusion, 0.815 for ECMO flow, 0.620 for masculine gender, 0.617 for sodium pre-canulation and 0.624 for heparin infusion.
**Conclusions:** This study highlights significant differences in risk factors and the progression of AKI among patients undergoing ECMO therapy with and without COVID-19 such as male gender, higher base excess pre-canulation, higher BMI, red blood transfusion, ECMO flow, sodium pre-canulation and heparin infusion. These findings emphasize the importance of tailored management approaches for patients requiring ECMO, which could improve clinical outcomes and reduce the incidence of complications, including AKI.

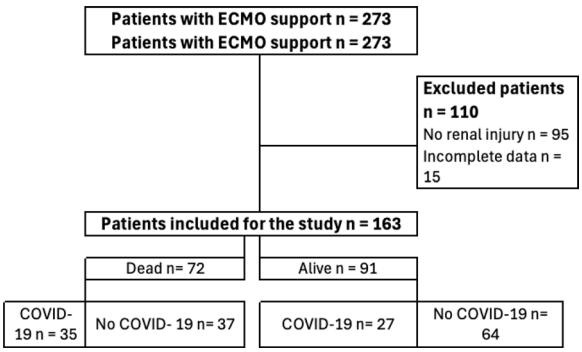


**Fig. 1 (abstract 001603)** Flowchart of subject enrolment in the study

**Table 1 (abstract 001603)** Characteristics of the patients.

| Characteristics | Population n = 163 | COVID-19 = 62 | No COVID-19 = 101 | p-value |
|---|---|---|---|---|
| Age in years, mean (SD) | 43.9 (12.5) | 42.1 (9.6) | 44.1 (14.1) | 0.279 |
| Male gender, n (%) | 115 (70.5) | 53 (85.5) | 62 (62.4) | <0,001* |
| BMI, mean (SD) | 28.8 (5.4) | 31.1 (5.1) | 27.3 (4.9) | <0,001* |
| Days in ICU - M (IQR) | 23.1 (13.4 -38.7) | 23.9 (13.6-44.6) | 22.8 (11.2-37.7) | 0.519 |
| Days on mechanical ventilation - M (IQR) | 16.1 (9.7-23.5) | 18.1 (12.5 -28.5) | 14.3 (8-21.6) | <0,001* |
| Days in Hospital - M (IQR) | 44 (29-59) | 48 (37-70) | 39 (25-56) | 0.075 |
| Days on Renal Therapy - M (IQR) | 12 (4-26) | 7 (4-18) | 16.5 (6-32) | 0.057 |
| Days on ECMO - M (IQR) | 10.6 (5.7-18.5) | 15.9 (9.7-29.5) | 7.5 (4.6-14.5) | <0,001* |
| Mortality | 72 (44.2) | 35 (56.4) | 37 (36.6) | 0.013* |
| **Comorbidities, n (%)** | | | | |
| Arterial hypertension | 36 (22.1) | 16 (25.8) | 20 (19.8) | 0.370 |
| Dyslipidaemia | 10 (6.1) | 2 (3.2) | 8 (7.9) | 0.225 |
| Type 2 diabetes | 23 (14.1) | 7 (11.3) | 16 (15.8) | 0.418 |
| Chronic pulmonary disease | 12 (7.4) | 6 (9.7) | 6 (5.9) | 0.375 |
| Smoking | 15 (9.2) | 7 (11.3) | 8 (7.9) | 0.470 |
| Hypothyroidism | 14 (8.6) | 2 (3.2) | 12 (11.8) | 0.056 |
| **Pre-canulation laboratory findings, mean (SD)** | | | | |
| Sodium (mEq/L) | 139.7 (5.8) | 141.6 (6.1) | 138.6 (5.3) | 0.002* |
| Potassium (mEq/L) | 4.6 (0.7) | 4.7 (0.6) | 4.6 (0.9) | 0.395 |
| Haemoglobin (mg/dL) | 13.8 (16.7) | 12.6 (1.8) | 14.6 (21.3) | 0.348 |
| Platelets (x10^3/µl) | 220.7 (117.7) | 245 (107.5) | 205.9 (121.8) | 0.033* |
| Neutrophil to lymphocyte ratio | 18 (20.3) | 22.8 (23.1) | 14.7 (17.5) | 0.027* |
| C-reactive protein | 175.3 (142.9) | 208.1 (131.6) | 148.5 (147.2) | 0.028* |
| Troponin I | 7502 (1592) | 143.8 (301) | 11537 (1866) | <0.001* |
| Ferritin | 4971 (10188) | 6270 (11139) | 2466 (7611) | 0.072 |
| **Admission Blood Gas Analysis, mean (SD)** | | | | |
| pH | 7.26 (0.16) | 7.30 (0.15) | 7.24 (0.17) | 0.013 |
| Partial pressure of CO2 (mmHg) | 52.9 (22.2) | 60.8 (20.2) | 48.1 (22.1) | <0.001* |
| Partial pressure of O2 (mmHg) | 72.1 (43.4) | 62.8 (14.6) | 77.8 (53.3) | 0.008* |
| HCO3 | 22.8 (6.9) | 27.7 (6.6) | 19.8 (5.1) | <0.001* |
| Base Excess | ˉ2.8 (7.9) | 1.8 (6.8) | ˉ5.7 (7.2) | <0.001* |
| Lactate | 3.1 (2.7) | 2.1 (1.8) | 3.7 (2.9) | <0.001* |
| **Support during cannulation, n (%)** | | | | |
| Noradrenaline | 144 (88.3) | 49 (79.1) | 95 (94.1) | 0.004* |
| Milrinone | 17 (10.4) | 1 (1.6) | 16 (15.8) | 0.004* |
| Levosimendan | 28(17.2) | 1 (1.6) | 27 (26.7) | <0.001* |
| Vasopressin | 88 (53.9) | 12 (19.3) | 76 (75.2) | <0.001* |
| Adrenaline | 32 (19.6) | 2 (3.2) | 30 (29.7) | <0.001* |
| Dobutamine | 39 (23.9) | 4 (6.4) | 35 (34.6) | <0.001* |
| Requirement of more than two vasopressors | 90 (55.2) | 12 (19.3) | 78 (77.2) | <0.001* |
| Requirement of more than two inotropes | 33 (20.2) | 3 (4.8) | 30 (29.7) | <0.001* |
| **Severity Score, M (IQR)** | | | | |
| SOFA Score | 8 (7-12) | 8.5 (6-11) | 8 (7-12) | 0.568 |
| APACHE II Score | 12 (8-17) | 10 (6-17) | 13 (10-17) | 0.018 |
| Oxygen Debt, DEOx mean (SD) | 117.8 (128.9) | 0.12 (22.2) | 190 (163.1) | 0.246 |
| **Transfusion Support, n (%)** | | | | |
| Red Blood Cell Transfusion | 134 (82.2) | 60 (96.8) | 27 (73.3) | <0.001* |
| Fresh frozen plasma Transfusion | 73 (44.8) | 18 (29.1) | 55 (54.5) | 0.002* |
| Platelets Transfusion | 121 (74.2) | 44 (70.9) | 77 (76.2) | 0.455 |
| Cryoprecipitate Transfusion | 46 (28.2) | 12 (19.3) | 34 (33.7) | 0.049* |
| **Type of Support, n (%)** | | | | |
| VV-ECMO | 104 (63.8) | 62 (100) | 42 (41.6) | <0.001* |
| VA-ECMO | 59 (36.2) | 1 (1.61) | 58 (57.4) | <0.001* |
| **Ventilator Settings, n (%)** | | | | |
| Pressure-Controlled Ventilation | 133 (82.6) | 46 (75.4) | 87 (87) | 0.060 |
| Respiratory Frequency | 19.3 (4.9) | 21.2 (4.2) | 18.1 (4.9) | <0.001* |
| PEEP | 10.7 (3.1) | 12.5 (2.1) | 9.6 (3.1) | <0.001* |
| FiO2 | 74.3 (27.4) | 86.1 (18.9) | 66.9 (29.2) | <0.001* |
| Plateau pressure | 24.9 (7.5) | 28.1 (5.1) | 23.1 (8.2) | <0.001* |
| Driving pressure | 14.4 (6.1) | 15.5 (5.2) | 13.7 (6.6) | 0.060 |
| **Type of complications, n (%)** | | | | |
| Mechanical complication | 7 (9.3) | 2 (8.3) | 5 (9.8) | 0.838 |
| Major bleeding | 20 (26.7) | 9 (37.5) | 11 (21.6) | 0.146 |
| Neurological | 7 (9.3) | 6 (25) | 1 (1.9) | 0.001* |
| Cardiovascular | 21 (28) | 10 (41.7) | 11 (21.6) | 0.071 |
| Renal | 17 (22.7) | 9 (37.5) | 8 (15.7) | 0.035* |
| Infection | 36 (48) | 12 (50) | 24 (47.1) | 0.812 |
| **Special Conditions** | | | | |
| Use of Heparin, n (%) | 122 (74.8) | 56 (90.3) | 66 (65.3) | <0.001* |
| Days on Heparin - M (IQR) | 6 (3-12) | 11 (5-17.5) | 4 (2-9) | <0.001* |
| ECMO Flow, mean (SD) | 4.2 (1.3) | 5.1 (1.2) | 3.7 (1.1) | <0.001* |

BMI, Body Mass Index; ICU, Intensive Care Unit; SD, standard deviation; M, median; IQR, interquartile range; ECMO, Extracorporeal Membrane Oxygenation; SOFA, Sequential Organ Failure Assessment; APACHE, Acute Physiology and Chronic Health Evaluation; *p < 0.05;

**Table 2 (abstract 001603)** Renal function characteristics in patients with ECMO support.

| Characteristics | Population n = 163 | COVID-19 = 62 | No COVID-19 = 101 | p-value |
|---|---|---|---|---|
| Creatinine prior to ECMO (mg/dl) | 1.86 (1.5) | 1.52 (1.1) | 2.07 (1.6) | 0.012 |
| Glomerular Filtration Rate prior to ECMO (mL/min) | 87.3 (64.9) | 116.4 (75.9) | 69.4 (49.8) | <0.001* |
| Creatinine on ECMO (mg/dl) | 2.13 (1.75) | 1.72 (1.23) | 2.39 (1.96) | 0.009 |
| Creatinine prior to ECMO withdrawal (mg/dl) | 1.55 (0.87) | 1.34 (0.89) | 1.68 (0.83) | 0.021 |
| Glomerular Filtration Rate prior to ECMO Withdrawal (mL/min) | 95.6 (73.5) | 132.8 (92.6) | 72.5 (45.9) | <0.001* |
| Creatinine after ECMO withdrawal (mg/dl) | 1.64 (1.03) | 1.07 (0.78) | 1.87(1.03) | <0.001* |
| Renal Replacement Therapy, n (%) | 88 (53.9) | 30 (48.4) | 58 (57.4) | 0.261 |
| **Stage of Renal Function During ECMO Support, n (%)** | | | | 0.073 |
| KDIGO I | 26 (15.9) | 15 (24.2) | 11 (11.9) | |
| KDIGO II | 29 (17.8) | 9 (14.5) | 20 (19.8) | |
| KDIGO III | 108 (66.3) | 38 (61.3) | 70 (69.3) | |
| **Severity Score During Renal Replacement Therapy, M (IQR)** | | | | |
| SOFA at the beginning of Renal Therapy | 12 (9.5-14) | 11 (10-14) | 13 (9-14) | 0.436 |
| APACHE II at the beginning of Renal Therapy | 19 (16-23) | 19.5 (16-23) | 19 (16-23) | 0.840 |
| **Fluid Balance M (IQR)** | | | | |
| 24 hours | 1703.3 (3260.1) | 1986.7 (4202.9) | 1525.8 (2504.7) | 0.436 |
| 72 hours | 2854.9 (4850.4) | 3175.2 (5169.5) | 2658.7 (4661.9) | 0.539 |
| 7 days | 2486.6 (6355.2) | 2587.5 (5948.1) | 2425.4 (6622.2) | 0.879 |

ECMO (Extracorporeal Membrane Oxygenation), KDIGO (kidney disease: Improving Global Outcomes), SOFA (Sequential Organ Failure Assessment), APACHE II (Acute Physiology and Chronic Health Evaluation II), M (IQR) (Median with Interquartile Range)

**Table 3 (abstract 001603)** Results of the risk score variables.

| Outcome | OR (CI 95%) | p-value | Adjusted OR (CI 95%) | p-value |
|---|---|---|---|---|
| Age, year | 0,89 (0,74-1,08) | 0,242 | 0.98 (0,96 - 1,01) | 0,32 |
| Gender, masculine | 2.73 (0,74-1,08) | 0,065 | 3.70 (1,64 - 8,34) | 0,002* |
| BMI | 1,31 (0,83-2,05) | 0,1 | 1,16 (1,08-1,24) | <0,001* |
| Day son mechanical ventilation | 1,05 (0,89-1,25) | 0,597 | 1,01 (0,99-1,01) | 0,497 |
| Day son ECMO | 1,05 (0,91-1,22) | 0,523 | 1,08 (1,04-1,12) | <0,001* |
| Sodium prior to ECMO | 1,39 (0,99-1,94) | 0,057 | 1,09 (1,03-1,16) | 0,003* |
| PaCO2 prior to ECMO | 1,10 (0,89-1,34) | 0,388 | 1,03 (1,01-1,04) | 0,001* |
| PaO2 prior to ECMO | 1,06 (0,97-1,14) | 0,159 | 0,97 (0,96-0,99) | 0,021* |
| HCO3 prior to ECMO | 0,65 (0,29-1,40) | 0,272 | 1,29 (1,18-1,40) | <0,001* |
| Lactate prior to ECMO | 0,62 (0,19-1,92) | 0,405 | 0,67 (0,54-0,83) | <0,001* |
| Base Excess prior to ECMO | 1,85 (0,94-3,64) | 0,076 | 1,16 (1,10-1,23) | <0,001* |
| APACHE II | 1,14 (0,87-1,50) | 0,337 | 0,94 (0,90-0,99) | 0,035* |
| Oxygen debt | 1,02 (0,85-1,22) | 0,872 | 0,94 (0,92 - 0,96) | 0,001* |
| Red blood cell transfusion | 5,16 (0,01-0,10) | 0,001 | 10,94 (2,50-47,89) | 0,001* |
| Use of Heparin | 1,52 (0,06-38,44) | 0,8 | 4,99 (1,94-12,62) | 0,001* |
| ECMO Flow | 2,45 (1,53-3,94) | <0,001* | 3,17 (2,15-4,67) | <0,001* |
| RF prior to ECMO | 1,04 (0,77-1,41) | 0,787 | 1,14 (1,06-1,23) | <0,001* |
| PEEP prior to ECMO | 0,94 (0,42-2,09) | 0,881 | 1,45 (1,27-1,67) | <0,001* |
| FiO2 prior to ECMO | 1,03 (0,94-1,12) | 0,568 | 1,03 (1,01-1,04) | <0,001* |
| Plateau pressure prior to ECMO | 1,06 (0,85-1,33) | 0,576 | 1,10 (1,04-1,15) | <0,001* |
| Creatinine prior to ECMO | 1,36 (0,38-4,87) | 0,632 | 0,75 (0,59-0,96) | 0,024* |
| Glomerular filtration rate | 1,04 (0,99-1,09) | 0,094 | 1,01 (1,01-1,02) | <0,001* |

OR Odds Ratio; CI, Confidence Interval; PaCO2, arterial partial pressure of carbon dioxide; ECMO, Extracorporeal Membrane Oxygenation; BMI, Body Mass Index; PaO2, arterial partial pressure of oxygen; RF, Respiratory Frequency; FiO2, fraction of inspired oxygen. *p<0,05

**Table 4 (abstract 001603)** Results of AKI risk score variables in SARS-CoV-2.

| Outcome | OR (CI 95%) | p-value | Adjusted OR (CI 95%) | p-value |
|---|---|---|---|---|
| Age, year | 0,89 (0,74-1,08) | 0,242 | 0.98 (0,96 - 1,01) | 0,320 |
| Gender, masculine | 2.73 (0,74-1,08) | 0,065 | 3.70 (1,64 - 8,34) | 0,002* |
| BMI | 1,31 (0,83-2,05) | 0,100 | 1,16 (1,08-1,24) | <0,001* |
| Sodium prior to ECMO | 1,39 (0,99-1,94) | 0,057* | 1,09 (1,03-1,16) | 0,003* |
| Base Excess prior to ECMO | 1,85 (0,94-3,64) | 0,076 | 1,16 (1,10-1,23) | <0,001* |
| Red Blood cell transfusion | 5,16 (0,01-0,10) | 0,001* | 10,94 (2,50-47,89) | 0,001* |
| Use of Heparin | 1,52 (0,06-38,44) | 0,800 | 4,99 (1,94-12,62) | 0,001* |
| ECMO flow | 2,45 (1,53-3,94) | <0,001* | 3,17 (2,15-4,67) | <0,001* |

OR Odds Ratio; CI, Confidence Interval; BMI Body Mass Index; ECMO, Extracorporeal Membrane Oxygenation *p<0,05

**Table 5 (abstract 001603)** Prediction of kidney injury in a patient with SARS-CoV-2 infection on ECMO.

| Factor | Cut point | Sensitivity | Specificity | LR+ | LR- | AUC (IC95%) |
|---|---|---|---|---|---|---|
| **Sex** | Masculine | 85,50% | 38,60% | 1,39 | 0,37 | 0,620 (0,54-0,69) |
| **BMI** | 31,1 | 53,20% | 78,20% | 2,44 | 0,59 | 0,716 (0,64-0,78) |
| **Sodium prior to ECMO** | 137 | 75,40% | 26,10% | 1,01 | 0,94 | 0,617 (0,54-0,69) |
| **Red Blood Cell** | Transfusion | 96,80% | 26,70% | 1,32 | 0,12 | 0,616 (0,53-0,69) |
| **Heparin infusion** | Use of heparin | 90,30% | 34,60% | 1,38 | 0,27 | 0,624 (0,54-0,70) |
| **ECMO Flow** | 4,23 | 79% | 71% | 2,72 | 0,29 | 0,815 (0,75-0,87) |
| **Base Excess** | -2,86 | 75,80% | 67,30% | 2.32 | 0,36 | 0,799 (0,73-0,86) |

LR, Likelihood Ratio; AUC, area under the curve; ECMO, Extracorporeal Membrane Oxygenation; CI, Confidence Interval

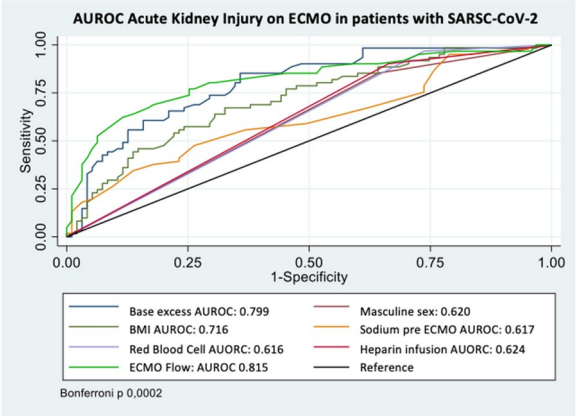


**Fig. 2 (abstract 001603)** AUROC Acute kidney injury on ECMO with SARS-CoV-2. AUROC, area under the receiver operating characteristics curve; BMI, Body Mass Index

**Reference(s)**

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**Topic:** Acute Kidney Injury and haemofiltration

## 001604

### Effectiveness of Continuous Lateral Rotational Therapy for prevention of lung complications and pressure injury: systematic review with meta-analysis

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001604

**Introduction:** Pulmonary complications (PC) and pressure injuries (PI) are frequent occurrences in critically ill patients, with supine positioning and prolonged immobilization being the main risk factors. Repositioning is a strategy to mitigate the effects of immobility on the development of pressure injuries and pulmonary complications. Automatic, constant, and programmable flow change, known as continuous lateral rotation therapy (CLRT), through special beds, in its longitudinal axis, can be an alternative for treating critical patients. Therefore, we investigated the effectiveness of new therapies, such as CLRT, that prevent these events, providing a greater understanding of the use of these technologies in clinical practice.
**Objectives:** The objective of this systematic review was to investigate the effectiveness of continuous lateral rotation therapy (CLRT), compared to manual lateralization, in preventing pressure injuries and pulmonary complications in critically ill patients.
**Methods:** Our systematic review was registered with PROSPERO (CRD42022385309), guided by PRISMA guidelines. Clinical trials evaluated were included from inception until January 15, 2023. We considered studies that used CLRT for the prevention and treatment of pulmonary complications and pressure injuries, regardless of the population (clinical and surgical). For critical evaluation, description, and synthesis of the data, we followed the JBI recommendations. We used JBI SUMARI to analyze the methodological rigor of the included studies. Homogeneous studies were grouped into statistical meta-analysis using JBI Sumari. Heterogeneity was assessed statistically using standard chi-square and I-square tests.
**Results:** From a total of 3913 relevant studies, 11 studies were included, with 887 participants meeting the inclusion criteria. No study met all validity criteria of the methodological assessment. We identified that CLRT is used for the treatment and prevention of respiratory complications, with records dating back to 1988; however, there is still a gap regarding its effect on the skin of critically ill patients. We found that CLRT has no impact on mortality (RR 0.86, 95% CI [0.64–1.15], $p = 0.31$) and mechanical ventilation (MV) time (MD − 1.24, 95% CI [− 3.17–0.70], $p = 0.21$). However, CLRT reduced the incidence of Ventilator-Associated Pneumonia (VAP) (RR 0.47, 95% CI [0.31–0.69], $p < 0.001$).
**Conclusions:** Continuous Lateral Rotation Therapy did not achieve statistical significance in association with a reduction in mechanical ventilation time and overall patient mortality, but it is effective in reducing the incidence of adverse events associated with MV, especially VAP. The effectiveness of CLRT on the skin remains difficult to assess. It is recommended to carry out an appropriately planned RCT, determining whether the apparent benefits of this therapy are worth the risks and costs.

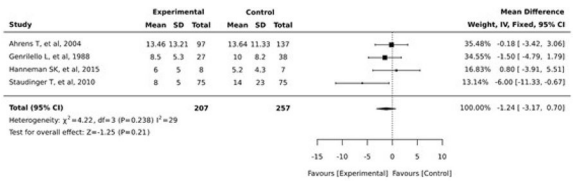


**Fig. 1a (abstract 001604)** Forest plot of the comparative meta-analysis of the effects of CLRT versus manual rotation on mechanical ventilation time

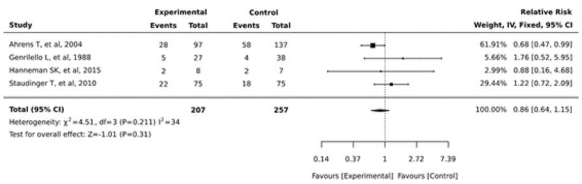


**Fig. 1b (abstract 001604)** Forest plot of the comparative meta-analysis of the effects of CLRT versus manual rotation on reducing mortality

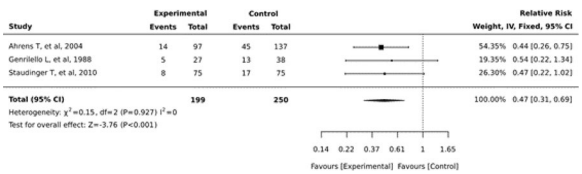


**Fig. 1c (abstract 001604)** Forest plot of the comparative meta-analysis of the effects of CLRT versus manual rotation on the incidence of Pneumonia Associated with Mechanical Ventilation

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**Topic:** Nursing care and physiotherapy

## 001605

### Impact of transcranial Doppler monitoring on the management of severe traumatic brain injury: a systematic review

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001605

**Introduction:** Monitoring intracranial pressure (ICP) is crucial in the choice of the best management for severe traumatic brain injury (TBI) since it is associated with high mortality and poor clinical outcomes when elevated. Nevertheless, the invasive aspect of this method carries complication risks such as bleeding and infection. Transcranial Doppler monitoring in the Intensive Care Unit (ICU) is a non-invasive method that can predict the increase of ICP through the detection of reduction of cerebral perfusion. Therefore, information about pathologic hemodynamic changes can be quite impactful on therapeutic considerations and the evaluation of the severity of the injury.
**Objectives:** To evaluate the impact of TCD monitoring on the management of TBI through controlled studies.
**Methods:** A systematic review was performed using the following combinations of MESH terms and Boolean operators: 'transcranial doppler ultrasonography' AND 'traumatic brain injury' AND 'management' on the bases MEDLINE via PubMed, EMBASE and SCOPUS from inception to April 2024. Only controlled studies were selected and the exclusion factors were theme fugue, repeated articles, and noncontrolled studies. The review was carried out under the methodological recommendations of the PRISMA guideline. We collected data on outcomes, the influence of TCD on early intervention, and prediction of prognosis and ICP elevation.
**Results:** Seven out of 34 articles were selected. Four of them concluded that TCD monitoring had a significant positive impact on early intervention, such as initiating ICP monitoring or operating a decompressive craniectomy, due to correct prediction of high ICP, the occurrence of post-traumatic vasospasm and hyperemia, and prevention of secondary ischemic injuries. Three of the selected studies found a correlation between TCD monitoring and favorable outcomes, improvement of long-term prognosis of patients that suffered from TBI, and prediction of TBI management outcomes. In addition, one study found that TCD can be useful in ruling out intracranial hypertension in situations where invasive methods cannot be used or are unavailable.
**Conclusions:** TCD monitoring of patients who suffered TBI in the ICU enables more secure early intervention, allows the prediction of patient prognosis, and is associated with favorable outcomes. Also, it can be useful in avoiding secondary cerebral injury through early detection of pathologic hemodynamic changes. Therefore, we found that TCD monitoring is a powerful non-invasive tool with a highly positive impact on effectively changing the usual course of severe brain damage after TBI.

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**Topic:** Neurointensive care

## 001606

### Temporal effect of ketogenic feeding on glucose control and insulin resistance in ICU patients

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001606

**Introduction:** Ketogenic enteral nutrition (KEN) with minimal carbohydrate content is known to improve the quality of [18F]-desoxyglucose positron emission tomography ( [18F]-FDG PET), as it reduces background uptake of glucose and [18F]-FDG [1]. In our institution, if a cardiac focus is part of the differential diagnosis, we strive to start KEN 48 h before the planned PET-scan. The time required to achieve lower and stable glucose levels as well as minimal insulin requirements, is not known.
**Objectives:** To study the time course of glucose control and insulin resistance in critically ill patients in whom KEN was initiated.
**Methods:** We examined glucose levels and insulin requirements from 120 h before till 48 h after the initiation of ketogenic feeding in adult patients treated in our ICU. This feeding consisted of KetoCal 4:1 enteral feeding (Nutrison) with 1 kCal/ml. The administration rate of KetoCal was adjusted to the previous caloric intake with standard enteral nutrition. Glucose levels were controlled by a nurse-centered computer program (GRIP), that was blinded for the type of feeding. Daily glucose levels and insulin requirements in IU/h were recorded. Daily glucose variability was also determined. Ketone levels were measured directly before the [18F]-FDG PET scan. Means were compared with the Student's *t*-test.
**Results:** We examined 9 sequential patients (5 males), aged $58 \pm 10$ years, who received KetoCal 4:1 at rates varying from 20 to 60 ml/h. In 8 patients it was given for FDG-PET preparation and in one patient as the treatment for super-refractory status epilepticus. During the study period, 565 glucoses were measured, resulting in 230 insulin adjustments by the GRIP system.
Glucose levels, glucose variability, insulin requirements and IR showed a marked decrease after initiation of KEN. From the period of 24h to 0h before starting KEN to 24h to 48h after starting KEN, the mean ($\pm$ SD) glucose changed from $7.6 \pm 0.7$ to $6.0 \pm 1.6$ mmol/L ($P = 0.01$) and glucose variability decreased from $1.5 \pm 0.8$ to $0.5 \pm 0.2$ mmol/L ($P = 0.004$).
Insulin requirements dropped $1.1 \pm 11$ to $0.2 \pm 0.3$ IU/h ($P = 0.02$). Two days after KEN, ketone levels were $1.7 \pm 2.2$ mmol/L.
**Conclusions:** Within two days after initiation of KEN, glucose levels, glucose variability and insulin resistance displayed a remarkable decrease. Whether these measures serve as a surrogate marker for optimal [18F]FDG-PET image quality in ICU patients, similar to ketone levels [1], needs further investigation.

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2. None.

**Topic:** Imaging in intensive care

## 001607

## Evaluating anesthesiologists' awareness about sevoflurane impact on climate change

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001607

**Introduction:** Climate change is one of the imperative problems we need to face in the current century.
Greenhouses gases (GHGs) emissions are completely destabilizing our planet's weather and climate system by increasing average temperature, causing extremes weather events, changing wildlife habitats, rising seas surface and declining air quality with a negative impact on human health.
Volatile anesthetics are recognized to contribute to climate change by altering the photophysical properties of the atmosphere 1,2,3. Sevoflurane particularly does not catalytically destroy ozone but its trace in the earth's atmosphere absorbs and reduces outgoing infrared thermal energy warming the environment. Determining the exact climate impact of worldwide anesthetic procedures using sevoflurane is complicated because of limited available data on the usage of anesthetic agents, that's why we are studying them. Although the contribution of volatile anesthetics to total GHG emissions is small (0.1%) compared with CO2 (82.2%), it is still important to consider the long-term, cumulative impact of inhaled anesthetics on climate change, finding strategies to minimize the introduction of these agents into the environment.2,3,4
**Objectives:** 1. Understanding anesthesiologists' awareness and attitude about sevoflurane impact on climate change. 2. Analyzing the average consumption of sevoflurane at « Marie Curie» Hospital in Charleroi
**Methods:** We used an anonymous survey based on an ad hoc questionnaire conducted in March and planned to last until April 2024, to investigate anesthesiologists' perception of sevoflurane gas consumption and its impact on climate change. We observed the relationship between their knowledge and a pro-environmental action at their workstation. The population of our study will be represented by 200 certified anesthesiologists and anesthesia residents, living in Belgium, Italy and France.
We performed a retrospective registry-based cohort study between January 2015 and July 2023 in Marie Curie Hospital, using anesthesia information management systems and the departmental hospital databases. The link between the handwritten data from the pharmacy represents the quantity estimated by the anesthesiologist of gas consumed during the act of anesthesia. The amount used is obtained from the information provided by the ventilator at the end of each procedure. The possible savings are based on the scientific recommendations to be applied to the settings of the anesthesia respirators. The comparison of these data constitutes the basis of the analysis.
**Results:** Preliminary findings are based on 130 anesthesiologists' replies. Our results show that 45.38% of our anesthesia providers never read about the impact of anesthesia on global warming; 53.85% have read articles about this subject but only 88.24% of them were convinced that inhaled anesthetics contribute to global warming. 87.88% are ready to receive ecological information adapted to their profession as anesthesiologist and 89.8% would like to adopt strategies to reduce the consumption of sevoflurane in their professional habits.
Other results are under analysis.
**Conclusions:** This study highlights the fact that there are still too many anesthesiologists who are unaware of anesthetic gases impact on climate, but most of them are ready to incorporate environmentally conscious anesthetics practices to reduce global pollution. It is imperative to raise awareness of volatile anesthetics consumption and promote volatile gas-sparing strategies to combat climate change.

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**Topic:** Health Services Research and Outcome

## 001611

## Early effects of EZ positive airway pressure therapy on gas

**exchange, hemodynamic, and dyspnea in spontaneously breathing critically ill subjects**

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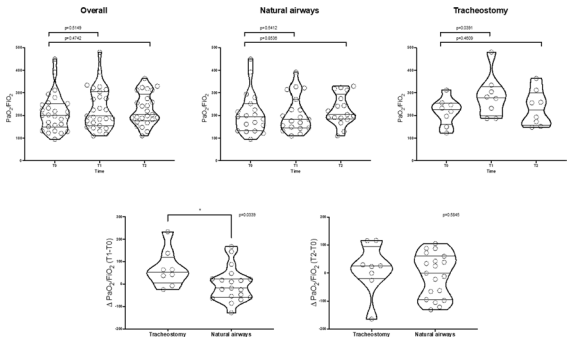
***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001611

**Introduction:** Ez Positive Airway Pressure (EzPAP), a non-invasive positive airway pressure system, prevents and treats atelectasis while promoting lung expansion [1–3].
**Objectives:** The primary aim was to assess the early effect of EzPAP on gas exchange in critically ill subjects who were spontaneously breathing after a period of invasive mechanical ventilation. Secondary aims included evaluating the early effects of EzPAP on hemodynamics and the Respiratory Distress Observation Scale (RDOS, dyspnea scale). Changes in the Radiological Atelectasis Score (RAS) before and after 1-week treatment (1–2 sessions/day) were also evaluated. Outcomes were compared between subjects utilizing EzPAP via natural airway and tracheostomy.
**Methods:** An observational pre-post study was conducted at a University hospital. Spontaneously breathing adult subjects admitted to the intensive care unit, with chest X-ray suggesting the need for lung re-expansion after a period of invasive mechanical ventilation, were inclusion criteria. Exclusion criteria were life-threatening conditions, intracranial hypertension, hemodynamic instability, and pneumothorax. Data about gas exchange, hemodynamic, and RODS were collected at T0 (before EzPAP), T1 (immediately after EzPAP), and T2 (2 h after EzPAP).
**Results:** The subjects included in the study were 27 ($n=19$ with natural airways and $n=8$ with tracheostomy) out of a total of 213 eligible patients. The median age was 65 (IQR = 58–74) years, and 66.7% were male (Table 1). In the overall population and subjects with natural airways, arterial partial pressure of oxygen to fraction of inspired oxygen (PaO2/FiO2) did not differ between T1 and T0 ($p=0.52$ and $p=0.54$) and T2 and T0 ($p=0.47$ and $p=0.85$). Considering the subjects with a tracheostomy, PaO2/FiO2 was higher at T1 (median [IQR] = 279 [199–327] mmHg) than at T0 (226 [162–254] mmHg, $p=0.039$). The same improvement was not achieved at T2 compared to T0 (Fig. 1). Arterial partial pressure of carbon dioxide (PaCO2) did not change in the overall cohort, nor between natural airways and tracheostomy. Hemodynamics did not change over time in the overall population and in natural airway vs. tracheostomy. In the overall population and in subjects with natural airways, the respiratory rate was lower at T1 vs. T0 ($p=0.010$ and $p=0.027$). Symptoms of dyspnea did not improve by the application of EzPAP therapy. RAS improved within about one week of treatment in the overall population (T1 median [IQR] 2 [1.25–3] vs. T0: median [IQR] 3 [2–3.75], $p<0.0001$).
**Conclusions:** In critically ill spontaneously breathing subjects, EzPAP did not improve gas exchange, despite ameliorated RAS after about 1-week. The use of EzPAP was safe regardless of hemodynamic stability. EzPAP therapy showed no improvement in dyspnea symptoms.




**(abstract 001611)** Effect of EzPAP on $PaO_2/FiO_2$ ratio in all patient, natural airways and tracheostomy. Dots represent individual patients. The violin plots represent delta changes (between two-time points) in PaO2/FiO2 (T0, baseline; T1 immediately after EzPAP; and T2, 2-h after EzPAP). Dots represent individual patients. Horizontal lines represent median and interquartile values

**Table 1 (abstract 001611)** General characteristics of patient

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001612

**Vasopressin in vasodilatory shock—real life experience in a tertiary center**

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001612

**Introduction:** Vasopressin (AVP) has been proposed as a secondary vasopressor therapy for patients with septic shock who are already receiving norepinephrine (NE) and with persistent arterial hypotension instead of increasing NE dosage. Nevertheless, the threshold for adding AVP remains unclear.1
Therefore, the place of AVP in the management of patients with vasodilatory shock is still debated with significant heterogeneity between Intensive Care Units (ICUs), as the optimal timing, dosage, duration, and modalities of vasopressin weaning remain subjects of clinical debate. 2
**Objectives:** The aim of this study is to get an up-to-date picture of the AVP use in patients with vasodilatory shock in a tertiary center.

**Methods:** Single tertiary center, retrospective cohort study of adult patients receiving AVP between April 1, 2020, and December 31, 2022. The primary outcome is in-hospital mortality.
**Results:** Seventy-one patients (mean age 60 ± 15 years, male 63.4%) received AVP.
The mean Acute Physiology and Chronic Health Evaluation (APACHE) II score was 29.1 ± 7.9 and the mean Sequential Organ Failure Assessment (SOFA) score was 11.9 ± 3.3.
All patients underwent invasive mechanical ventilation, with 57.7% requiring renal-replacement therapy and 8.5% being supported by extracorporeal membrane oxygenation (ECMO).
NE was administered to all patients, with a median dose of 1.3 ± 0.5 µg/kg/min. The mean time between initiation of NE and AVP administration was 10.9 ± 8.2 h. The maximum dose of AVP was 0.04 IU/min.
AVP effectively increased mean arterial pressure (MAP) and reduced NE requirements across the patient cohort, with 57.8% of patients demonstrating a pressure response. This response correlated with lower catecholamine doses, reduced mortality rates and shorter lengths of hospital stay.
Ischemic complications occurred in 7 patients, including digital ischemia (4.2%), acute mesenteric ischemia (2.8%), stroke (1.4%) and acute myocardial ischemia (1.4%). The incidence of ischemic complications was associated with higher NE doses (1.6 µg/kg/min) and prolonged exposure to elevated AVP doses (0.03–0.04 IU/min).
In-hospital mortality rate was 50.7% ($n = 36$), primarily due to multi-organ failure. Deceased patients had a higher median age (64 ± 11 y), higher NE doses (1.5 ± 0.5 µg/kg/min, $p$-value 0.5), delayed AVP initiation (12.4 ± 8.4 h, $p$-value 0.07) and a lesser decrease in MAP (17% vs 41%).
**Conclusions:** A favorable hemodynamic response to AVP therapy was associated with improved mortality outcomes, suggesting that hemodynamic response may be an appropriate marker of the efficacy of AVP. Consistent with existing literature, patients with lower baseline NE doses and early initiation of AVP appear to benefit more from AVP.
Furthermore, AVP administration was associated with a low incidence of ischemic events, supporting its safety profile in this patient population.

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**Topic:** Cardiovascular issues in ICU

## 001614

### Mechanical Insufflation:Exsufflation is effective and safe in patients undergoing active ICP management in a Neurosciences Critical Care Unit

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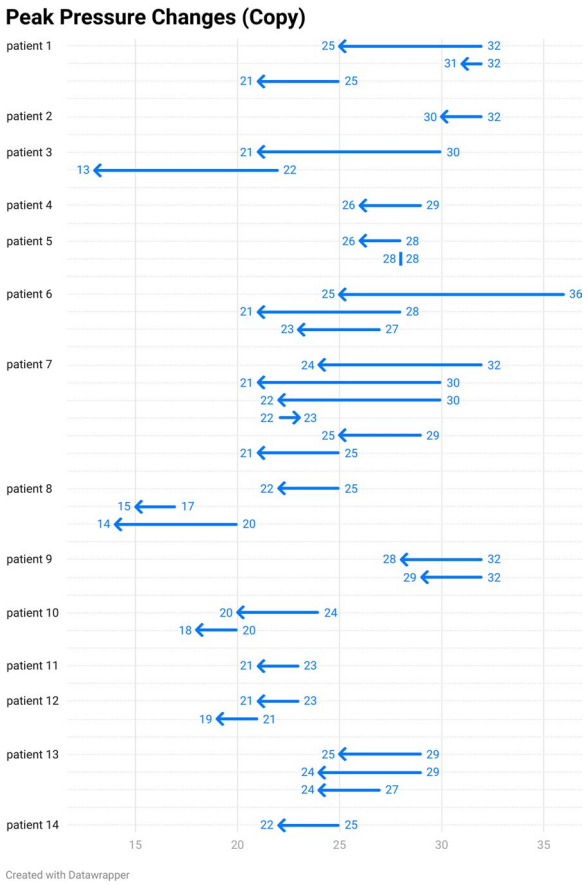
***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001614

**Introduction:** Acute brain injury (ABI) is associated with impaired sputum clearance, aspiration pneumonia and ventilator-associated pneumonia. Commonly, these patients require careful management of PaCO2 to prevent cerebral ischaemia and control intracranial pressure (ICP), alongside adequate oxygenation and are often sedated and given neuromuscular blockade to achieve control. Peak cough flow of above 160 l/min is required for an effective cough and less than 270 l/min is associated with increased secretion retention. Bronchoscopy is widely used for secretion clearance but can induce a significant rise in ICP, even with adequate sedation. The other limitation is the size of the bronchoscope used as this will determine the subsegmental bronchial level that can be reached. Mechanical insufflation:exsufflation (MI:E) is a device used when a cough is absent/ineffective. Whilst commonplace in some pathologies e.g. high spinal cord injury it is much less common in patients who are undergoing active ICP management.
**Objectives:** To determine whether MI:E is feasible and safe to use for sputum clearance in ventilated ABI patients on ICP protocol.
To determine whether MI:E will lead to reduction in pressure required to generate required tidal volume.
To determine whether ETCO2, cerebral perfusion pressure (CPP) and ICP can be maintained at safe values during MI:E treatment.
To determine frequency and type of adverse effects.
**Methods:** Ventilator data was used to determine starting insufflation pressures, titrating up as required. Oxygen was supplemented through the circuit. Variable ratio MI:E was used in a manual mode, alongside positioning, to clear sputum load with endotracheal tube suction. Changes to peak pressures (Ppk) that were sustained for longer than one hour were recorded. Changes to FiO2 that were sustained were also recorded. ETCO2, ICP and CPP were continuously monitored. Adverse events were recorded and intervention provided.
**Results:** Fourteen patients underwent one or more episodes of MI:E. 30 out of 32 episodes of MI:E resulted in reduced pressure to generate prescribed tidal volume, indicating improved pulmonary compliance (Fig. 1). The largest drop in plateau pressure (Pplat) was from 30 to 23.
Two patients required sedation bolus and one required titration of noradrenaline. One patient obstructed their proximal bronchi during treatment, requiring manual ventilation and saline instillation to clear. ICP and CPP were stable in all patients. ETCO2 was well-controlled during MI:E, in keeping with ESICM consensus. A further 8 patients on pressure support ventilation demonstrated a decreasing trend in FiO2 requirements following treatment with MI:E.
**Conclusions:** MI:E can be used safely and to good effect in acute brain-injured patients undergoing active ICP management, at all stages of ICP Prorocol (1–4).
We found a near-universal improvement in lung compliance following MI:E therapy with no adverse effects on ETCO2 clearance, ICP, CPP and minimal adverse cardiovascular effects.
MI:E can be used to good effect in brain-injured patients on ICP protocol with ICP remaining stable, CPP targets achieved and with minimal cardiovascular instability.
Although not tested in a head-to-head manner, our impression was that MI:E was more beneficial for sputum clearance than bronchoscopy in a small number of patients.
In this small study, this approach appears safe and effective, further studies are required to definitively establish safety and superiority to other techniques such as bronchoscopy.




**(abstract 001614)** Peak pressure changes pre and post-MI:E

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**Topic:** Neurointensive care

## 001616

### Barriers and facilitators for change fatigue: an integrative review on strategies to reduce change fatigue in healthcare

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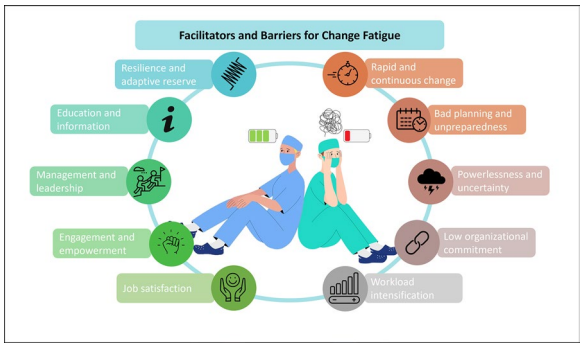
***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001616

**Introduction:** Healthcare is characterized by constant change and innovation to keep pace with technological advancements, regulations and scientific insights, aiming to elevate patient care standards. This makes continuous change inevitable. However, frequent and continuous exposure to poorly managed changes can lead to change fatigue among healthcare workers. Change fatigue is defined as feelings of stress, exhaustion and apathy caused by rapid and continuous change. Consequences of change fatigue are disengagement, increased rates of absenteeism, resistance, burnout and change failure. To pursue change success, improve patient care and safeguard employees wellbeing, it is crucial to know the factors contributing to the development of change fatigue and ways to mitigate change fatigue.
**Objectives:** To integrate empirical and theoretical literature on factors facilitating change fatigue and barriers to mitigate change fatigue in healthcare professionals.
**Methods:** An integrative review following the six-step Whittmore and Knafl methodology was conducted. A search was conducted in the PubMed, Embase, Cochrane and CINAHL databases. Quality was assessed using the Mixed Methods Appraisal Tool (MMAT) quality assessment tool.
**Results:** Twenty-six articles were included in this review, including 22 empirical studies and 4 theoretical articles. From these articles, groups were identified on 1) facilitating factors for change fatigue and 2) factors that act as barriers and mitigate change fatigue.
**Conclusions:** Healthcare workers are constantly subjected to change, and therefore are at risk of developing change fatigue which has major consequences. The outcomes of this review provide an overview of organizational and individual factors acting as facilitators and barriers to the development of change fatigue, presented in Fig. 1. Organizational factors include frequent and continuous change, higher workload, unpreparedness, low organizational commitment and weak planning. Individual factors include high (psychological) demand, negative feelings of powerlessness and uncertainty. Factors that act as barriers and help to mitigate change fatigue on the organizational level are adaptive reserve, engagement and empowerment of staff, providence of education and information, reduction of workload and adequate management and leadership skills regarding change communication and planning. On the individual level, resilience, defined as the ability to successfully adapt to stressors, maintaining psychological well-being in the face of adversity, acts as the most important barrier to change fatigue, alongside job satisfaction and commitment to change. Factors that enhance resilience include mindfulness, qualification, education and job satisfaction. These findings should be considered to improve future changes, mitigate change fatigue and enhance change outcomes.




**(abstract 001616)** Overview of facilitators and barriers for change fatigue

**Topic:** Health Services Research and Outcome

## 001617

### Platelet transfusion induces transfusion-associated circulatory overload in rats with myocardial infarction

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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001617

**Introduction:** Transfusion-associated circulatory overload (TACO) is a major transfusion complication, accounting for 23% of all transfusion-related fatalities. Understanding of potential risk factors remains limited. Previous pre-clinical studies explored the impact of plasma and red blood cell transfusion in TACO. However, platelet transfusions, among all blood products, result in the highest overall number of adverse reactions per unit transfused and its effects on TACO remain unexplored.
**Objectives:** Our aim is to determine if platelet transfusion induces circulatory overload more than crystalloids and evaluate if it leads to a more severe phenotype than plasma transfusion in a rat heart failure model, with the overarching goal of shedding light on the pathophysiology of TACO.
**Methods:** We utilized a validated TACO model in male anaemic Wistar rats with acute myocardial infarction. Animals were randomized into three groups: platelets ($n=11$), plasma ($n=10$), or Ringer's lactate ($n=11$). The primary outcome was the difference between pre- and post-transfusion left ventricular end-diastolic pressure (ΔLVEDP) measured with a left ventricular catheter. Secondary outcomes included pulmonary wet/dry weight ratio, circulating biomarkers, and arterial blood gas measurements. Data are expressed as mean and standard deviation.
**Results:** Pre-transfusion characteristics, including cardiac infarct size, LVEDP and P/F ratio were comparable between groups. The ΔLVEDP following platelet transfusion (10.4 mmHg ± 4.6) was significantly larger than the ΔLVEDP following Ringer's lactate infusion (0.9 mmHg ± 1.4), $p<0.001$. ΔLVEDP following plasma transfusion (13.0 mmHg ± 7.7) did not significantly differ from ΔLVEDP following platelet transfusion ($p>0.5$). Pulmonary wet/dry weight ratio did not differ among groups ($p>0.5$), however, when compared to control animals all groups had a significantly larger wet/dry weight ratio ($p<0.05$). Biomarker of heart failure (NTpro-BNP) did not differ between groups at termination ($p>0.1$), there was a significant increase in NTpro-BNP from baseline (50 pg/ml ± 24) to termination (177 pg/ml ± 86) across all groups ($p<0.001$). At termination, the P/F-ratio was significantly lower after platelet transfusion (599 ± 77) compared to Ringer's Lactate (721 ± 128; $p<0.05$), whereas no significant difference was observed after plasma transfusion (675 ± 83; $p>0.1$).
**Conclusions:** Platelet transfusion induces circulatory overload, as evidenced by an increase in LVEDP, comparable to that induced by plasma transfusion in rats with myocardial infarction when compared to Ringer's lactate. However, lower P/F-ratio's suggest that platelet transfusion may lead to greater pulmonary injury. Further investigation is warranted to elucidate whether similar underlying pathophysiological mechanisms are involved.

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6. Prof. Dr. A.P.J. Vlaar is supported by a personal grant of NWO (Dutch: Nederlandse Organisatie voor Wetenschappelijk Onderzoek), VIDI grant number: 09150172010047 and Landsteiner Foundation for Blood Research (LSBR) fellowship grant, grant number: 1931F.

**Topic:** Transfusion and haemostasis disorders

## 001618

### Microcirculatory response to fluid responsiveness tests

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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001618

**Introduction:** Tissue red blood cell perfusion (tRBCp), which integrates capillary density and blood flow, has been proposed as a novel target for fluid resuscitation. Despite systemic hemodynamic responses or lack thereof to fluid responsiveness tests, microcirculation may exhibit a different response, highlighting the dissociation between macrocirculation and microcirculation. This study examines the tRBCp responses in critically ill patients during fluid responsiveness tests.
**Methods:** CI was measured using pulse contour analysis (PiCCO2 and PulsioFlex) during passive leg raising (PLR), PEEP test (decrease in positive end-expiratory pressure by 5 cmH2O in mechanically ventilated patients), and fluid challenge (500 mL normal saline I.V. in 15') in critically ill patients with acute circulatory failure. Preload responsiveness was defined as an increase in CI ≥ 10% during the PLR test, ≥ 9% during the PEEP test and ≥ 15% during volume expansion.

Microcirculation was assessed with Cytocam at baseline and during fluid responsiveness tests. The three best quality videos according to the Massey Score were selected for each time-point and analyzed using MicroTool automatic software.
**Results:** Thirty-three measurements were taken including 21 in septic shock patients, 6 in cardiogenic shock and 5 in hypovolemic shock (age: 77 [44–78], SOFA score: 9 [7–11], SAPS II:47 [39–58], lactate: 1.8 [1.2–2.5] mmol/l). One patient was excluded because missing microcirculation measurement during fluid responsiveness measurement.
tRBCp changes after test correlated negatively with the baseline tRBCp (ΔtRBCp: $R = -0.53$, $p < 0.002$, Fig. 1). Patients with higher initial tRBCp were more likely to experience a deterioration of microcirculation after fluid responsiveness test. On the contrary, an impaired microcirculation at the baseline were more likely to improve after the test. Notably, responders to fluid responsiveness tests showed a significant lower pre-test red blood cell velocity (RBCv) in comparison to non-responders (mean: 354.2 µm/s [SD: 32.8] vs 387.2 µm/s [SD: 30.8], Fig. 2). The RBCv were not different among responders and not-responders after the test (376.3 µm/s [45.1] vs 390.0 µm/s (56.4), Fig. 2).
**Conclusions:** This study confirms the dissociation between macro- and microcirculatory responses during fluid responsiveness tests. It reveals that patients with higher initial tRBCp typically experience worsened microcirculation post-test, whereas those with impaired baseline microcirculation often improve. Notably, fluid responsiveness appears more related to changes in blood flow rather than capillary recruitment. These findings suggest that baseline microcirculation should be considered in fluid resuscitation strategies, highlighting tRBCp's potential as a critical marker for tailored fluid therapy.

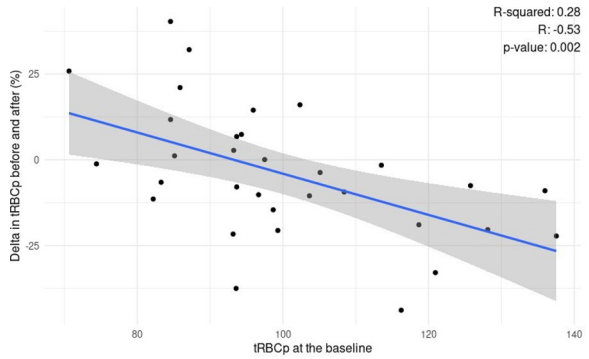


**Fig. 1 (abstract 001618)** Changes in tissue Red Blood Cell perfusion (tRBCp) after fluid responsiveness test in correlation with the pre-test baseline tRBCp

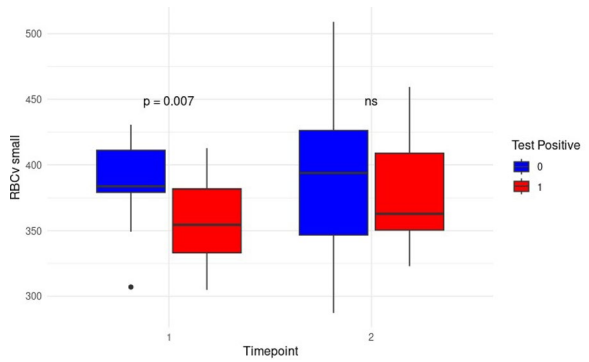


**Fig. 2 (abstract 001618)** Comparison of the capillary Red Blood Cell velocity (RBCv) among responders and non-responders before and after the fluid responsiveness test

**Topic:** Cardiovascular issues in ICU

## 001619

### What happens after ECMO?—follow-up of patients needing extracorporeal membrane oxygenation

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001619

**Introduction:** Critical illness has an impact on long-term health status and quality of life. Adults who recover from ICU can develop muscle weakness, cognitive impairment, difficulties in managing activities of daily living and returning to work, and psychological problems such as depression/anxiety.
ECMO is an increasingly common supportive therapy. Sedation and immobility are necessary in most patients, resulting in high rates of delirium and physical impairment. Therefore, patients requiring ECMO are at high risk of post intensive care syndrome (PICS).
**Objectives:** Analyze survivor outcomes, patient-reported outcome measures and identify PICS at follow-up evaluation.
**Methods:** Evaluation of patients that underwent ECMO after ICU discharge since July 2021. Evaluation occurred 6 months–1 year post discharge. Surveys were applied to assess patients' current health status, identify PICS related symptoms such as pain, anxiety/depression, mobility, and difficulties managing personal care and daily activities.
**Results:** From July 2020 to June 2023, 69 patients underwent ECMO. ICU mortality was 39.1%. Of the 42 surviving patients, 2 passed away at home before the follow-up. In 6 patients, follow-up was lost. 3 patients did not attend the follow-up appointment. In 2 patients follow-up process was not initiated at the time data was collected.
29 patients were evaluated at the outpatient follow-up appointment. 27 (93.1%) underwent ECMO due to ventilatory failure (26 due to ARDS; 1 due to massive hemoptysis), and 2 (6.9%) due to circulatory failure. Delirium was reported in 18 of the patients (62.1%).
Regarding previous health condition, 20.7% considered themselves completely healthy, while 79.3% reported non-disabling chronic conditions.
At follow-up, 2 patients (6.9%) reported persistence of extreme pain, while 9 (31.0%) reported moderate pain.
10 Patients (34.5%) reported anxiety/depression symptoms after ICU discharge—9 with moderate symptoms, while 1 reported extreme anxiety/depression, severely impacting daily life.
Most patients could manage their personal care (82.8%), and 58.62% of patients returned to their daily life activities. Only 1 patient was uncapable of managing personal care, and 2 were unable to return to their activities.
Concerning self-reported current state of health, patients ranked themselves on a scale from 0 to 100, based on previous health condition. 16 ranked themselves 81 or higher; 7 from 61 to 80; and 4 from 41 to 60.
More than 90% of patients maintain hospital follow-up, and more than 2/3 are still in active rehabilitation.
**Conclusions:** Functional outcome is mostly good in surviving patients previously submitted to ECMO, with the majority returning to their daily activities in less than a year.
PICS is a complex condition that overlaps with many other disorders, making its prevention, identification, and treatment during and after ICU stay paramount.
More in-depth work is needed to truly evaluate the impact of ECMO on long-term patient quality of life.

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**Topic:** Health Services Research and Outcome

### 001620

### Effect of fluid responsiveness tests and volume expansion on microcirculation

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**Introduction:** Patients admitted to intensive care units who are fluid responders require fluid administration to increase cardiac index (CI) and then tissue perfusion. Currently, several tests exist to predict whether a patient can increase CI following fluid administration, but the behavior of the microcirculation in these circumstances and after volume expansion remains unclear. The aim of this study is to analyze changes in the microcirculation during fluid responsiveness tests and after volume expansion.
**Methods:** CI was measured using pulse contour analysis (PiCCO2 and PulsioFlex) during passive leg raising (PLR), PEEP test, and fluid challenge (500 mL normal saline in 15') in critically ill patients with acute circulatory failure. Preload responsiveness was defined as an increase in CI $\geq$ 10% during the PLR test, $\geq$ 9% during the PEEP test and $\geq$ 15% during volume expansion.
Microcirculation was assessed with Cytocam at baseline, during fluid responsiveness tests, and after volume expansion to assess the proportion of perfused vessel (PPV), total vessel density (TVD) and functional capillary density (FCD). The three best-quality videos according to the Massey Score were selected for each time point and analyzed using MicroTool automatic software.
**Results:** Thirty-eight measurements were taken including 21 in septic shock patients, 6 in cardiogenic shock and 5 in hypovolemic shock (age: 77 [44–78], SOFA score: 9 [7–11], SAPS II:47 [39–58], lactate: 1.75 [1.2–2.5] mmol/l). Twenty-two measurements were made in patients treated with a median dose of norepinephrine of 0.320 [0.12–0.74] mcg/kg/min. Twenty-five PLR tests, 6 PEEP tests and 7 fluid challenges were performed. A total of 196 microcirculation videos were analyzed. PPV at baseline was 0.961 [0.933–0.977], TVD 26.095 [22.882–28.065] mm/mm$^2$ and FCD 24.588 [22.489–26.448] mm/mm$^2$. During the interventions, CI, mean arterial pressure (MAP) and MAP-CVP gradient increased, respectively, by 11.1 ($\pm$9.7)%, 6.5 ($\pm$8.2)%, and 5.7 ($\pm$8.5)% while the proportion of perfused vessels (PPV) decreased by 0.2 ($\pm$4.3)%. In preload non responder patients ($n=22$), PPV decrease by 1.5 ($\pm$4.8)% ($p=0.291$) and it increased by 1.6 ($\pm$2.8)% ($p=0.035$) in preload responders ($n=16$). This was the case in septic patients as in non-septic patients.
**Conclusions:** In critically ill patients with circulatory failure with a PPV at baseline $\geq$ 0.90, increasing cardiac output by increasing cardiac preload did not change PPV to a clinically significant extent, neither in preload responders nor in preload non-responders. The study is still ongoing.

**Topic:** Cardiovascular issues in ICU

### 001621

### Commonly prescribed steroids for severe community-acquired pneumonia have differing immunosuppressive effects on monocytes and lymphocytes

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001621

**Introduction:** For patients with severe pneumonia, there are a few treatments available beyond antimicrobials to treat the infection and supportive care (oxygen, intubation etc.).
Steroids have been shown to have benefits in pneumonia, potentially by reducing inflammatory lung injury, however, they have numerous problematic side-effects including hyperglycaemia and immunosuppression leading to secondary infection [1–2].
'Steroids' encompass several classes and types of drugs with different effects. It is unclear which drug we should use, how much, for how long, and when it should be started. If we could demonstrate that certain steroids have a better immunosuppressive side-effect profile, that would help focus ongoing clinical research efforts.
**Objectives:** Identify whether there are differences in the immunosuppressive effects between corticosteroids used for management of pneumonia.
**Methods:** Healthy volunteer PBMCs were co-incubated for 24 h (monocytes, with heat-killed S *aureus*) or 72 h (lymphocytes, CD3/CD28 beads) with two concentrations of dexamethasone, hydrocortisone and methyl-prednisolone. Low and high doses were based on pharmacokinetic studies carried out in ICU patients [3].
Cells were analysed using flow cytometry to assess functions including:
Monocytes—Antigen presentation (HLA-DR, CD80, CD86), chemokine receptors (CCR2 and CXCR4), cytokine release (TNF-α, IL-1β, IL-6, IL-10), T-cell suppression (PD-L1), and glucocorticoid receptor expression.
Lymphocytes—Activation (CD28, CTLA-4), proliferation (IL-7R, IL-2R, % divided), cytokine release (IL-10, IFN-γ), cell death (viability, PD-1), and glucocorticoid receptor (GCR) expression.
Data expressed as a heat map of percentage change and analysed using Friedmans test, $p$-values < 0.05 denoted with a *.

**Results:** Dexamethasone altered monocyte antigen presentation (CD80 and CD86), chemokine receptor expression (CCR2) and cytokine release (IL-6). In lymphocytes dexamethasone reduced CTLA-4 expression, IL-7R expression, IFN-γ release and decreased cell viability.
Hydrocortisone caused upregulation of monocyte HLA-DR, altered chemokine receptor expression (CXCR4), and cytokine release (IL-6). It had no effect on lymphocyte function.
Methyl-prednisolone cased upregulation of monocyte HLA-DR but downregulation of co-stimulation (CD80 and CD86), altered chemokine receptor expression (CXCR4), and cytokine release (IL-1β and IL-6). In lymphocytes, it caused a decrease in viability.
All steroids suppressed GCR expression in monocytes, but only dexamethasone affected lymphocytes.
**Conclusions:** In volunteers, the immunomodulatory effect of steroids on monocyte and lymphocyte function is dependent on the type of steroid.
Dexamethasone seems to have multiple immunosuppressive effects above that of the other steroids.
Further work needs to explore whether this effect is seen in patients with pneumonia.

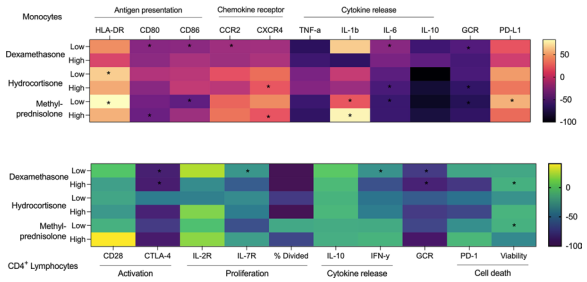


**Fig. (abstract 001621)** Percentage change of steroid compared to stimulated cells (monocytes—HKB, lymphocytes—beads). Significant values denoted by *

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001622

### Septic AKI: preliminary study on the correlation between biomarkers and ultrasonographic parameters in abdominal sepsis

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001622

**Introduction:** Sepsis-associated acute kidney injury (SA-AKI) is a complication that often can occur in critically ill patients causing high morbidity and mortality. Early diagnosis plays a key role in the prognosis of SA-AKI. Several studies have been conducted to assess whether there could be variables with predictive value toward SA-AKI. We carried out a single-center pilot study to determine whether clinical, laboratory and ultrasound parameters indicative of renal perfusion and venous congestion, could have predictive value and prognosis toward SA-AKI.
**Objectives:** The primary endpoint of the study is to correlate biological markers and ultrasonographic parameters with the development of AKI in patients with sepsis or septic shock, that may be useful in clinical practice to implement appropriate therapeutic measures. The secondary endpoint is to establish how the variation of these variables can be correlated with prognosis.
**Methods:** we prospectively enrolled critically ill patients with abdominal sepsis according to Sepsis-3 criteria. SA-AKI was defined combining Sepsis-3 and Kidney Disease Improving Global Outcomes (KDIGO) AKI criteria. We compared vital signs, sequential organ failure assessment (SOFA) score, Charlson Comorbidity Index, Simplified Acute Physiology Score (SAPS), procalcitonin (PCT), interleukin IL6 and IL10, serum Cystatin C levels, urinary Cystatin C levels, endotoxin activity between the sepsis-associated acute kidney injury (SA-AKI) group and sepsis without AKI group. Then, we evaluated intrarenal venous flow (IRVF), hepatic, portal and splenic vein patterns using Doppler ultrasonography, and venous excess ultrasound (VExUS) grading system prototype C. We measured inferior vena cava (IVC) diameter, renal doppler resistive index (RDRI), renal, splenic and hepatic venous impedance index (VII), portal vein pulsatility index. All these variables are collected at admission.
**Results:** 11 patients with abdominal septic shock were enrolled. Six patients developed SA-AKI within the first 72 h after admission to ICU. The median serum Cystatin C levels, SAPS III score, SOFA score were significantly ($p < 0.1$) higher in the SA-AKI group than in the sepsis without SA-AKI group on ICU day 1. The median RDRI was higher ($p$ 0.1126) in the SA-AKI group than in the sepsis without SA-AKI group on day 1. Multivariate logistic regression showed that the association of serum cystatin C, urinary cystatin C, IL6, and endotoxin activity on day 1 correlates with the presence of SA-AKI with AUC 0.9200 ($p < 0.05$). Also the combination of serum cystatin C, urinary cystatin C, IL10 on day 1 is associated with the development of SA-AKI with AUC 0.9200 ($p < 0.05$). Then, the association of serum cystatin C, renal VII, VExUS-C, RDRI is predictive of SA-AKI with AUC 0,9000 ($p < 0.05$). The venous congestion, detected by measuring renal, splenic and hepatic venous impedance index, IVC diameter and portal vein pulsatility index, correlates with the development of SA-AKI with AUC 0.9200 ($p < 0.05$). In addition, the results show that the association of SOFA score, Charlson Comorbidity Index and SAPS correlates with the presence of SA-AKI with AUC 0,8667 ($p < 0.05$).
**Conclusions:** In critically ill patients, the combination of biomarkers, such as serum and urinary cystatin C, interleukins and endotoxin activity, correlates with statistical significance with the development of SA-AKI. In addition, evaluation of ultrasonographic parameters may be useful to determining venous congestion and renal hypoperfusion, especially in association with laboratory biomarkers.

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**Topic:** Sepsis

## 001623

## Early physiologic changes after awake prone positioning predict clinical outcomes in patients with acute hypoxemic respiratory failure

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**Introduction:** It is poorly understood which physiologic parameters to monitor after a session of awake prone positioning in patients with acute hypoxemic respiratory failure. Identifying which early changes after prone positioning can help identify those patients with a lower risk of endotracheal intubation might help determine the appropriate monitoring tools to guide clinical decision-making, with the final aim of providing individualized treatments.
**Objectives:** We sought to assess which early physiologic changes after awake-prone positioning are associated with the receipt of invasive mechanical ventilation or death among patients with acute hypoxemic respiratory failure receiving high-flow nasal oxygen (HFNO).
**Methods:** We conducted a prospective cohort study of adult patients with COVID-19 related acute respiratory failure who received awake prone positioning. We assessed the association between relative changes in physiological variables (oxygenation, respiratory rate, pCO2 and respiratory oxygenation ratio [ROX] index) within the first 6 h of awake prone positioning and the risk of failure, defined as the composite of endotracheal intubation and/or death within 7 days. The relative change was computed as follows: value at time 1 (prone)—value at time 0 (supine) / value at time 0. A relative change in each physiologic parameter was calculated for each study patient and expressed as a proportion. For instance, a relative change in PaO2:FiO2 ratio of 25% would indicate an improvement in oxygenation of that magnitude. We used bivariate analysis to compare the baseline characteristics of patients with awake prone positioning failure and those with awake prone positioning success and fitted a multivariable logistic regression model to evaluate the association between patients' baseline characteristics (age, sex, disease severity [SOFA and APACHE scores] and baseline ROX index) and relative changes in the ROX index with the primary outcome of awake prone positioning failure.
**Results:** Between November 2020 and February 2022, 244 (70 female [29%], mean age 60 [SD 13] years old) patients were included. Seventy-one (29%) patients experienced awake prone positioning failure. Table 1 describes clinical and physiological features at baseline and relative changes within 6 h of prone positioning. Patients with awake prone positioning failure had lower mean [SD] ROX index at baseline (5.0 [1.4] versus 6.6 [2.2], $P < 0.0001$) and within 6 h of prone positioning (5.6 [1.7] versus 8.7 [2.8], $p < 0.0001$). After adjusting for baseline characteristics and severity scores, we observed that a relative increase of the ROX index compared to baseline (OR 0.37; 95% CI 0.25–0.54 every 25% increase) was associated with lower odds of failure (Fig. 1).
**Conclusions:** A relative increase in the ROX index within six hours of awake prone positioning is associated with a lower incidence of failure of awake prone positioning in patients with COVID-19 related acute hypoxemic respiratory failure. This may help select patients with most likelihood of benefiting from awake prone positioning.

**Table 1 (abstract 001623)** Clinical and physiological features at baseline and relative changes within 6 hours of prone positioning.

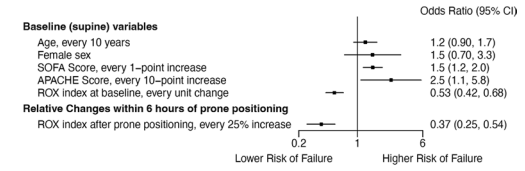


**Fig. 1 (abstract 001623)** Association between baseline features and relative changes within 6 hours of prone positioning with awake prone positioning failure

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001625

### Retrospective study comparing a number of presentations to the Emergency Department in the year preceding admission to ICU and mortality at one year post-ICU

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**Introduction:** Patients are frequently referred to and admitted to the ICU during their last year of life. Identifying patients with a terminal trajectory is an important but challenging aspect of ICU decision-making. The number of emergency presentations in the past year is a simple, accessible, and objective metric. Multiple presentations are often viewed as a poor prognostic indicator. However, there is little published evidence to support this.
**Objectives:** This study looks to see if there is a correlation between the number of emergency attendances in the year prior to an ICU referral and mortality outcomes within 12 months of the referral date.
**Methods:** Retrospective notes were reviewed of those admitted to the ICU in a district general hospital over a three-month period (1st April 2022 to 30th June 2022). All ED presentations or non-elective admissions in the year before referral were tallied. Mortality outcomes were assessed based on survival status at 12 months post-referral.
**Results:** Records of 107 ICU-admitted patients during the study period were reviewed, with 40 patients deceased within 12 months (37.38% overall mortality). Mortality rates increased with higher emergency attendances, ranging from 29% for patients with no previous emergency or non-elective admissions to 67% for those with six attendances. However, mortality rates dipped for patients with four presentations (25%) and those with more than seven presentations (30%).
A 1-tailed Chi-square test revealed statistically significant differences in the risk of death between Group 1 (no/1 ED attendances) and Group 2 (2–6 attendances) ($p = 0.056$), as well as between Group 1 and the combined Group 2 and 3 ($p = 0.10$). However, no significant difference was observed between Group 1 and Group 3 ($p = 0.44$).
Odds ratios (OR) to evaluate the risk of death between Group 1 and Group 2, and between Group 1 and the combined Group 2 and 3, were 1.98 (95% CI: 0.85–4.64, $p = 0.11$) and 1.68 (95% CI: 0.76–3.71, $p = 0.20$), respectively.

| No. of ED attendances | Mortality (% of death over total) | Alive at 12 months | Dead at 12 months | Total |
|---|---|---|---|---|
| 0 | 29 | 15 | 6 | 21 |
| 1 | 34 | 27 | 14 | 41 |
| 2 | 50 | 6 | 6 | *12* |
| 3 | 60 | 4 | 6 | 10 |
| 4 | 25 | 6 | 2 | 8 |
| 5 | 50 | 1 | 1 | 2 |
| 6 | 67 | 1 | 2 | 3 |
| >7 | 30 | 7 | 3 | 10 |
| Total | | 67 | 40 | 107 |

**Conclusions:** The study suggests there may be an association between multiple emergency presentations (2 to 6 attendances) and increased risk of death compared to those with fewer presentations (< 2 times). However, further investigation with a larger sample size is needed for more accurate results. Interestingly, patients with more than six emergency presentations exhibited lower mortality rates, warranting further exploration into potential contributing factors such as resilience, demographic profile, or underlying mental health conditions among others.

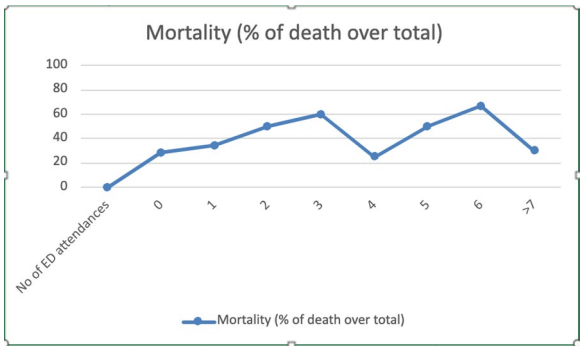


**Fig. 1 (abstract 001625)** .

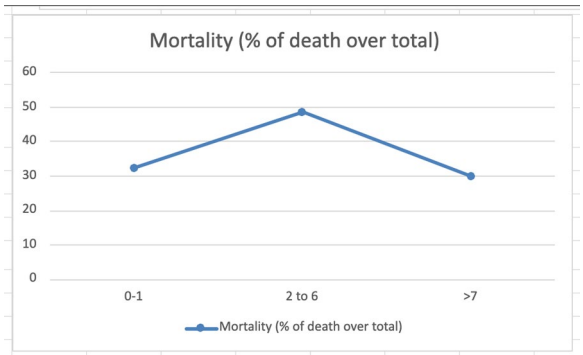


**Fig. 2 (abstract 001625)** .

**Topic:** Health Services Research and Outcome

## 001627

### Proposing a scoring system for ARDS physiological subphenotyping: a supervised machine learning approach

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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001627

**Introduction:** Acute respiratory distress syndrome (ARDS) represents a significant burden on critical care, with a mortality rate of 45% and

accounting for 10.4% of global ICU admissions (1). Its clinical, radiological, pathological, and biological heterogeneity poses substantial challenges in patient management, including difficulties in treatment selection and patient stratification for clinical trials (2). The current ARDS definitions, though valuable, often fail to capture the diverse manifestations of the syndrome accurately. Hence, there is a pressing need for a simple yet effective method to subphenotype ARDS patients, allowing for personalized therapeutic strategies.

**Objectives:**

1. Develop a parsimonious supervised model to assign a score to ARDS patients based on physiological variables.
2. Evaluate the discriminative and predictive capacity of the proposed score for ARDS subphenotyping.

**Methods:** Leveraging previous research on ARDS physiological subphenotypes through clustering with a Gaussian mixture model, we developed a parsimonious supervised model using logistic regression. This model utilized the physiological subphenotypes identified in previous research as labels for classification. It allowed for the weighting of influential variables, based on their odds ratios, in discriminating subphenotypes. Subsequently, a final score, derived from these variables, demonstrated high discriminatory power and enabled patient stratification. Finally, a defined cut-off score was determined according to the Youden index of the ROC curve.

**Results:** The supervised model allowed a score to be assigned to each patient with ARDS to predict subphenotype 2, which is more severe, restrictive, and less ventilator-efficient than subphenotype 1 (Fig. 1). The variables that best-predicted subphenotype 2, aiming to capture its physiological severity, were respiratory rate (OR: 1.31), EtCO2 (OR: 1.32), normalized tidal volume (OR: 2.24), and driving pressure (OR: 1.39) (Table 1, Fig. 2).

**Table 1 (abstract 001627)** Multivariate logistic regression analysis for predicting physiological subphenotypes in ARDS patients

| Predictor | Multivariate model | | | | |
|---|---|---|---|---|---|
| | *β* | *p*-value | OR | 95% CI lower | 95% CI upper |
| Respiratory rate (rpm) | 0.269 | < 0.001 | 1.309 | 1.184 | 1.448 |
| EtCO2 (mmHg) | 0.28 | < 0.001 | 1.324 | 1.189 | 1.473 |
| Tidal volume (ml/kg/PBW) | − 0.806 | 0.012 | 0.446 | 0.238 | 0.838 |
| Driving pressure (cmH2O) | 0.33 | < 0.001 | 1.391 | 1.158 | 1.67 |

β: Beta coefficient, OR: Odds ratio, CI: Confidence Interval. PBW: Predicted Body Weight. Statistical significance set at $p < 0.05$

The ROC curve of the model had an area under the curve of 0.91, with a cut-off point of 15.92. This cut-off score demonstrated a sensitivity of 0.75 and specificity of 0.94 in discriminating physiological subphenotypes (Fig. 3).

**Conclusions:** The proposed score offers a practical and robust tool for physiological subphenotyping of ARDS. This approach could facilitate personalized treatment selection and improve clinical outcomes in ARDS patients. Moreover, this method is multivariate, bedside, easy to use, and operator-independent, ensuring rapid and reliable results at the point of care. This approach underscores the importance of physiological subphenotyping in ARDS management, providing a comprehensive evaluation reflecting the complexity of the disease.

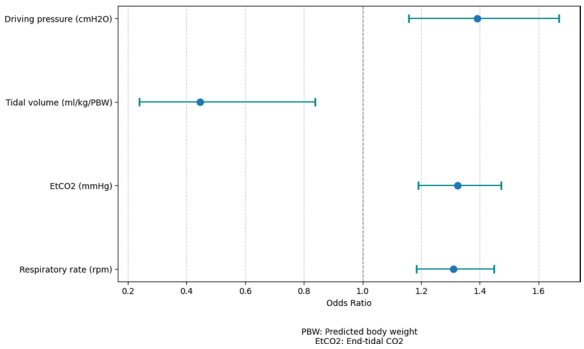


**Fig. 2 (abstract 001627)** Odds ratios of significant variables in discriminating subphenotypes: Forest plot illustrating the odds ratios of the most significant variables in discriminating between subphenotypes. Included variables are respiratory rate, normalized tidal volume, driving pressure, and end-tidal CO2 (etCO2). All variables show statistically significant differences ($p < 0.05$)

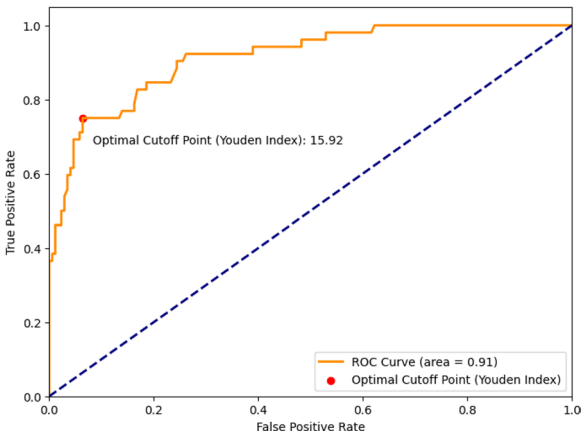


**Fig. 3 (abstract 001627)** ROC curve of ARDS Subphenotyping Score for Subphenotype 2: ROC curve illustrating the discriminative performance of the ARDS subphenotyping score in identifying subphenotype 2. The curve depicts the area under the curve and the optimal cutoff point determined using the Youden index. The curve demonstrates the model's discriminative performance in identifying the more mechanically restrictive and severe subphenotype

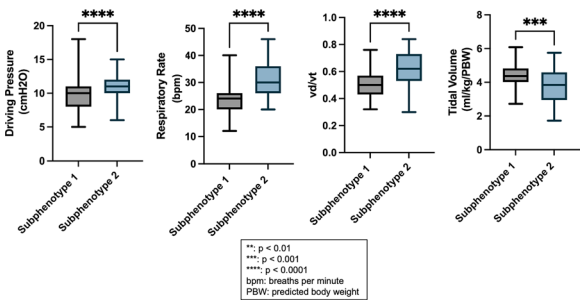


**Fig. 1 (abstract 001627)** Physiological parameters in ARDS patients: Boxplots illustrating the distribution of driving pressure, respiratory rate, vd/vt, and normalized tidal volume between subphenotypes.

Subphenotype 2 exhibits higher levels of mechanical restriction and lower ventilatory efficiency, with all differences statistically significant ($p < 0.05$)

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**Topic:** Systemic diseases

## 001630

### Videolaryngoscope (VL)-guided transesophageal echocardiography (TEE) probe insertion in intubated patients: a systematic review and meta-analysis

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001630

**Introduction:** Transesophageal echocardiography (TEE) has emerged as an integral tool in evaluation of critically ill patients, who are often sedated and intubated. Insertion of TEE probes in these patients can be difficult and may cause trauma to oropharyngeal mucosa from multiple attempts. The use of video laryngoscopes (VL) to assist placement has been increasingly studied. We conducted this meta-analysis to assess complications and success rates of TEE probe insertion in VL-guided approach as compared to a conventional approach.
**Methods:** MEDLINE, Embase and CENTRAL databases were systematically searched from inception to April 12, 2024, for Randomized Controlled Trials (RCTs) evaluating the use of VL-guided versus either Macintosh-guided or blind insertion of TEE probe in intubated patients. The primary outcome was the incidence of pharyngeal injury. Secondary outcomes included success in the first attempt, overall success in probe insertion, and duration of probe insertion. Random-effects model was adopted for meta-analysis. Study quality was assessed using the Cochrane Risk of Bias 2 tool (RoB2).
**Results:** This meta-analysis included 4 RCTs from 2016 to 2024 with a total of 645 patients. VL-guided TEE probe insertion led to a significantly lower incidence of pharyngeal injury (OR 0.26, 95% CI 0.13–0.52, $p = 0.0002$, $I2 = 34\%$). Operators using the VL-guided approach were more likely to succeed at the first attempt (OR 4.75, 95% CI 2.39–9.43, $p < 0.00001$, $I2 = 42\%$) and to achieve overall success (OR 12.57, 95% CI 1.04–151.83, $p = 0.05$, $I2 = 26\%$) in TEE probe insertion. However, the time required for successful TEE probe insertion was not statistically significant between the groups (Mean difference − 4.47 s, 95% CI − 20.83–11.88, $p = 0.59$, $I2 = 97\%$).
**Conclusions:** Our meta-analysis showed that VL-guided TEE probe insertion in intubated patients significantly reduced the occurrence of pharyngeal injury and increased the success rate of probe insertion at the first attempt and in overall attempts.

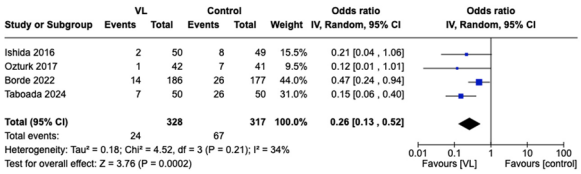


**Fig. 1 (abstract 001630)** Forest plot of the primary outcome: pharyngeal injury

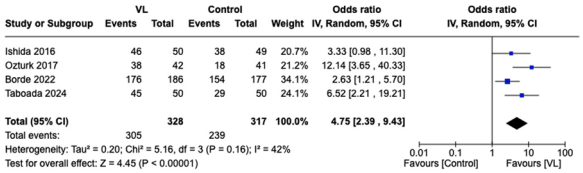


**Fig. 2 (abstract 001630)** Forest plot of the secondary outcome: success at first attempt

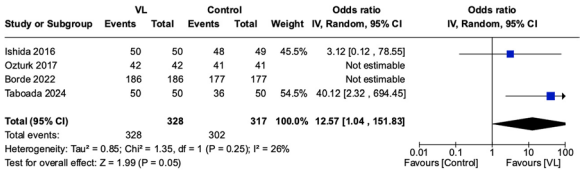


**Fig. 3 (abstract 001630)** Forest plot of the secondary outcome: overall success

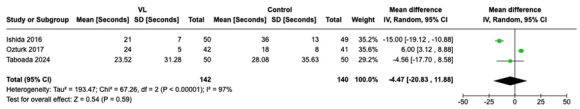


**Fig. 4 (abstract 001630)** Forest plot of the secondary outcome: duration of TEE probe insertion

**Topic:** Imaging in intensive care

## 001631

### Arterial blood gas analysis: effects of analysis delay

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001631

**Introduction:** The results of arterial blood gas (ABG) analysis can be affected by several pre-analytical factors, including time from sample collection to analysis. This is primarily believed to be caused by the continued metabolism of the cells in the blood sample. Prior research on the effects of analysis delay has yielded inconclusive results and the acceptable delay time is unknown.
**Objectives:** To describe the changes that occur in an ABG sample when the analysis is delayed and estimate the acceptable delay time.
**Methods:** A total of 80 patients were included in the study. Two arterial blood gas samples were collected from each patient and analyzed in parallel at 0, 5, 10, 20, 30, 45, 60 and 120 min on two different analyzers. The samples were stored at room temperature between analyses. It was determined at what timepoint the parameter changes became statistically significant as well as at what timepoint the changes would be considered clinically important.
**Results:** Up until the last time interval, a rise in pO2 levels and a decrease in pCO2 levels was noted, contrary to what was expected. The change in pO2 reached the predetermined level of clinical importance at 45 min but the changes in pCO2 did not become clinically important during the 120 min studied. The levels of lactate increased over time but did not reach the level of clinical importance until at 120 min and on only one of the analyzers. The changes in HCO3- and base excess also first reached the level of clinical importance at 120 min and on only one of the analyzers. The glucose levels decreased over time but did not reach the level of clinical importance. The pH and electrolytes remained relatively stable over time and did not reach the level of clinical importance over the 120-min time period studied.
**Conclusions:** At 45 min, the change in pO2 reached the predetermined level of clinical importance, indicating that an analysis delay of up to 45 min is acceptable. However, most parameters remained reliable for even longer or for up to 120 min. Knowledge of the potential errors that might result from analysis delay can decrease the risk of incorrect interpretation of ABG analysis results in the clinical setting.

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**Topic:** Translational biology

## 001632

### Omega-3 fatty acid in critically ill patients with COVID-19 in Qatar, a randomized controlled multicenter trial

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001632

**Introduction:** The efficacy of omage-3 fatty in the treatment of severe respiratory failure remains controversial. Patients with Severe Acute Respiratory Syndrome due to Coronavirus 2 infection (SARS-CoV-2) may also develop a severe form of respiratory failure, therefore we assessed if the addition of omage-3 fatty acid to the standard of care would improve clinical outcomes of patients with SARS-CoV-2.
**Methods:** Double-blinded block stratified randomized, multicenter, clinical trial of adult patients ($\geq$18 years old) admitted with PCR-confirmed severe COVID-19 infection requiring Intensive Care Unit admission. Patients were randomly assigned to omega-3 fatty acid 2 g enterally twice daily for 28 days or until hospital discharge (whichever came first) in addition to standard of care vs standard of care alone. The primary outcome was the number of ventilator-free days. Secondary outcomes included length of ICU and hospital stay and in-hospital mortality.
**Results:** A total of 380 patients were included, 211 in the intervention group and 169 patients in the control group. Ventilator-free days were similar comparing the omega-3 fatty acid group compared to standard of care alone [mean 12.4 days (9.3–15.5) vs 11.1 (7.2–15.0), $p=0.48$). There was no difference between omega-3 fatty acid and control group care in terms of length of ICU stay (7 days for both groups) or hospital length of stay [16 days vs 15 days, $p=0.03$). Patients who received Omega-3 fatty acid had a trend toward lower mortality (4.3% vs 7.7%, $p=0.15$). In the pre-defined sub-group of critically ill patients who required mechanical ventilation (89 patients), omega-3 fatty group had a significant lower mortality compared to the control group (15.1% vs 33.3%, $p=0.04$).
**Conclusions:** In patients with SARS-CoV-2, the addition of Omega-3 fatty to standard of care did not increase ventilator-free days. However, it may decrease mortality in the sub-group of patients requiring mechanical ventilation.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001633

### Improved AI-based prediction of ICU mortality of sepsis patients based on change in HRV parameter upon fluid bolus therapy

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001633

**Introduction:** Sepsis, a life-threatening organ dysfunction caused by a dysregulated host response to infection, is a major cause of mortality across globe. It is, therefore, important to analyse patient-specific efficacy of interventions such as fluid bolus therapy (FBT), a standard of care management for septic shock. At the same time, one seeks to accurately predict patient outcomes to optimally triage patients at high risk. Traditionally, severity score models including SAPS II, OASIS, and SOFA have found use in identifying high-risk patients. Patients present to the hospitals with baseline acute and chronic pathophysiological features, which, in their static values, form the basis of the above models. In addition, one may argue that response patterns to basic and routinely used therapies such as FBT can and should form part of prediction models, as a particular response to a therapeutic

intervention reflects a patient's underlying physiological reserve at the organic as well as the cellular level.

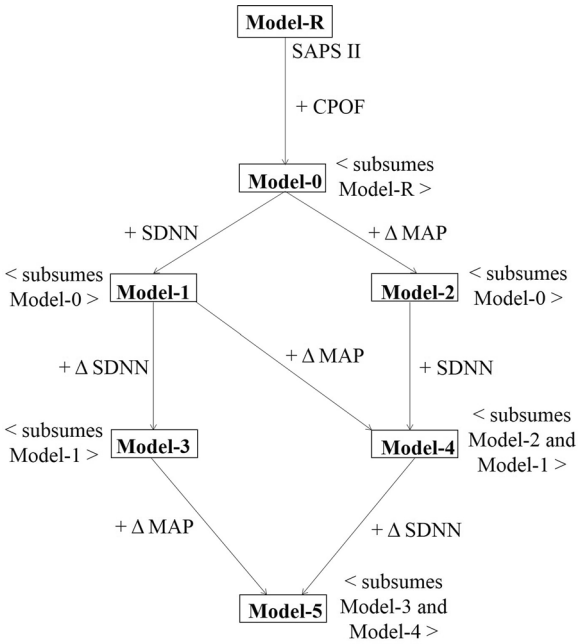
It has been established that sepsis and septic shock can cause autonomic nervous system (ANS) dysfunction. Heart rate variability (HRV) analysis, which computes statistics on time intervals between successive cardiac beats, can be used to assess ANS activity. In this scenario, we hypothesise that the prediction of mortality in sepsis patients can not only be improved by incorporating baseline HRV in the prediction model, but HRV response to FBT can also form a very strong predictive feature for sepsis morality.

**Objectives:** To examine the role of heart rate variability (HRV) changes in response to fluid bolus therapy (FBT) on mortality prediction among sepsis patients in critical care.

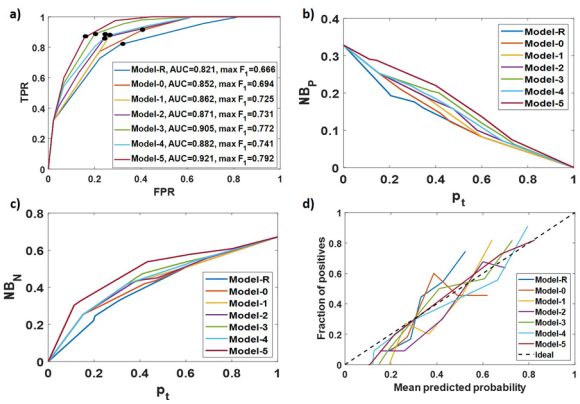
**Methods:** Adult patients diagnosed with sepsis in the Medical Information Mart for Intensive Care (MIMIC)-III and MIMIC-IV clinical database, who also had continuous ECG in the corresponding waveform database, within 48 h of ICU admission were selected for the study. All the predictive models were developed using a common AI architectural template. Each was based on an ensemble of decision trees making use of eXtreme Gradient Boosting (XGBoost). A mortality prediction model (Model-0) was built including the SAPS II score and common pool of features (CPOF) comprising age, sex, ethnicity, insurance, admission type, heart rate (HR), mean arterial pressure (MAP) and Elixhauser comorbidity score. A combination of the standard deviation of NN intervals (SDNN) as the HRV parameter, and FBT response in terms of the change in MAP (ΔMAP) as well as the change in SDNN (ΔSDNN) were then added hierarchically and also separately to Model-0 to develop additional models (Model-1 to Model-5). Finally, the performance of all the developed models was compared.

**Results:** A total of 5960 patients were initially screened and eventually 542 were included following exclusion criteria. The mean age of survivors and non-survivors is 63.29 and 68.94, respectively. The model with a baseline traditional feature set (SAPS II, CPOF and ΔMAP) was surpassed by an augmented model (Model-5) using HRV measurements (SDNN and ΔSDNN) as additional features in terms of predictive performance (AUC: 0.871 vs 0.921, maximum F1 score: 0.731 vs 0.792, indicating respective gains of 5.74% and 8.34%). In order of feature importance, following the SAPS II score, ΔSDNN superseded ΔMAP.

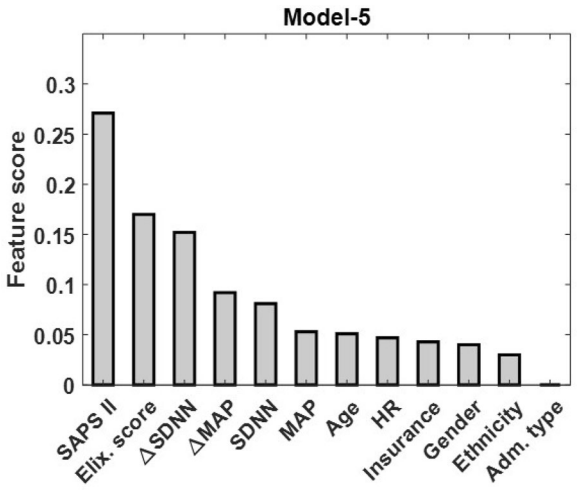
**Conclusions:** The ΔSDNN can be an important predictor of mortality in septic patients requiring fluid bolus and is stronger than ΔMAP. Clinicians can choose ΔSDNN as an additional bedside parameter to predict mortality risk in sepsis patients.




**(abstract 001633)** Block diagram of proposed mortality prediction scheme. (CPOF: Common pool of features which includes elixhauser score, age, insurance, gender, ethnicity, admission type, HR, MAP; SDNN: Standard deviation of NN intervals (NNI); FBT: fluid bolus therapy; HR: heart rate; MAP: mean arterial pressure; ( ΔMAP: Change in MAP; ΔSDNN: Change in SDNN; The baseline model (Model-R) was developed using SAPS-II as the foundational feature.)




**(abstract 001633)** (a) ROC plots with the operating point marked at max F1 score; Decision curve analysis for (b) positive/non-survived and (c) negative/survived predicted patients; (d) Calibration plot




**(abstract 001633)** Feature importance plot of Model-5

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**Topic:** Sepsis

## 001634

### Extracorporeal circulation-induced hemolysis and endothelial dysfunction are associated with acute kidney injury in a rat model


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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001634


**Introduction:** Hemolysis affects 15–21% of patients supported with extracorporeal membrane oxygenation (ECMO) [1, 2] and is associated with acute kidney injury (AKI) and mortality [3, 4]. Hemolysis is characterized by an increase in cell-free hemoglobin (CFHb), which can activate the endothelium [5, 6, 7]. Concurrently, ECMO is associated with a pro-inflammatory state that may contribute to endothelial dysfunction, subsequently leading to AKI. Nonetheless, the mechanism of hemolysis-induced endothelial dysfunction and its association with AKI during ECMO remains poorly understood.

**Objectives:** To determine the occurrence of hemolysis and endothelial dysfunction during extracorporeal circulation in rats and to assess the relation with AKI.

**Methods:** Rats were subjected to 75 min of extracorporeal circulation (ECC) or underwent a sham procedure ($n=8$). Renal vascular leakage and edema were assessed by FITC-labeled dextran extravasation (70 kDa) and wet-to-dry weight ratio, respectively. Markers related to hemolysis, inflammation, endothelial activation and renal injury were measured in blood, plasma and urine using enzyme-linked immunosorbent assay or Luminex.

**Results:** ECC resulted in elevated levels of CFHb (1.03 [0.88–1.42] vs. 0.69 [0.47–0.89], $p=0.04$), metHb (1.5 [0.8–2.1] vs. 0.3 [0.3–0.3] %, $p=0.03$) and unchanged concentrations of haptoglobin (677 [626–918] vs. 620 [505–750] pg/mL, $p=0.40$) compared to controls. Levels of lactate dehydrogenase were increased 60 min after ECC compared to controls (0.029 [0.023–0.040] vs. 0.002 [0.001–0.003] U/mL, $p<0.001$). Additionally, plasma levels of TNF-α (7.6 [6.7–10.0] vs. 0.2 [0.1–0.3] ng/mL, $p=0.008$), interleukin-6 (2.0 [1.5–2.9] vs. 0.4 [0.4–0.5] ng/mL, $p=0.008$) and angiopoietin-2 (96 [76–138] vs. 0 [0–0] ng/mL, $p<0.001$), but not ICAM-1 (38 [28–43 vs. 27 [24–33] ng/mL, $p=0.26$) increased over time during ECC. Renal dextran extravasation was similar (0.49 [0.26–0.61] vs. 0.34 [0.15–0.63] µg/mg, $p=0.57$) whereas renal wet-to-dry weight ratio was increased in rats on ECC (4.5 [4.3–4.7] vs. 4.0 [3.9–4.0], $p=0.001$). Furthermore, plasma NGAL, a biomarker of AKI, increased following one hour of ECC (1710 [1367–2787] vs. 383 [278–569] ng/mL, $p<0.001$) and was significantly elevated in urine samples when compared to controls (1733 [828–3157] vs. 437 [314–577] ng/mL, $p=0.006$). We found a positive relationship between CFHb and angiopoietin-2, though not significant ($p=0.12$). However, increased angiopoietin-2 was associated with higher levels of urinary NGAL ($\beta=52.8$, $R2=0.87$, $p<0.001$) in rats on ECC.

**Conclusions:** ECC in rats results in hemolysis, inflammation, endothelial dysfunction and renal injury compared to control animals. Interestingly, endothelial dysfunction is associated with renal injury. Future research should elucidate the role of hemolysis in endothelial dysfunction, in our model and in ECMO patients, to gain a better understanding of the pathophysiology of AKI during ECC.

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**Topic:** Translational biology

## 001635

### Prediction of successful liberation from continuous renal

**replacement therapy using a novel biomarker in patients with acute kidney injury after cardiac surgery—an observational trial**

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001635

**Introduction:** Acute kidney injury (AKI) is with an incidence of up to 40% the most common complication following cardiac surgery (1) and leads to initiation of continuous renal replacement therapy (CRRT) based on e.g. quantitative or qualitative insufficient urinary output. Still there is insufficient evidence when CRRT should be discontinued. (2) Proenkephalin A 119–159 (PENK) is a novel biomarker reflecting kidney function independently. (3–5).
**Objectives:** Our aim was to investigate if PENK can guide a successful liberation from CRRT (no need for CRRT in the following 7 days) in patients with AKI after cardiac surgery.
**Methods:** Methods We performed a prospective, observational, single-center study at the Medical University of Vienna between July 2022, and May 2023. We included all adult patients after cardiac surgery operated on cardiopulmonary bypass, only patients on preoperative RRT were excluded. EDTA blood samples were collected and tested using the IB10 sphingotest penKid immunoassay (Sphingotec GmBH, Henningsdorf, Germany) on the Nexus IB10 Analyzer (Nexus-Dx, Inc., San Diego, USA) point of care testing (POCT) device to evaluate PENK levels.
**Results:** We screened 61 patients with postoperative AKI, 20 of them gave consent and had a progression of AKI needing CRRT. CRRT was initiated for the following reasons: 10 patients (50%) had quantitative insufficient urinary output, 4 (20%) patients suffered a reduction in vigilance due to increased blood urea nitrogen, 3 patients (15%) suffered from pulmonary dysfunction and did not reach negative bilances due to their kidney impairment, 3 patients (15%) had combined problems. Patients had a mean age of 67 ± 11 years, nine (45%) of them were female, the mean EuroSCORE was 19.7 ± 15.4%, and the mean SOFA score on ICU admission was 10.6 ± 2.4. Most of the procedures were performed electively ($N = 11$, 55%), urgent indication for operation was found in three patients (15%) and six patients (30%) were emergency procedures. At the time of CRRT liberation, patients successfully liberated from CRRT had mean PENK levels of 113 ± 95.4 pmol/L compared to 290 ± 175 pmol/L ($P = 0.018$) patients unsuccessfully liberated. For the prediction of successful liberation from CRRT we found an AUC of 0.798 (95% CI, 0.599–0.997) with an optimal threshold value of 126.7 pmol/L of PENK (Youden-Index = 1.53) at the time of CRRT discontinuation (sensitivity = 0.64, specificity = 0.89).
**Conclusions:** PENK is a novel biomarker that has the potential to predict successful liberation from CRRT in patients with AKI after cardiac surgery. This prospective study found that the novel biomarker Proenkephalin reflects kidney function independently. Therefore, Proenkephalin may be used as decision guidance for successful liberation from renal replacement therapy.

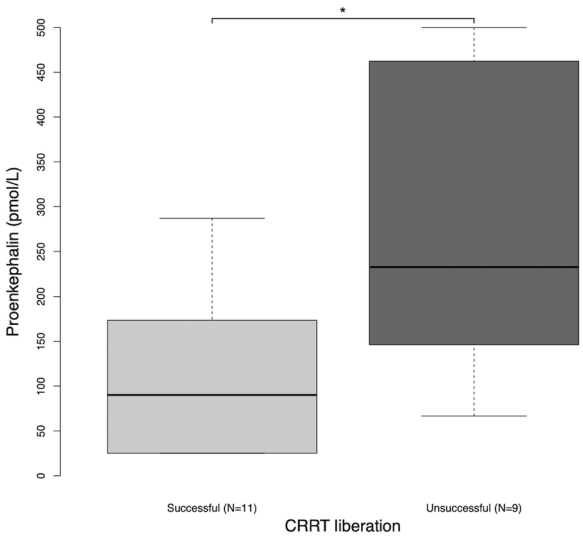


**Fig. 1 (abstract 001635)** Proenkephalin serum levels for patients with successful vs. unsuccessful CRRT liberation

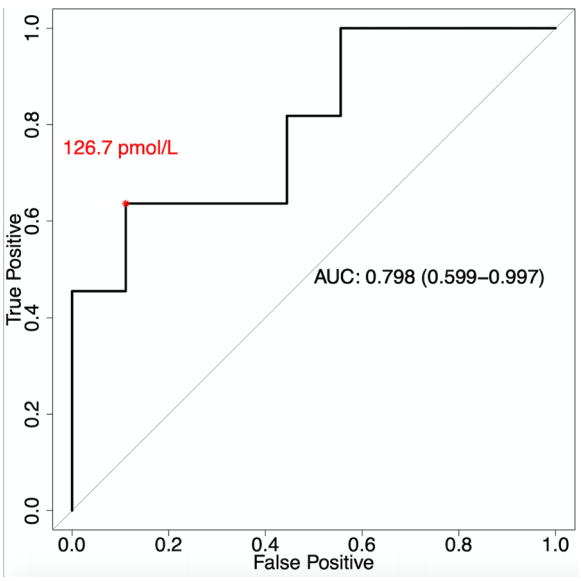


**Fig. 2 (abstract 001635)** AUC for Proenkephalin serum levels to predict success in CRRT liberation

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6. Materials were partially funded by Sphingotec GmBH, Henningsdorf, Germany.

**Topic:** Acute kidney injury and haemofiltration

## 001638

### The impact of a telemedicine intervention on early sedation depth in critically ill patients—a secondary analysis of the ERIC SW-RCT

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**Introduction:** Sedation is a core aspect of intensive care medicine. Although sedatives are commonly used to manage symptoms arising during mechanical ventilation, guidelines recommend light over deep sedation in the ICU [1]. Several studies have shown that the early phase of treatment is particularly important, with early deep sedation independently associated with increased long-term mortality [2,3]. Despite efforts, there remains a gap in clinical practice in achieving evidence-based sedation management [4].
**Objectives:** To explore the impact of a comprehensive telemedicine intervention on the sedation depth of critically ill patients using the Sedation Index (SI), a time-dependent measure of sedation.
**Methods:** This study is a secondary analysis of the Enhanced Recovery after Intensive Care (ERIC) study [5], a multicenter, stepped-wedge cluster-randomized trial in a German metropolitan area. Inclusion criteria for this secondary analysis were (1) patients who required intensive care for more than 24 h, (2) were over 18 years old, (3) gave consent, (4) were covered by statutory health insurance, (5) underwent sedation for at least 48 h upon admission, and (6) had at least one daily assessment of sedation depth using the Richmond Agitation-Sedation Scale (RASS). The trial-intervention consisted of a daily telemedicine round from a university telemedicine hub structured alongside predefined quality indicators of Intensive Care [6] compared to standard-of-care (no telemedicine, control).
The SI was calculated as previously published [7]. Patients with deep sedation ($SI \geq 3$) and light sedation ($SI < 3$) were compared using univariate analysis and mixed logistic regression models.
**Results:** $N = 482$ were evaluated in this secondary analysis (control: $n = 100$; intervention: $n = 382$). The Sedation Index in the intervention group was significantly lower than in the control group (Median [Interquartile Range]: 3 [1.5–4.5] vs. 3.5 [2.6–4.5]; $p = 0.014$). Patients who received the intervention had higher chance (OR 1.8 (95% Confidence Interval: 1.1–3.1; $p = 0.005$)) of receiving evidence-based, light sedation.
**Conclusions:** A comprehensive telemedicine intervention focused on quality indicators is associated with a lower SI and may facilitate early light sedation. Future controlled studies should directly assess the impact of telemedicine rounds on sedation, an important modifiable factor in the care of critically ill patients.

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8. [8] The ERIC trial was an investigator-initiated trial funded by the German Innovation Fund (Innovationsfonds) of the Federal Joint Committee (Gemeinsamer Bundesausschuss, G-BA), 01NVF16011. The funding body had no role in study design, data collection, analysis, interpretation, drafting this abstract, or deciding to submit the abstract for publication.

**Topic:** Sedation, analgesia and delirium

## 001640

### Association between sex and clinical outcomes for critically ill patients in India: a registry-based cohort study

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001640

**Introduction:** Studies from high-income countries suggest different admission patterns, care delivery and outcomes for male and female patients admitted to intensive care units (ICUs). Such data is lacking for critically ill patients in lower-middle income countries. We aimed to evaluate the association between sex and clinical outcomes for patients admitted to ICUs in India.
**Objectives:** Among adult patients admitted to the ICU, to determine the association between sex at birth and receipt of life-sustaining therapies and clinical outcomes.
**Methods:** We conducted a cohort study of adult patients (age > 18 years) admitted to 36 ICUs contributing to the Indian Registry of IntenSive care (IRIS), between January 2019 to December 2023. The primary exposure variable was sex at birth. The primary outcome was ICU mortality; secondary outcomes were receipt of mechanical ventilation, renal replacement therapy and vasopressors. Outcomes were censored at day 28. Categorical variables are reported as counts and proportions and continuous outcomes as mean (standard deviation) or median (interquartile range). Statistical significance testing used the Chi-square, Fisher exact test or Mann–Whitney test as appropriate. Regression evaluated associations (odds ratio [OR], 95% confidence interval) between sex and clinical outcomes, adjusting for age, APACHE II score, and Charlson Comorbidity Index. Ethics approval was obtained from the institutional ethics committee.
**Results:** Among 63,981 patients admitted to ICU, 24,264 (37.9%) were female and 39,717 (62.1%) male. Median age was 60.0 (46.0, 70.0) years. ICU mortality was 10.3% and hospital mortality 23.0%. ICU mortality was higher among male (vs. female) patients (adjusted OR 1.06, 95% CI (1.00,1.12). Hospital mortality (males vs. females) was not significantly different (OR 1.06, 95%CI (0.99,1.12). Female patients were less likely to receive invasive ventilation (OR 0.84, 95%CI (0.80–0.87),

vasopressors (OR 0.94, 95% CI (0.90–0.99) and renal replacement therapy (OR 0.76, 95%CI (0.69–0.82).
**Conclusions:** In a large Indian ICU registry of adult patients, female patients were less likely to receive common life-sustaining therapies and were more likely to survive ICU discharge.

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**Topic:** Health services research and outcome

## 001642

### Extended pre-ECMO mechanical ventilation—good outcome, huge burden

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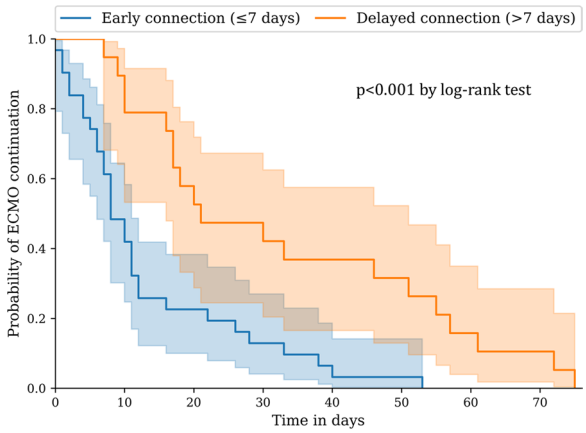
*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001642

**Introduction:** Mechanical ventilation (MV) for more than 7 days has been traditionally considered a relative contraindication for veno-venous (VV) ECMO due to observational studies prior to 2018 showing increased mortality in these patients. This recommendation has been recently challenged. In a cohort of VV ECMO patients, we compared patients connected within 7 days of invasive MV (early connection, EC) to those connected after 7 days of MV (delayed connection, DC).
**Objectives:** The primary objective is to determine if the duration of pre-ECMO MV independently affects hospital and long-term mortality. Secondary objectives are to compare complications, duration of ECMO and ICU stay between patients with EC and DC.
**Methods:** Single-center retrospective cohort study. We included all patients on VV ECMO at Clínica Alemana de Santiago between February 2017 and August 2023. Patients on ECCO2R and VAV ECMO were excluded. Demographic, physiological variables and severity scores were assessed prior to ECMO connection. Complications during ECMO, duration of ECMO and ICU stay were recorded. Survival was followed till 09/30/2023. Local IRB waived patient consent. Variables are presented as median [IQR]. Univariate analysis comparing patients according to vital status and pre-ECMO MV duration categories was performed using Mann–Whitney *U* and Fisher exact test. Kaplan–Meier time-to-event analysis comparing EC and DC groups and a multivariate Cox regression analysis for long term mortality including pre-ECMO MV duration as independent variable were performed. Significance was set at $p < 0.05$.
**Results:** 52 patients were included, 33 had COVID-19, 10 died in-hospital; 33 had EC and 19 DC. Pre ECMO MV was 2 [1–4] and 12 [9–15] days ($p < 0.01$); hospital mortality was 24.2% and 10.5%, respectively ($p = 0.293$). Those who died had higher APACHE II (17.5 [10–23.3] vs 10 [1–14] points, $p < 0.01$) and lower RESP score (0.5 [-3–2.3] vs 2 [0–4] points, $p = 0.03$), but severity scores were not different between EC and DC groups. Patients were followed for 820 [248–1126] days; 2 more patients died after hospital discharge, one from each group. Survival analysis revealed no difference between groups (log-rank $p = 0.418$). In a model including pre-ECMO MV duration, APACHE II and RESP scores, the hazard ratio for long-term mortality of pre-ECMO MV duration was 0.944 [95% CI: 0.846 to 1.05] ($p = 0.307$) for each additional day. Patients with DC had longer ECMO runs (21 [16–55] vs 10 [5.5–24] days, $p < 0.01$; Fig. 1), and ICU length of stay (56 [47–118] vs 31 [13–57] days, $p < 0.01$) than those with EC. Patients with DC also developed more hypofibrinogenemia and/or thrombocytopenia (68% vs 36%, $p = 0.026$) and required more tracheostomies (84% vs 39%, $p < 0.01$) than those with EC.
**Conclusions:** Pre-ECMO MV duration had no effect on long term mortality in VV ECMO patients. Patients with DC to VV ECMO had longer ECMO runs and ICU stays with a more complicated course than those with EC. It is uncertain if these observations pertain only to COVID-19 patients.




**(abstract 001642)** Kaplan–Meier estimates of ECMO continuation probability with 95% confidence intervals according to the duration of pre-ECMO mechanical ventilation categories. The analysis excludes two outliers from the early connection group ($n = 50$; early connection $n = 31$, delayed connection $n = 19$ patients)

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4. This work had no funding.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001643

### Serum amphiregulin as a prognostic and potential therapeutic target in adult sepsis

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001643

**Introduction:** The production of amphiregulin, a tissue repair growth factor encoded by the *AREG* gene, is upregulated in the leucocytes of septic neonates1. In the same cohort higher plasma levels of amphiregulin accurately identified septic individuals, when other inflammatory markers remained equivocal. In murine models of influenza infection, administration of recombinant amphiregulin can ameliorate lung inflammation and reduce mortality2,3. This evidence raises the question whether amphiregulin could be predictive of severe infection, and whether its modulation may have a therapeutic role. The role of amphiregulin in adult sepsis and critical illness in unknown.
**Objectives:** This work aimed to determine the relationship between serum concentrations of amphiregulin and mortality in an adult intensive care population.
**Methods:** A single-centre, prospective, observational study. Blood samples were drawn from adult intensive care unit (ICU) patients with sepsis within 7 days of ICU admission. We collected clinical and laboratory data (including bilirubin, creatinine, CRP, lactate, lymphocyte count, monocyte count, neutrophil count, neutrophil/lymphocyte ratio, platelets and total white cell count). Serum immune parameters (amphiregulin [AREG], GM-CSF, IFN-a2, IFN-b, IFN-g, IFNl1, IFNl2/3, IL-1b, IL6, IL8, IL10, IL-12p70, IP-10, TNFa) were measured using enzyme linked immunosorbent assay (ELISA) or multiplex. Data was analysed in GraphPad Prism 10.
**Results:** A volcano plot (Fig. 1a) shows biomarkers that discriminate patients who suffered inpatient mortality versus patients who survived (FDR = false discovery rate). Serum Amphiregulin was higher among patients who eventually died, compared to patients who survived; outperforming over 20 other biomarkers in its ability to predict outcome. AREG was significantly lower in survivors versus non survivors where CRP did not discriminate (Fig. 1b) and more accurately predicted mortality (Fig. 1c).
**Conclusions:** Plasma amphiregulin concentration discriminates between ICU patients who survive or eventually die, outperforming over 20 other biomarkers tested. These findings support further investigation of the role of plasma amphiregulin in the pathophysiology of sepsis.

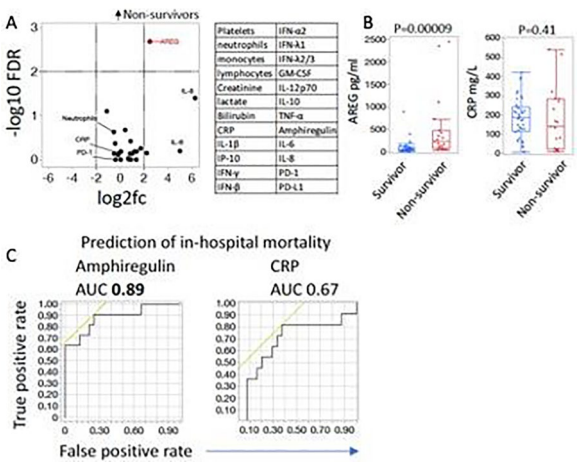


**Fig. 1 (abstract 001643)** (A) Volcano plot showing biomarkers that discriminate patients who suffered inpatient mortality versus survivors (FDR = false discovery rate). (B) Demonstrates the difference in serum amphiregulin (AREG) and C-reactive protein (CRP) between survivors and non-survivors of critical illness. (C) Demonstrates the ability of amphiregulin and CRP to predict inpatient mortality

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**Topic:** Sepsis

## 001644

### Prediction of fluid responsiveness in patients with intra-abdominal hypertension: a bicenter, prospective, observational study

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**Introduction:** There are 34 ~ 45% of patients have intra-abdominal hypertension (IAH) in the intensive care unit (ICU). Studies have shown that in patients with acute circulatory failure and IAH, the accuracy of the passive leg raising test (PLR) to predict fluid responsiveness may be questioned.
**Objectives:** This study aims to compare the predictive performance of PLR, end-expiratory occlusion test (EEOT) and mini-fluid challenge (mini-FC) in patients with IAH and non-IAH to predict fluid responsiveness.
**Methods:** This was a two-center, prospective, observational study. Patients with acute circulatory failure who needed mechanical ventilation support in two ICUs of tertiary hospitals in China were screened. Patients who require fluid therapy as assessed by charged clinician were included. Patient were monitored by transpulmonary thermodilution device (PULSION Medical Systems SE, Feldkirchen, Getinge, Schweden). We performed consecutively 1-min PLR, 15-s EEOT, and 1-min mini-FC in all patients, and the changes in CI of the patients during each test were monitored. After completing the mini-FC test, all patients underwent a 400 mL fluid challenge during 15 min. The presence of fluid responsiveness was defined as a CI increase of $\geq$ 15% after fluid challenge. According to intra-abdominal pressure (IAP), patients were divided into IAH group (IAP) $\geq$ 12 mmHg and non-IAH group (IAP < 12 mmHg).
**Results:** From March 2023 to March 2024, a total of 74 patients were included. The median age was 61 (49,72) y.o., and 76% were male. The main cause ICU admission was infectious diseases and the median SOFA score was 12 (9,15). Among them, 82% of patients were treated with norepinephrine; 77% had sepsis/septic shock and the median arterial blood lactate level at the time of inclusion was 2.3 (1.2, 4.0) mmol/L. In IAH group (17 $\pm$ 3 mmHg), 17 patients were fluid responsiveness and 19 patients were fluid non-responsiveness. In non-IAH group (9 $\pm$ 2 mmHg), 22 patients were fluid responsiveness and 16 patients were fluid non-responsiveness. In non-IAH group, the area under the receiver operating characteristic curve (AUROC) of PLR for predicting fluid responsiveness was 0.96 (0.83–1.00), sensitivity: 90% (70%-99%), specificity: 93% (68–100%) with cut-off value of 9%. In

IAH group, the AUROC of PLR was 0.74 (0.57–0.87), sensitivity: 59% (33–82%), specificity: 84% (60–97%), with the cut-off value of 5%. The AUROC of PLR is significantly lower in non-IAH group compared to that in IAH group ($p = 0.02$). There was no statistical difference regarding the AUROC of EEOT in predicting fluid responsiveness between the two groups of patients (0.91 (0.78–0.98) vs. 0.87 (0.72–0.96), $p = 0.59$). There was also no statistical difference in AUROC of mini-FC between these two groups (0.95 (0.83–1.00) vs. 0.88 (0.72–0.96), $p = 0.41$).
**Conclusions:** In mechanically ventilated patients with acute circulatory failure, PLR has limited value in fluid responsiveness prediction in patients with IAH, while EEOT and mini-FC may be reliable alternative tests.

**Topic:** Cardiovascular issues in ICU

### 001645

**Extracorporeal adsorption of distinct bioactive middle molecules using the CytoSorb® system for rare indications**

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**Introduction:** The hemoperfusion device CytoSorb® has been proposed to remove cytokines [1] as well as excess myoglobin and bilirubin [2] from the circulation, even though its clinical relevance is still under debate [3]. Given its adsorptive characteristics being unselective for hypophilic middle molecules, we analyzed its effectiveness in other, rare indications. On one hand, as therapeutic option in Immune effector cell-associated neurotoxicity syndrome (ICANS), a common complication of Chimeric antigen receptor T-lymphocytes (CAR-T) therapy [4]. This complication arises due to an overwhelming immune response with high cytokine levels, including Interleukin-6 (Il-6), which can theoretically be reduced through hemoperfusion (Patient A). On the other hand, CytoSorb's use in decompensated pulmonary hypertension due to intravascular hemolysis. Free hemoglobin inactivates nitric oxide and consequently leads to a precapillary pulmonary hypertension [5], thus we analyzed Cytosorb's adjuvant efficiency in reducing the requirement of vasoactive medication and oxygen through removal of free hemoglobin (Patient B).
**Objectives:** Explorative retrospective analysis to evaluate CytoSorb's efficacy in reducing Il-6 levels in ICANS and free hemoglobin in hemolysis with complicating decompensated pulmonary hypertension. Correlation with clinical markers of disease/symptom severity.
**Methods:** Consent to use anonymized data was given by the patients upon admission. As soon as the diagnosis of ICANS was made, Patient A received high dose steroid treatment according to institutional standards. The clinical state of Patient A deteriorated and excessive plasma Il-6 levels were measured. CytoSorb was connected in series with a running continuous renal replacement treatment. Plasma samples for Il-6 analysis were taken at the start and then at hourly intervals during 3-h treatment duration of two filter cycles, both systemically and post-CytoSorb. Clearance rates were calculated as CI = Q x (Csyst – Cpost) / Csyst.
Patient B presented with a decompensated Cor pulmonale requiring urgent circulatory support through a VA-ECMO. When intravascular hemolysis with high levels of free hemoglobin was identified as triggering factor, a CytoSorb filter was added to the circuit and free hemoglobin levels were measured systemically at two-hour intervals over the course of 14 h.
**Results:** Repeated measurements showed a marked reduction of IL-6 and free hemoglobin, respectively. In Patient A we found an overall clearance of 31,78 ml/min for Il-6, with a Il-6 level going down from 2060 pg/ml in the beginning to 596 pg/ml within 7 h. Clinically, the reduction in Il-6 correlated with an improvement of the neurological status in patient A. For Patient B, the free hemoglobin level went down from1229 mg/l before the treatment to < 80 mg/l after 14 h. That correlated with a clinical improvement: by the end of the CytoSorb treatment the patient no longer needed Nitroglycerin (500 mcg/min at treatment start) and was weaned from the High-Flow oxygen therapy (FiO2 0.6, with 50 l/min flow) to receiving oxygen via nasal cannula (2 l/min).
**Conclusions:** CytoSorb might remove literally any hydrophobic middle-weight molecule from the circulation, which can have a meaningful application in the individualized care of selected patients. In this explorative analysis, CytoSorb was used to reduce a) Il-6 levels in a patient with ICANS, who significantly improved in its neurological status and b) free hemoglobin levels in a patient with a decompensated Cor pulmonale, who showed an improvement in the requirement of vasoactive medication and oxygen.

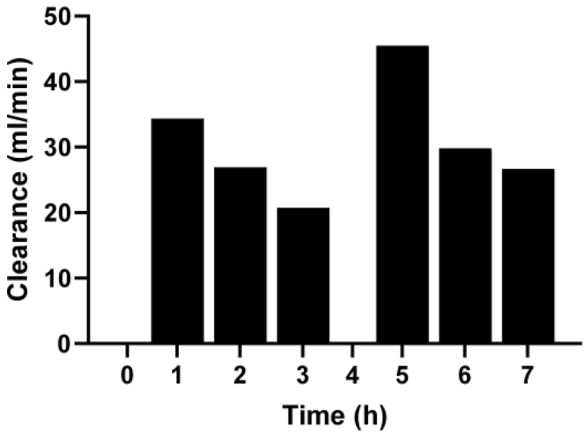


**Fig. 2 (abstract 001645)** Interleukin-6 clearance with CytoSorb

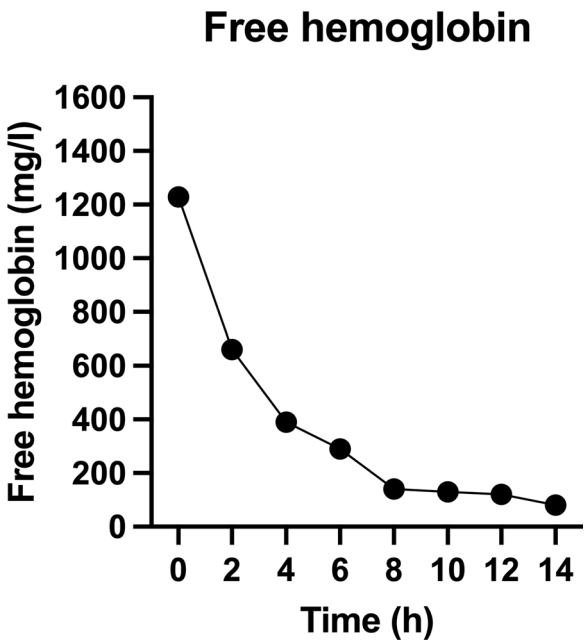


**Fig. 3 (abstract 001645)** Quantitative free hemoglobin levels during CytoSorb

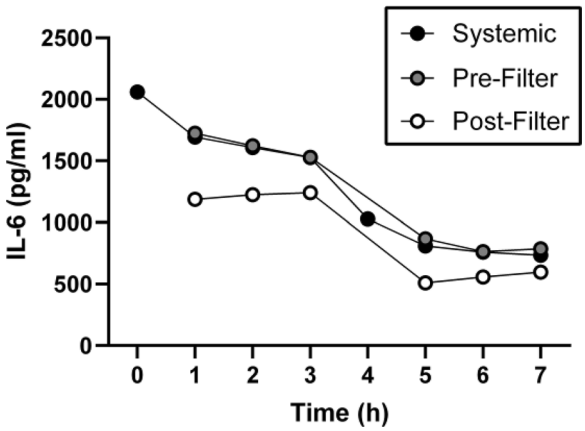


**Fig. 1 (abstract 001645)** Quantitative Interleukin-6 levels during CytoSorb

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6. SD is supported by an unrestricted research grant from Cytosorbents for a RCT to test CytoSorb in CRS (CYTORELEASE-Ex)

**Topic:** Acute Kidney Injury and haemofiltration

## 001646

## The influence of neoadjuvant chemotherapy on post-operative complications and immunophenotype

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001646

**Introduction:** Neoadjuvant chemotherapy (NACT) given prior to elective cancer surgery has cytoreductive benefits but its impact on post-operative immune function and infectious complications is unclear. We hypothesized that NACT is associated with an impaired immune cell response to infectious stimuli post- operatively, with increased post operative infections.
**Objectives:** To determine the influence of neoadjuvant chemotherapy on circulating immune phenotype response to an ex vivo infectious stimulus, and associated complications.
**Methods:** We conducted a secondary analysis of patients enrolled in a prospective observational study in which they had major elective cancer surgery and planned admission to a post-anaesthetic high dependency care unit. Routine clinical data were collected. Peripheral blood mononuclear cells (PBMCs) were isolated both immediately before and 24 h following surgery. PBMCs were stimulated with either heat-killed bacteria for 24 h to assess dynamic monocyte function, or CD3/ CD28 beads for 72 h to assess dynamic lymphocyte function. Using multi-parameter flow cytometry we assessed monocyte HLA-DR, PD-L1, intracellular cytokines (IL-1b, IL-10, TNF-a), and chemotaxis markers (CCR2, CXCR4). Additionally, CD4 and CD8 + lymphocyte cell death, markers of activation (CD28), proliferation/ maturation (IL-7R, IL-2R), and suppression (PD-1, CTLA-4). Outcomes measured included organ specific dysfunction, clinical infection, length of stay, unplanned ICU admission, and mortality.
**Results:** We included 38 patients undergoing cancer surgery, 22 (58%) of whom had received NACT. Patients in the NACT group had higher rates of post-operative cardiovascular (36% vs 6%, *p*-value = 0.05) and respiratory complications (59% vs 19%, *p*-value = 0.013), as well as a trend towards increased rates of infection (73% vs 50%, *p*-value = 0.2) and unplanned ICU admission (23% vs 0%, *p*-value = 0.061). No differences in immunophenotype were seen in unstimulated cells. Following stimulation, NACT was associated with higher expression of monocyte HLA-DR, and lower monocyte PD-L1 and IL-10. Additionally, CD4 IL-7R and CD8 CD28 expression were higher. However, chemotaxis marker CCR2 was lower among patients receiving NACT. Among patients without NACT, there was significant fall in monocyte count following surgery, but not among patients who received NACT.

**Significant groupwise differences in immunophenotype data**

| | NACT, *N* = 22 | No NACT, *N* = 16 | *p*-value |
|---|---|---|---|
| *Unstimulated, post-op sample* | | | |
| Monocyte Count | 0.7 (0.6, 0.9) | 0.5 (0.4, 0.7) | **0.020** |
| *Stimulated, pre-op sample* | | | |
| Monocyte HLADR | 8051.0 (1771.5, 14,629.8) | 969.5 (534.8, 9253.3) | **0.049** |
| CD4 IL7R | 630.0 (502.5, 753.5) | 546.0 (− 207.5, 620.5) | **0.041** |
| *Stimulated, post-op sample* | | | |
| Monocyte HLADR | 7145.5 (2,912.3, 8530.8) | 941.0 (661.0, 1840.8) | **0.025** |
| Monocyte CCR2 | 195.0 (0.1, 530.8) | 3054.5 (1145.3, 4346.8) | **0.036** |
| Monocyte IL10 | − 27.0 (− 76.9, 18.0) | 197.5 (− 0.6, 423.3) | **0.021** |
| Monocyte PDL1 | 182.5 (62.3, 358.3) | 540.5 (257.5, 722.5) | **0.043** |
| CD4 IL7R | 570.0 (480.0, 613.0) | 434.0 (− 70.9, 474.5) | **0.002** |
| CD8 CD28 | 3716.0 (3107.0, 4325.0) | 2728.0 (2624.0, 3253.0) | **0.048** |

**Conclusions:** Increased rates of post-operative complications were observed in patients who had received NACT prior to cancer surgery. However, their immunophenotypes contrasted with that seen in patients with sepsis-induced immunosuppression. Lower monocyte CCR2 and the lack of reduction in monocyte count following surgery suggest a different immune-mediated mechanism of post-operative complications.

**Reference(s)**
1. MRC (NA).
2. RCOA/BJA Project Grant (TACS).

**Topic:** Translational biology

## 001647

### Impact on the evolution of patients with major haemorrhage depending on their presentation during working hours or on call hours ("On-hours" versus "out-hours")

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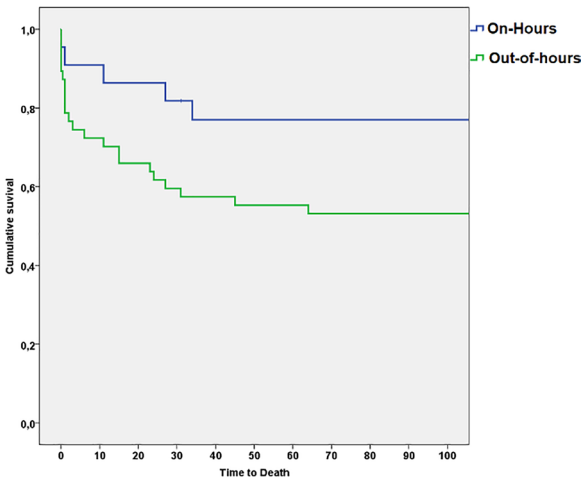
**Introduction:** The organization of hospital activity in our environment is based on a model using two work shifts. In the morning shift (08:00 a.m. to 3:00 p.m.) in which the entire on-site medical team is concentrated and the rest of the schedule (3:00 p.m. to 7:59 a.m.; as well as the weekend) in which medical care is offered through on-call teams (physical or localized).
**Objectives:** Our objective is to evaluate patients who present with major bleeding and their prognosis based on their presentation during working hours or out of hours at a second-level hospital.
**Methods:** Retrospective observational study of patients with severe bleeding in a second level hospital from 2022 to 2024. Qualitative variables were recorded as absolute number and percentage. Quantitative ones such as median and interquartile range. In the univariate analysis, the chi-square test, Man-Witney *U* test and Sperman test were performed depending on the variables to be contrasted. A Kaplan–Meier curve was designed to analyze mortality between the two groups.
**Results:** 69 patients had major bleeding. The median age was 66.7 (52.3–75.8) years. Most of the major hemorrhages occurred during "on-call hours" 47 (68.1%) and were mainly due to traumatic bleeding 21 (30.4%). No significant differences were observed in age, personal history of the patients, vital signs, analytical parameters or length of stay. Mortality was higher in the group that presented severe bleeding outside of working hours with 23 deaths (48.9%) vs. 5 that occurred during standard hours (22.7%); OR: 3.26 (95% CI: 1.03–10.28); $p = 0.039$. (Fig. 1).

| On-hours *n* = 22 (31.8%) | Out-of-hours *n* = 47 (68.1%) | *p* | |
|---|---|---|---|
| Age (years) | 70.3 (55.6–79.8) | 67.0 (47.2–73.5) | 0.281 |
| Diagnosis *n* (%) | 8 (36.4) | 13 (27.7) | 0.890 |
| Severe Trauma (21) | 4 (18.2) | 6 (12.8) | |
| G.I bleeding (10) | 2 (9.1) | 8 (17) | |
| Vascular surgery (10) | 5 (22.7) | 11 (23.4) | |
| GI surgery (16) | 2 (9.1) | 5 (10.6) | |
| Medical Coagulopathy (7) | 1 (4.5) | 4 (8.5) | |
| Urogyn Surgery (5) | | | |
| Men (%) | 14 (63.6) | 30 (63.8) | 0.988 |
| Ischemic disease (%) | 2 (9.1) | 8 (17.0) | 0.383 |
| CRD (%) | 4 (18.2) | 3 (6.4) | 0.130 |
| Cirrosis (%) | 2 (9.1) | 3 (6.4) | 0.686 |
| Neoplasia (%) | 5 (22.7) | 9 (19.1) | 0.731 |
| Antiaggregation (%) | 3 (13.6) | 9 (19.1) | 0.573 |
| Anticoagualation (%) | 6 (27.3) | 5 (10.6) | 0.079 |
| pH | 7.3 (7.1–7.3) | 7.2 (7.0–7.3) | 0.496 |
| Lactic (mEq/L) | 4.2 (1.7–7.1) | 3.8 (2.7–10.0) | 0.329 |
| Hb (gr/dL) | 9.1 (6.3–11.7) | 9.2 (7.5–10.5) | 0.726 |
| INR | 1.4 (1.1–1.8) | 1.4 (1.2–1.8) | 0.220 |
| Platelets | 171 (115–215) | 205 (135–275) | 0.169 |
| Ionic calcium | 1.0 (0.9–1.1) | 1.1 (1.0–1.2) | 0.230 |
| RBC (units)<br>(mL) | 4.0 (3.7–6.0)<br>800 (750–1200) | 5.0 (4.0–8.0)<br>1000.0 (800.0–1600.0) | 0.121<br>0.113 |
| FFP (units)<br>ml | 3.0 (0–3.0)<br>600.0 (600.0–1200.0) | 3 (0–5.0)<br>600.0 (600.0–1000.0) | 0.235<br>0.590 |
| Fibrinogen | 267.0 (180.0–350.0) | 250 (209.0–350.0) | 0.446 |
| Noradrenaline (%) | 10 (54.5) | 28 (59.6) | 0.697 |
| Deaths (%) | 5 (22.7) | 23 (48.9) | 0.039 |

**Conclusions:** Major bleeding developed during on-call hours was associated with mortality in our series. It's possible that unanalyzed factors could explain these results.




**(abstract 001647)** Survival analysis between "on hours" time and "out-hours" time

**Topic:** Transfusion and haemostasis disorders

## 001649

### Outcomes of octogenarian patients in an intensive care unit—district hospital epidemiological study

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001649

**Introduction:** With time, population pyramids have become progressively wider at the top, reflecting the ageing of the population, especially in European countries. Although several progresses have been made in chronic disease management and greater availability of less invasive forms of support, long-term morbidity and mortality rates for older patients admitted to the Intensive Care Unit (ICU) remain substantial.
**Objectives:** We aimed to study the local epidemiological and clinical outcomes of patients ≥ 80 years of age admitted to our ICU.
**Methods:** Our sample included patients in a mixed ICU model with level two and three care in a district hospital ICU from January 2018 to December 2022. All patients with age equal to or greater than 80 at admission were included. We evaluated patients' demographics, length of ICU and hospital stay, rate of ICU mortality and in-hospital hidden mortality.
**Results:** In the referred period, 2761 patients were admitted to our ICU. Our ICU median age in this period was 67 [56.0–76.0], and 16% ($n = 432$) were ≥ 80 years of age. 53.2% were admitted to level 2 treatment, usually limited to non-invasive ventilation, and only 1.2% of these were upgraded from level 2 to level 3 treatment. Most were medical admissions, generally due to infection or acute exacerbation of known comorbidities (53.7%, $n = 232$), followed by trauma patients (22.2%, $n = 96$), and then surgical patients (12% urgent surgery, 7.9% elective surgery). Mean APACHE predicted mortality of 35% (± 24.2), and SAPS II predicted mortality of 41.2% (± 25.7). The median ICU length of stay of octogenarians was 3 days [1.0–6.0] days, and the median duration of hospitalisation was 13 [7.0–13.0] days. The ICU mortality rate in the octogenarians was 26.1%, more significant than the ICU general mortality, calculated to be 19.7%. However, when considering only level 3 patients, mortality rises to 38.6% in this subpopulation. In 17.4%, an end-of-life decision was assumed, usually with a withdrawal approach. The hidden ICU mortality rate of octogenarian patients was 9.3%. In patients that survived hospitalisation episodes after ICU stay, mortality at one year was 16.8%.
**Conclusions:** ICUs have recently increasingly admitted more elderly patients, especially in mixed intensive care units. From our study, we can see that there is a higher mortality rate in this subpopulation, especially when considering a greater level of support, with a substantial hidden ICU mortality and mortality at one year. This may justify why most patients were admitted to level 2 treatment, with a small proportion escalating to level 3 treatment, avoiding inappropriate or disproportionate care and guaranteeing adequate end-of-life care. It would have also been essential to analyse these patients' morbidity and likely loss of function. Further investigation is also necessary to identify subgroups of patients that did particularly well and the accuracy of scoring systems to predict outcomes in these groups. Multidisciplinary meetings with input from palliative or geriatric medicine are vital for discussing the best care, and meetings with surgical teams are also deemed to define treatment limitations and prognosis before major surgery.

**Topic:** Health Services Research and Outcome

### 001650

### Fluid administration practices in adult intensive care units of saudi arabia: a multicenter-cross sectional study

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001650

**Introduction:** Intravenous fluids are one of the most common interventions in critically ill adult patients. However, inappropriate use of fluids occurs in approximately 20% of the patients. Volume overload is very common in critically ill patients, especially in the absence of a standardized approach to volume management and removal. Little is known regarding current fluid administration practices in adult critically ill patients in Saudi Arabia. Therefore, our objective is to determine the current fluid practices in adult intensive care units (ICUs).
**Objectives:** Determine the fluid administration practices in adult critically ill patients.
**Methods:** A national, observational, point prevalence study of critically ill patients was conducted on a single chosen day for each participating site during a 3-month period in the year 2022. The study included adult patients aged ≥ 18 years admitted to any adult ICUs and received any crystalloid or colloid fluid (bolus or maintenance) during the last 24 h of the screening time point. The study was approved by the local IRB of each center. The primary outcome was to describe current practices regarding the choice and use of fluid administration by ICU clinicians.
**Results:** Overall, 65 ICUs within 18 institutions participated in the study. A total of 726 critically ill patients were screened and 239 patients were enrolled. The median screening day from ICU admission was 6 days [2–68]. The median age was 52 years [18–100], and 58.2% were male. The median APACHE II was 17 [2–51], and SOFA was 6 [2–17]. During the study period, 58.6% of the patients were on mechanical ventilation, and 9.38% were on renal replacement therapy. Crystalloid was administered as bolus and maintenance in 30.1% and 72.4% of the patients, respectively; while colloid was administered as bolus and maintenance in 13% and 10.5 of the patients, respectively. The mean total volume of crystalloid administered as bolus and maintenance was 1213 mL [300–6045], and 1778 mL [240–4800], respectively. Impaired perfusion was the most common reason for crystalloid administration (44.5%). The mean total volume of colloid administered as bolus and maintenance was 456 mL [100–2500].and 200 mL [50–400], respectively. Volume resuscitation in septic shock was the most common reason for colloid administration (37%). We found 81.2% of the patient on a positive balance.
**Conclusions:** Crystalloids are more frequently used fluid than colloids. Practice patterns of fluid administration in Saudi Arabia are consistent with international practices.

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2. I would like to express my special thanks to all other co-author E.Alhaderbi, L.Aldawood, B.Aldakeel, S.Alzahrani, A.Alhuntush, R.AlMutairi,

S.Albajri, B.Adosari, M. ALfaifi, R. ALqahtani, N.Alkhani, J.Alghaith, H.Eltomy, A.alkeraidees, H.Alghamdi, R.Alamoudi, B.Alammash, S.Albakri, O.Abdul Haq

**Topic:** Sepsis

## 001651

## Computational modeling of prone positioning: initial validation of a new model

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001651

**Introduction:** High-fidelity computational models that capture key mechanisms of human pathophysiology offer a promising approach to investigate novel interventions for critical illness. In particular, they can augment the expensive, time consuming and logistically challenging work of conducting in vivo randomised control trials [1–2].
One such intervention, increasingly used in ARDS, is the use of a prone position [3]. While proning is not a novel intervention, its increased utilisation during the COVID-19 pandemic highlighted the many unanswered questions regarding its use. These questions range from when the intervention is best implemented, to the optimal duration of a proning session, to the supporting ventilation modalities which provide the most complementary effects [4–6]. Here, we present initial results on the development of a novel mechanistic cardiopulmonary model which can be used to investigate the above questions. As an initial validation, the model outputs have been compared to data from a patient with no respiratory history undergoing elective spinal surgery.
**Objectives:** To develop and validate a computational model of the physiological effect of prone positioning.
**Methods:** An established high-fidelity computational model of the cardiopulmonary system (Fig. 1) [7–8, and references therein] was adapted to capture the physiological changes that occur when patients are placed in the prone position. The model consists of 100 individually configurable alveolar compartments which allow for regional lung heterogeneity. To represent the impact of changing patient position, the alveolar units in the model needed to be given a spatial definition. Based on the work presented in [9–10], the lungs were divided into 10 coronal slices (Fig. 2). The mechanisms that lead to the regional changes due to the patient positioning were then added, considering the impact on the pulmonary circuit and alveolar compartments. To validate the model, clinical data was taken from a 68-year-old female undergoing elective spinal surgery. The patient had no respiratory history but did have a history of hypertension.
**Results:** Table 1 shows the supine and prone clinical data compared to the simulator outputs after the model was matched to the patient. The results show excellent agreement with the data points for both prone and supine positioning.

**Table 1 (abstract 001651)** Clinical Data vs Simulator Outcome for both prone and supine positions. Pmean—mean airway pressure. VT—tidal volume

| | Supine (measurement 15 min post-intubation) | | | | Prone (measurement 25 min post-proning) | | | |
|---|---|---|---|---|---|---|---|---|
| | Patient data | Model output | Absolute error | Absolute % error | Patient data | Model output | Absolute error | Absolute % error |
| PaO2 (kPa) | 33.10 | 33.04 | 0.06 | 0.18 | 27.70 | 27.88 | 0.18 | 0.65 |
| PaCO2 (kPa) | 4.62 | 4.61 | 0.01 | 0.22 | 4.21 | 4.21 | 0.00 | 0.00 |
| pH | 7.45 | 7.44 | 0.01 | 0.13 | 7.47 | 7.47 | 0.00 | 0.00 |
| Pmean (cmH2O) | 9.0 | 9.4 | 0.4 | 4.26 | 10.0 | 9.3 | 0.7 | 7.53 |
| VT (ml) | 420.0 | 418.6 | 1.4 | 0.33 | 415.0 | 416.7 | 1.7 | 0.41 |

**Conclusions:** The presented computational model is able to accurately capture the physiological changes caused by moving a patient with no respiratory pathophysiology from the supine to the prone position. The next stage of the study will extend the model to represent the effects of proning in patients with acute respiratory failure, ultimately leading to a tool that can be used to conduct research into the optimisation of prone positioning.

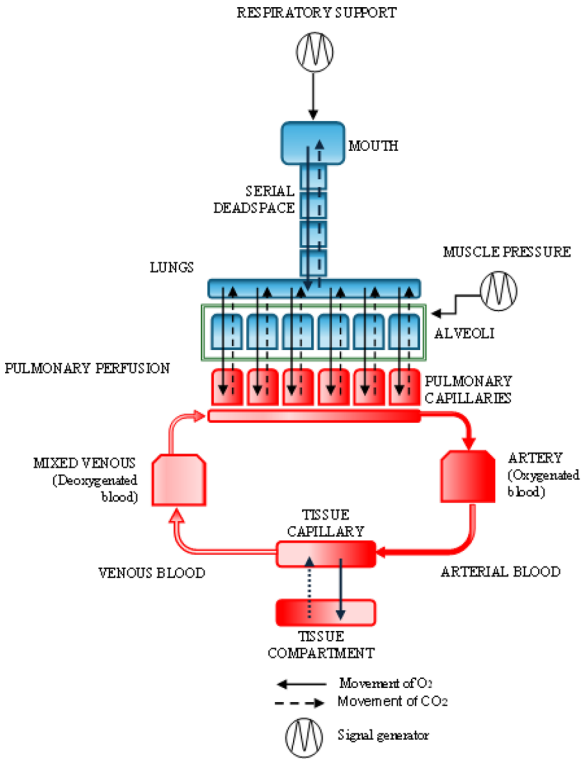


**Fig. 1 (abstract 001651)** Graphical representation of the cardiopulmonary simulator

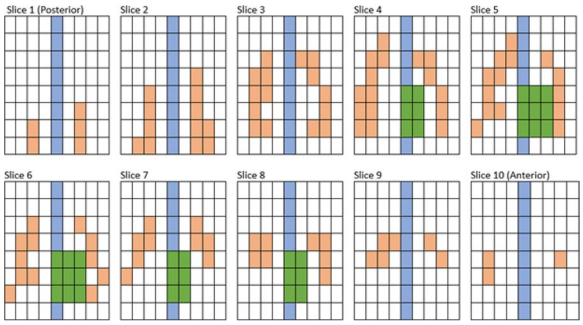


**Fig. 2 (abstract 001651)** Coronal lung slices implemented to the cardiopulmonary model. Spatial positioning of the alveolar compartments (orange), heart (green), and mediastinum (blue) are highlighted

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001654

## Epidemiology, incidence and predictors for developing nosocomial pneumonia in the surgical ICU—a single centre study

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**Introduction:** Nosocomial pneumonia (NP), including hospital-acquired pneumonia (HAP) and ventilator-associated pneumonia (VAP), represents a complex and challenging clinical phenomenon that demands a profound understanding of epidemiological, pathophysiological, and therapeutic aspects, particularly within intensive care units. This clinical entity is further complicated by the escalating prevalence of multidrug-resistant strains causing nosocomial infections.
**Objectives:** To present the epidemiological situation and incidence of nosocomial pneumonia in the intensive care unit (ICU) of the Emergency Center at the University Clinical Center of Serbia and to identify potential predictors for the development of nosocomial pneumonia.
**Methods:** The study was designed as a retrospective cohort study that includes patients treated for three days and more from June 2023 to January 2024 at the central surgical ICU of the Emergency Center (EC) at the University Clinical Center of Serbia. All necessary data were obtained from the EC electronic information system. The primary outcomes of interest were the development of nosocomial pneumonia and mortality. Secondary outcomes were days on invasive mechanical ventilation, vasopressors, and ICU stay, as well as a hospital stay. Analytical and descriptive statistical methods were used in data processing.
**Results:** A total of 129 patients were enrolled in the study. The patient characteristics are demonstrated in Table 1. The microbiology of causative agents of NP are shown in Table 2. Of those parameters that were explored to be associated with NP, only chronic kidney disease (CKD), acute kidney injury (AKI) and invasive mechanical ventilation (IMV) have shown statistically significant differences (Table 3.). We performed univariable and multivariable logistic regression analysis (CKD, AKI and IMV); in multivariable CKD (odds ratio [OR], 2.35; 95% CI, 0.809–6.85) AKI (OR, 7.1; 95% CI, 2.08–24.04) and IMV (OR, 3.62; 95% CI, 1.37–9.58) are independently associated with the development of nosocomial pneumonia. Patients who developed NP had statistically significant higher mortality, stayed longer in the ICU and hospital, and also had more days on IMV and vasopressors (Table 4.).
**Conclusions:** Nosocomial pneumonia increases mortality and extends stay in the ICU and hospital among the patients in the ICU. Also, patients who developed NP had had more days on IMV and vasopressors. Only 7.93% of isolates did not have resistance to antibiotics, and the most frequent cause of pneumonia is *Acinetobacter spp.* CKD, AKI and IMV are independently associated with developing nosocomial pneumonia.

**Table 2 (abstract 001654)** The microbiology of causative agents of nosocomial pneumonia.

| Microorganism | Drug resistance | | | | |
|---|---|---|---|---|---|
| | Total, N(%) | MDR, N(%) | XDR, N(%) | PDR, N (%) | No resistance, N(%) |
| *Pseudomonas spp.* | 8 (12.70) | 3 (4.76) | 5 (7.94) | 0 (0) | 0 (0) |
| *Providencia spp.* | 4 (6.35) | 0 (0) | 4 (6.35) | 0 (0) | 0 (0) |
| *E. coli* | 1 (1.59) | 1 (1.59) | 0 (0) | 0 (0) | 0 (0) |
| *Proteus spp.* | 1 (1.59) | 0 (0) | 0 (0) | 1 (1.59) | 0 (0) |
| *Klebsiella spp.* | 5 (7.94) | 2 (3.17) | 2 (3.17) | 0 (0) | 1 (1.59) |
| *Acinetobacter spp.* | 40 (63.49) | 3 (4.76) | 35 (55.56) | 0 (0) | 2 (3.17) |
| *Stenotrophomonas spp.* | 2 (3.17) | 0 (0) | 2 (3.17) | 0 (0) | 0 (0) |
| *Serratia spp.* | 2 (3.17) | 0 (0) | 0 (0) | 0 (0) | 2 (3.17) |

spp – species; MDR – multi-drug resistance; XDR - extensively drug-resistant; PDR - pandrug-resistant

**Table 3 (abstract 001654)** Sociodemographic and clinical characteristics of patients.

| Variable | No nosocomial pneumonia | HAP | VAP | p-value |
|---|---|---|---|---|
| Gender | | | | |
| Male, N(%) | 44 (55) | 8 (80) | 26 (66.7) | ns |
| Female, N(%) | 36 (45) | 2 (20) | 13 (33.3) | ns |
| Age (x̄ ± SD) (years) | 56.4 ± 18.5 | 64.6 ± 16.7 | 55.3 ± 20.5 | ns |
| Previous surgery | | | | |
| Emergency surgery, N(%) | 60 (75.9) | 6 (66.7) | 31 (81.6) | ns |
| Elective surgery, N(%) | 19 (24.1) | 3 (33.3) | 7 (18.4) | ns |
| Previous hospitalization, N(%) | 22 (27.5) | 0 (0) | 11 (28.2) | ns |
| Comorbidity | | | | |
| Pulmonary, N(%) | 5 (6.3) | 1 (10) | 2 (5.1) | ns |
| Cardiovascular, N(%) | 40 (50) | 8 (80) | 21 (53.8) | ns |
| DM, N(%) | 16 (20) | 0 (0) | 8 (20.5) | ns |
| Neurological, N(%) | 8 (10) | 1 (10) | 8 (20.5) | ns |
| Cirrhosis, N(%) | 1 (1.3) | 1 (10) | 1 (2.6) | ns |
| CKD, N(%) | 8 (10) | 4 (40) | 10 (25.6) | 0.014 |
| Comorbidity number | | | | |
| Less than 2, N(%) | 35 (43.8) | 2 (20) | 14 (35.9) | ns |
| 2 or more, N(%) | 45 (56.3) | 8 (80) | 25 (64.1) | ns |
| AKI, N(%) | 4 (5) | 2 (20) | 14 (35.9) | 0.000 |
| IMV, N(%) | 47 (58.8) | 9 (90) | 33 (84.6) | 0.005 |

CKD - chronic kidney disease ; AKI - acute kidney injury; IMV - invasive mechanical ventilation; HAP – hospital-acquired pneumonia; VAP – ventilator-associated pneumonia

**Table 4 (abstract 001654)** Patient outcomes by the development of nosocomial pneumonia.

| | No nosocomial pneumonia | HAP | VAP | p-value |
|---|---|---|---|---|
| Days in hospital, x̄ (IQR) | 12.75 (8.75) | 34.10 (47.50) | 25.63 (23.25) | <0.05 |
| Days in ICU, x̄ (IQR) | 7.34 (3.75) | 23.00 (17.75) | 24.08 (16.75) | <0.05 |
| Days on IMV, x̄ (IQR) | 2.30 (4.00) | 13.30 (6.00) | 19.92 (11.75) | <0.05 |
| Days on vassopressors, x̄ (IQR) | 1.712 (3.00) | 6.2 (5.50) | 9.56 (9.00) | <0.05 |

HAP – hospital-acquired pneumonia; VAP – ventilator-associated pneumonia; IQR – interquartile range; ICU – intensive care unit; IMV – invasive mechanical ventilation

**Table 1 (abstract 001654)** The patient characteristics included in the study.

| Variable | Value |
|---|---|
| Gender | |
| Male, N(%) | 78 (60.5) |
| Female, N(%) | 51 (39.5) |
| Age (x̄ ± SD) (years) | 56.7 ± 18.9 |
| Type of HAP | |
| No HAP, N(%) | 80 (62) |
| HAP, N (%) | 10 (7.8) |
| VAP, N (%) | 39 (30.2) |
| MDR, N(%) | 50 (100) |
| MDR present, N(%) | 1 (2) |
| No MDR, N(%) | 49 (98) |

HAP – hospital-acquired pneumonia; VAP – ventilator-associated pneumonia; MDR – Patient with multi-drug resistant isolates

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2. There is no grant acknowledgment.

**Topic:** Infections and prevention

## 001655

### Prognostic role of right ventricular dysfunction assessed by speckle tracking and strain rate echocardiography

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**Introduction:** Hemodynamic assessment of tseptic shock (SS) patients has a paramount role. A mixed shock hemodynamic profile on these patients is a frequent finding and is related to isolated and bi-ventricular dysfunction. LV Dysfunction has been extensively studied with conventional and speckle-tracking echocardiography (STE) and related to clinical outcomes. Nevertheless, the prognostic role of RV dysfunction in this population of patients has been undervalued despite its great relevance due to direct interactions with other organs and potential implications with therapeutic strategies.
**Objectives:** To assess the prevalence of RV and LV dysfunction in SS assessed by STE, which RV strain parameter better correlates to prognosis in these patients, and whether myocardial dysfunction assessed by STE is associated with ICU mortality.
**Methods:** We included consecutive patients with SS criteria undergoing mechanical ventilation and performed echocardiography in the first 24 h and a control echocardiography between day 3–5 of ICU admission.
**Results:** From January 2020 to November 2023, we included 72 patients in the analysis. Among patients, 80% were male, mean age 61 ± 12, most frequent foci of infection were lung (32%) followed by the abdomen (26%). ICU mortality was 30%, 44% of the patients had RV Failure according to conventional methods and 61% with STE. When comparing the two echo measurements STE worsening was associated with ICU mortality (mean change − 2.3) and Hospital

mortality (mean change − 2.1), with logistic regression analysis RV Dysfunction assessed by STE was associated with ICU mortality (OR = 3.23, 95% CI, 1.12–9.32, $p = 0.030$) and hospital mortality (OR = 2.86, 95% CI, 1.02–7.98) $p = 0.007$. LV STE was not associated with mortality.
**Conclusions:** Speckle tracking echocardiography seems to be more accurate to detect RV dysfunction in SS Patients than conventional methods. RVFWS impairment was associated with ICU and hospital mortality.

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**Topic:** Cardiovascular issues in ICU

## 001656

### Impact of medical nutrition therapy in obese critically ill

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**Introduction:** Critically ill obese patients have anthropometric characteristics that could give them different nutritional-metabolic requirements than other critically ill patients.
**Objectives:** To evaluate the impact of caloric-protein intake in critically obese patients.
**Methods:** Multicenter prospective observational study (NCT:03634943). Adult patients who required medical nutrition therapy (MNT) were included and obese patients (BMI $\geq 30$ kg·m$^{-2}$) were analyzed. Demographic data, comorbidities, nutritional status, the average caloric-protein intake administered during the first 14 days and its complications, and outcomes, were recorded in a database (RedCAP®). Patients were classified and analyzed based on the adequacy of caloric and protein intake according to the recommendations of clinical practice guidelines. Univariate and multivariate analysis was performed using SPSS 25.0.
**Results:** 525 patients were included in the database. From those, 150 (28.6%) were obese. The caloric intake was considered inadequate (< 11 kcal/Kg/d) in 30.67% ($n = 46$), while 69.33% ($n = 104$) was adequate ($\geq 11$ kcal/Kg/d). The protein intake was inadequate (< 0.8 g prot/Kg/day) in 63.33% ($n = 95$), insufficient (0.8–1.2 g prot/Kg/day) in 31.33% ($n = 47$) and adequate ($\geq 1.2$ g prot/Kg/d) only in 5.33% ($n = 8$). Obese patients with an adequate caloric intake had a higher incidence of neoplasia (6.52% vs 23.1%; $p = 0.028$), a tendency towards lower organ failure upon admission (SOFA $8.2 \pm 3.6$ vs $7.3 \pm 3.4$; $p = 0.15$) and a higher use of parenteral nutrition (PN) (4.35% vs 22.12%; $p = 0.014$). Although the average hospital stay (days) was longer ($28.62 \pm 26.04$ vs $39.29 \pm 28.08$; $p = 0.032$), they had lower mortality in the ICU (32.61% vs 16.5%; $p = 0.046$).
Obese patients with an inadequate protein intake, in relation to those who received an insufficient or adequate intake, were younger ($60.12 \pm 13.06$ vs $67.04 \pm 12.5$ vs $67.5 \pm 17.86$ years; $p = 0.009$) and had lower use of PN (12.63% vs 19.15% vs 50%; $p = 0.027$). Obese showed a worse protein intake had a higher mortality in the ICU (25.53% vs 14.89% vs 12.5%; $p = 0.002$).
The multivariate analysis showed that obese patients with adequate caloric intake (HR:0.398; 95% CI: 0.180–0.882; $p = 0.023$) had better survival, while patients with insufficient protein intake (HR:0.404; CI 95%:0.171–0.955; $p = 0.038$) had better survival than those with inadequate intake.
**Conclusions:** In our population, an inadequate caloric-protein intake was observed according to clinical practice guidelines and this negatively impacts its evolution. Patients with an adequate caloric intake have better survival and an insufficient protein intake increases their mortality. Strategies should be developed to optimize MNT in the subgroup of critically obese patients.

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**Topic:** Metabolism, endocrinology, liver failure and nutrition

## 001658

### Pendelluft during a spontaneous breathing trial and its association with inflammatory biomarkers

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**Introduction:** Pendelluft is a potentially injurious inspiratory pattern characterized by volume displacement from non-dependent to dependent lung regions during spontaneous breathing, which may lead to an increase in regional transpulmonary pressure and strain (1). It has been demonstrated an association between pendelluft magnitude and an increase in inflammatory biomarkers in acute distress respiratory syndrome (ARDS) patients resuming spontaneous breathing (2). ARDS patients are prone to develop vigorous effort, and, therefore, pendelluft, during ventilatory weaning and spontaneous breathing trials (SBT). Physiological determinants of pendelluft during an SBT and its association with an inflammatory response have not been evaluated.
**Objectives:** To determine the development of pendelluft and its physiological determinants during an SBT and to explore the potential association between pendelluft and an inflammatory response.

**Methods:** Adult ARDS patients who met the criteria for a SBT were evaluated during a T-tube trial. Pendelluft was quantified as the percentage of volume displaced from non-dependent to dependent lung regions during inspiration using electrical impedance tomography. Respiratory effort variables were obtained, including esophageal pressure swing (ΔPes) and pressure time product per minute (PTPmin). Pendelluft and physiological variables were measured at baseline (during pressure support ventilation) and during SBT each 30 min. Plasma inflammatory biomarkers were obtained at baseline and at the end of the T-tube trial. The association between pendelluft and ΔPes and PTPmin was evaluated with mixed-effect models. Correlation between pendelluft and inflammatory biomarkers was assessed with Pearson's test.
**Results:** Twelve ARDS patients were included (60 ± 12 years old, PaO2/FiO2 301 ± 93 mmHg, 8 ± 5 days of mechanical ventilation). Two patients exhibited SBT failure criteria and were reconnected to mechanical ventilation; the other 10 patients successfully completed a 2-h trial. The mean of magnitude pendelluft increased during the trial (7.6 ± 7% at baseline vs 11.9 ± 8% at 30 min of T-tube trial, $p = 0.002$) and it was associated with both ΔPes and PTPmin ($\beta = -0.699$, $p < 0.0001$ for ΔPes; $\beta = 0.0388$, $p < 0.0001$ for PTPmin). Although no differences were observed in any inflammatory biomarker between the beginning and the end of the trial, the change in frequency of ventilatory cycles with high-magnitude pendelluft (> 25% of volume displacement) between baseline and SBT was correlated with the change in IL-8 concentration (R2 0.41; $p = 0.02$).
**Conclusions:** Inspiratory effort is a determinant of pendelluft during SBT. The change in frequency of high-magnitude pendelluft is associated with the change of IL-8 during SBT, suggesting a potential impact of pendelluft in the inflammatory response of ARDS patients during spontaneous breathing.

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001659

### Effects of elevating the head of the bed and body mass index on interface pressure in the sacral and occipital regions of patients in the Intensive Care Unit

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001659

**Introduction:** Patients in the Intensive Care Unit, especially those using invasive mechanical ventilation, have a high risk of developing pressure injuries1. Supine positioning and prolonged immobilization are the main risk factors for its development, in addition to factors related to shear, friction, nutrition and humidity2. Frequent repositioning and the use of support surfaces, which reduce and redistribute the interface pressure between the patient and the bed, are some of the strategies implemented for prevention3. Regarding the effect of body mass index (BMI) on interface pressure at different locations of bone prominences, the literature is divergent, and most studies were carried out with healthy individuals4. Furthermore, another aspect that presents divergence in the literature is the ideal degree of elevation of the head of the bed, as the need to maintain the elevation of the head of the bed from 30º to 45º has been questioned to prevent pneumonia associated with mechanical ventilation, in addition to the effects that this can cause to lung mechanics5.
**Objectives:** To evaluate the effect of different degrees of elevation of the head of the bed and body mass index on the interface pressure between the patient and the bed surface.
**Methods:** Pilot randomized clinical trial, carried out in a Respiratory Intensive Care Unit with adult patients, on invasive mechanical ventilation and eligible for ventilatory weaning at Hospital das Clinicas HCFMUSP, Faculdade de Medicina, Universidade de Sao Paulo, Sao Paulo, SP, BR. Patients were positioned in the supine position at 0°, 10°, 20°, 30° and 40°, for 10 min in each position. Interface pressure was measured continuously using the XSENSOR pressure mapping system (XSENSOR Technology Corporation, Calgary, Canada), and the sacral and occipital areas were analyzed. Sociodemographic and clinical data were acquired from the patient's electronic medical record. The study was approved by the Ethics and Research Committee of the Hospital das Clinicas HCFMUSP, protocol nº68464523.9.0000.0068. For data analysis, the linear mixed-effects model was used in the software R (R Foundation for Statistical Computing, Vienna, Austria; http://www.r-project.org), with $p$ values < 0.05 being considered statically significant.
**Results:** Data from ten patients who represented the pilot sample of the study were analyzed. 50% of participants were male. The median Braden score was 10 points and the BMI was 32.6. The average number of days intubated on the day of data collection was 3 days (SD 2.5). Regarding the interface pressure peaks identified in each region, in the horizontal supine position at 0º, the mean interface pressure was 25.7 (SD 15.8) in the occipital region and 39.8 (SD 14.6) in the sacral region, at 10º it was 24.4 (SD 14.6) in the occipital and 45.7 (SD 19.5) in the sacral, the 20th was 17.6 (SD 8.6) in the occipital and 48.1 (SD 17.9) in the sacral and the 30th was 20.3 (SD 10.4) in the occipital and 47.9 (SD 18.6) in the sacral. From the Linear Mixed Model (LMM), considering the degrees of head elevation, BMI and region as predictors, we have no evidence that head elevation changes interface pressure ($p = 0.934$), we have weak evidence of an association between BMI and interface pressure ($p = 0.063$) and strong evidence that pressure is different depending on the region, in this case, comparing the occipital and sacral regions ($p < 0.0001$). Comparing each of the 10º ($p = 0.572$), 20º ($p = 0.964$) and 30º ($p = 0.731$) decubitus positions with the horizontal dorsal decubitus position at 0º, we also have no evidence that they are different. Regarding BMI, for every 1 kg/m, the interface pressure increases by an average of 1.1 mmHg and the sacral region has a peak pressure 23.4 units higher than the occipital region on average.
**Conclusions:** In the pilot clinical trial, we did not identify evidence that the degrees of elevation of the head of the bed have a significant change with the interface pressures between the patient and the surface of the bed. We also showed a weak association between BMI and interface pressures in the sacral and occipital regions and between these regions, we obtained a significant difference in the behaviour of interface pressures. Our limitation is the sample of patients, which only included pilot cases. Furthermore, these results highlighted the importance of evaluating these aspects in critically ill patients, of considering other aspects of mechanical forces that may influence and the influence of the support surface used.

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**Topic:** Nursing care and physiotherapy

## 001660

### Targeting low-value care to reduce healthcare-associated carbon emissions: Reducing the unnecessary use of intermittent pneumatic compression in intensive care

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**Introduction:** 30% of carbon emissions from hospital clinical care are a result of the delivery of low-value care. Intensive care (ICU) is a major contributor to waste production. Waste associated with ICU care delivery could be reduced by identifying low-value care. Use of intermittent pneumatic compression (IPC) may be one such care practice. IPC are used in ICU to reduce venous thromboembolism (VTE) risk, but literature suggests there is no additional benefit in IPC as an adjunct to VTE chemical prophylaxis in critically ill patients.
**Objectives:** 1. Perform a carbon footprint analysis of IPC; 2. Assess change in usage of IPC prior to and following implementation of an education package to guide IPC prescription; 3. Determine waste production, greenhouse emissions and financial costs associated with changes in IPC use.
**Methods:** In this before-and-after study, the use of IPC were audited in a 58-bed level III ICU over a 3-month period, before and after the implementation of an educational intervention. Education included in-person staff education, posters, relocation of IPC stock to limit access, and an IPC prescription tool. Change in the number of IPC used, appropriateness of use, change in waste production, carbon emissions and financial cost will be reported.
**Results:** A bottom-up process-based carbon footprinting analysis was performed for IPC materials. Emissions, product weight and cost associated with a single pair of IPC were 453.44gCO2e, 124.704 g and $17.46, respectively. The audit conducted prior to educational intervention demonstrated IPC were used unnecessarily in 55.2% of cases (32/58), equating to emissions of 11.79KgCO2e, 3.99 kg of waste and a cost of $558.72 in a 3-month period. Results to date of the post-educational intervention audit demonstrate IPC were used unnecessarily in only 3 of 20 (15%) cases, equating to emissions of 1.360KgCO2e, 0.374 kg of waste and a cost of $52.38 in a 3-month period. This demonstrates an overall reduction in unnecessary use of IPC by 90.6%.
**Conclusions:** A multi-faceted approach to staff education has reduced the number of IPCs used inappropriately. This comes with greenhouse gas emissions and financial saving. Reducing low-value care provision can work to reduce the carbon footprint of low-value clinical care delivered in the ICU setting.

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**Topic:** Nursing care and physiotherapy

## 001661

### Unmasking the virulence and molecular mechanisms of Infectious Endocarditis Induced by an Escherichia coli serotype O25b:H4-B2-ST131

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**Introduction:** Infectious endocarditis (IE) is a low-frequency disease with high mortality. Grampositive bacteria are frequently isolated from the majority of IE cases. Etiology, however, differs according to local epidemiology (1). E. coli is the most common bacteria isolated from human and animal gastrointestinal systems (2). Extraintestinal pathogenic Escherichia coli (ExPEC) is the leading cause of bacteremia worldwide, in which O serotype 25 has been reported as the most ubiquitous, and as etiology of urinary tract infections (UTI) (3). Moreover, the prevalence of Extended-spectrum β-lactamase producing E. coli (ESBL-EC) has increased in recent years (4). However, IE caused by Extended-spectrum β- lactamase producing E. coli (ESBL-EC) is rare (1,5,6) and evidence is limited, making it important to understand the physiopathologic and virulence involved in this infection (7).
**Objectives:** Describe the genomic, resistome, and potential molecular mechanisms of an ESBLEC bacteremia with a secondary IE of the native mitral valve.
**Methods:** Genomic DNA was isolated from the cultivated E. coli using a DNeasy UltraClean Microbial Kit DNA isolation kit (QIAGEN) following the manufacturer's instructions. Subsequently, it was sequenced using Oxford Nanopore technologies using the ligation sequencing kit SQK-LSK109 and a flow cell R9.4.1. Guppy tool was used to basecall Fast5 to Fastq files, quality preprocessing, and adapter removal. The Fastq file from sequencing was assembled using the Fyle v2.9 tool with default parameters. Assessment of assembly quality was performed with CheckM v1.1.3. Taxonomic assignment was performed with GTDB-Tk. Identification of molecular markers of interest, such as ARG and virulence factors, was performed using the web server of center genomic epidemiology (https://www.genomicepidemiology.org/services/), as follows: SerotypeFinder v2.0 to identify serotypes from isolates of E. coli (8), ResFinder 4.1 to identify AMG (9), VirulenceFinder 2.0 to detect acquired virulence genes (10) and PathogenFinder 1.1, a tool for prediction of a bacteria's pathogenicity towards human hosts (11). The assembly and subsequent quality assessment showed an assembly consisting of three contigs totaling 5,480,739 (5.4 Mb), which agrees with the reported size of the E. coli genome (4.5–5.5 Mb). An N50 value of 5,333,733 was found, indicating that the assembled genome was reasonably complete. The taxonomic assignment corresponding to Escherichia coli was confirmed with GTDBTk (12). The fliC gene was found with 100% of coverage and 100% identity, indicating an H_type (H4 serotype), as well as two copies of the wzx gene

with 100% of coverage and 95.79% identity, indicating an O_type (O25 serotype). Finally, this isoplate was typed as ST-131, a predominant E. coli lineage among ExPEC. However, a lost of identity (99.77%) was identified in mdh gene, being an indicator of genetic diversity.

**Results:** Understanding the importance of early, real-time genotyping and molecular characterization of E. coli strains with the potential to cause IE could represent the future of clinical practice. Knowledge of the virulome allows us to identify genes that encode virulence factors, such as adhesins (fimH, iha, AslA, papC, fdeC, hra), involved in bacterial adhesion to host tissues, facilitating the colonization of damaged areas of the valves. or the endothelium, a critical event in the onset of endocarditis. Another set of genes identified is related to iron acquisition (iucC, iutA, sitA) and genes for siderophores (fyuA, iutA, usp, yfcV), involved in the uptake and release of host iron. Since bacteria require iron for growth and replication, this ability contributes to their survival and persistence in the heart, where iron availability may be limited. These findings suggest a pathological cascade that involves direct contact with the endocardium mediated by multiple adhesion factors in E. coli, triggering an imbalance in the immune response that leads to the destruction of valvular structures and creates an environment conducive to the development of endocarditis.

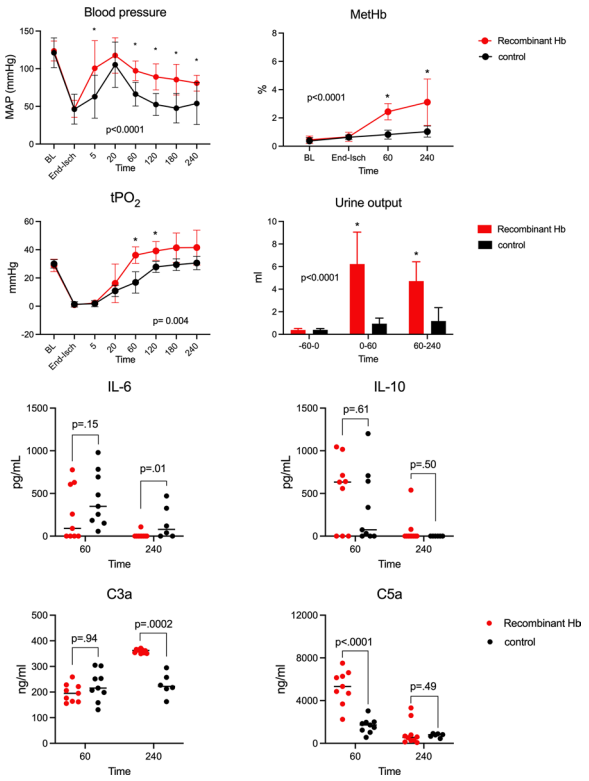
**Conclusions:** IE caused by E. coli lacks detailed descriptions, particularly regarding the characterization of its virulence mechanisms. In ESBL-EC, several genes are involved in the pathological progression of IE from UTI. Understanding the importance of early and real-time molecular virulome and resistome characterization of E. coli strains in bloodstream infections could improve the risk evaluation for developing IE and maybe the future of clinical practice.

**Table 1 (abstract 001661)** Antibiotic resistome of E. coli.

| CLASS | *Antimicrobial* | Match* | Genetic background |
|---|---|---|---|
| BETA-LACTAM | *Aztreonam* | 2 | blaCTX-M-15 (blaCTX-M-15_AY044436) |
| | *Cefotaxime* | 2 | blaCTX-M-15 (blaCTX-M-15_AY044436) |
| | *Amoxicillin+clavulanic acid* | 3 | blaOXA-1 (blaOXA-1_HQ170510) |
| | *Ceftazidime* | 2 | blaCTX-M-15 (blaCTX-M-15_AY044436) |
| | *Ampicillin* | 3 | blaOXA-1 (blaOXA-1_HQ170510), blaCTX-M-15 (blaCTX-M-15_AY044436) |
| | *Ampicillin+clavulanic acid* | 3 | blaOXA-1 (blaOXA-1_HQ170510) |
| | *Piperacillin+tazobactam* | 3 | blaOXA-1 (blaOXA-1_HQ170510) |
| | *Ticarcillin* | 2 | blaCTX-M-15 (blaCTX-M-15_AY044436) |
| | *Piperacillin* | 3 | blaOXA-1 (blaOXA-1_HQ170510), blaCTX-M-15 (blaCTX-M-15_AY044436) |
| | *Ceftriaxone* | 2 | blaCTX-M-15 (blaCTX-M-15_AY044436) |
| | *Amoxicillin* | 3 | blaOXA-1 (blaOXA-1_HQ170510), blaCTX-M-15 (blaCTX-M-15_AY044436) |
| | *Cefepime* | 3 | blaOXA-1 (blaOXA-1_HQ170510), blaCTX-M-15 (blaCTX-M-15_AY044436) |
| AMINOGLYCOSIDE | *Netilmicin* | 2 | aac(6')-Ib-cr (aac(6')-Ib-cr_DQ303918) |
| | *Dibekacin* | 2 | aac(6')-Ib-cr (aac(6')-Ib-cr_DQ303918) |
| | *Tobramycin* | 2 | aac(6')-Ib-cr (aac(6')-Ib-cr_DQ303918), aac(3)-IIa (aac(3)-IIa_CP023555) |
| | *Sisomicin* | 2 | aac(6')-Ib-cr (aac(6')-Ib-cr_DQ303918) |
| | *Gentamicin* | 2 | aac(3)-IIa (aac(3)-IIa_CP023555) |
| | *Amikacin* | 2 | aac(6')-Ib-cr (aac(6')-Ib-cr_DQ303918) |
| QUINOLONE | *Ciprofloxacin* | 3 | aac(6')-Ib-cr (aac(6')-Ib-cr_DQ303918) gyrA (p.S83L) |
| | *Fluoroquinolone* | 2 | aac(6')-Ib-cr (aac(6')-Ib-cr_DQ303918) |
| | *Nalidixic acid* | 3 | gyrA (p.S83L), gyrA (p.D87N) |
| TETRACYCLINE | *Tetracycline* | 2 | tet(A) (tet(A)_AJ517790) |
| | *Doxycycline* | 2 | tet(A) (tet(A)_AJ517790) |
| PEROXIDE | *Hydrogen peroxide* | 1 | sitABCD (sitABCD_AY598030) |
| AMPHENICOL | *Chloramphenicol* | 1 | catB3 (catB3_U13880), catB3 (catB3_AJ009818) |

* 1: Match < 100% ID AND match length < ref length; 2: Match = 100% ID AND match length < ref length; 3: Match = 100% ID AND match length = ref length

**Table 2 (abstract 001661)** Virulence factors and physiopathological mechanisms for IE.

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**Topic:** Sepsis

## 001662

### Double cycling during partial support ventilation in hypoxemic patients resuming spontaneous breathing: is it a problem?

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**Introduction:** Double cycling asynchrony has been associated with lung and diaphragm injury in mechanically ventilated hypoxemic patients, mainly during volume- and pressure-targeted time-cycled modes.
**Objectives:** We aimed to identify double cycling with breath stacking during neurally-adjusted ventilatory assist (NAVA), proportional assist ventilation (PAV+) and pressure support ventilation (PSV) in hypoxemic patients resuming spontaneous breathing. Subsequently, to assess the risk of muscle and lung injury, we compared inspiratory effort, tidal volume, regional stretch and pendelluft magnitude in cycles with double cycling versus normal breaths.
**Methods:** Data from a crossover study of twenty patients during NAVA, PAV+and PSV (for 20-min each), were analyzed (1). Airway pressure, flow and esophageal pressure were recorded using a pneumotachometer (FluxMed MBMED®). Regional ventilation was quantified using electrical impedance tomography (EIT, Enlight 1800, Timpel Medical®). Double cycling was defined as two consecutive ventilator cycles separated by an expiratory time less than one-half the mean inspiratory time using pressure and flow waveforms (2), by experts blinded to the inspiratory effort and EIT analysis. Breath-stacking was detected when the early second insufflation occurred before complete exhalation of the previous one. We analyzed the muscular pressure (Pmus), tidal volume, regional inflation (change of impedance at non-dependent and dependent regions) and pendelluft (percentage of volume displaced from non-dependent to dependent lung regions during inspiration) in cycles with double cycling compared to an average of the 5 previous normal breaths. Analyses were performed in Stata v 14.0.
**Results:** The patients had 9 [5–14] days on mechanical ventilation. Respiratory system was 38 [30–47] mL/cmH2O and PaO2:FiO2 ratio 275 ± 46 mmHg. Tidal volume was ~ 7.4 mL/Kg PBW and PEEP 10 [7–12] cmH2O. The incidence of double cycling was lower than 1% for each mode. Only 11 patients in NAVA, 7 in PAV+and 8 in PSV presented double cycling with breath stacking. Pmus was higher in cycles double cycling compared with normal breaths in NAVA (15.0 [9.2–17.6] cmH2O vs 11.6 [8.9–13.9] cmH2O, $p = 0.003$) and PSV (13.3 [11.1–16.0] cmH2O vs 11.1 [7.7–12.8] cmH2O, $p = 0.0017$). but not in PAV+ (17.5 [13.5–21.6] cmH2O vs 14.1 [12.1–21.0] cmH2O, $p = 0.2402$). On the other hand, double cycling was not systematically associated with higher tidal volume (Fig. 1), regional stretch or higher pendelluft magnitude compared with normal breaths. Anyway, in each mode at least one cycle with double cycling and breath stacking increased tidal volume higher than 12 ml/kg IBW.
**Conclusions:** Double cycling with breath stacking is an infrequent event during NAVA, PAV+and PSV. However, in case of a higher incidence during spontaneous modes, this asynchrony could augment the risk of myotrauma more than lung injury, due to the increase in inspiratory effort and eccentric contractions.

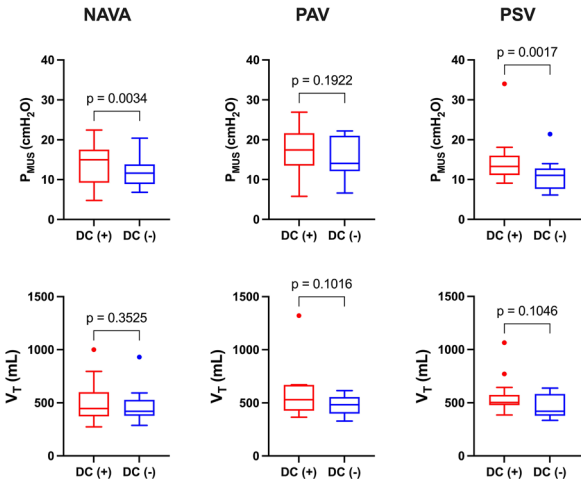


**Fig. 1 (abstract 001662)** Comparison of muscular pressure and tidal volume between cycles with double cycling and without double cycling during partial support ventilation modes. DC (+): cycles with double cycling; DC (−) cycles without double cycling; NAVA: neurally-adjusted ventilatory assist; PAV+: proportional assist ventilation; Pmus: muscular pressure; PSV: pressure support ventilation; Vt: tidal volume


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4. FONDECYT 1161510.


**Topic:** Poisoning/Toxicology/Pharmacology

## 001665

### Trends in risk adjusted mortality in Australian and New Zealand intensive care units over the past 30 years—reaching the Nadir?

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001665

**Introduction:** The Australia and New Zealand Intensive Care Society (ANZICS) adult patient database (APD) has been running for 30 years to benchmark hospital outcomes of intensive care unit (ICU) patients in Australia and New Zealand. This data allows the examination of the trends in risk-adjusted mortality and is key to planning future healthcare resources.
**Objectives:** To assess the change in risk-adjusted mortality in all ICU patients over the last 30 years and among diagnostic groups with the highest mortality rates.
**Methods:** We performed a retrospective cohort study of admission to the ANZICS APD from January 1993 to December 2022. Patient demographics, diagnosis, acute physiology and hospital outcome were extracted. All ICU admissions for adult patients (16 years) were eligible for inclusion. Readmission episodes, admissions for palliative care, intra-hospital transfers and patients with COVID-19 were excluded. Characteristics of patients were compared across the three decades using ANOVA, Kruskal–Wallis and Chi-square tests. We used mixed effects regression models adjusted for APACHE III score, hospital classification and sex to assess the adjusted odds of mortality over time.
**Results:** The final cohort included 2,838,654 patients from 209 participating ICUs. Compared to the first decade patients admitted during the final decade of the study were older (60 (SD 18.2) vs 62 (SD 17.8) years), more often had a least one major comorbidity (23.2% vs 25.2%) and had higher APACHE III scores (45.6 (SD28.1) vs 50.9 (SD 24.1)). Risk adjusted mortality fell over the study period until 2010 but then plateaued (Fig. 1). The five diagnostic groups with the highest mortality rates were, cardiac arrest 31,999/60722 (52.7%), stroke and intracranial haemorrhage 12,989/37696 (34.5%), subarachnoid haemorrhage 5775/27447 (21%), pneumonia 19,834/104028 (18.6%) and sepsis 36,073/191724 (18.8%). Cardiac arrest saw the greatest improvement in mortality OR 0.82 (95% CI 0.81 to 0.83) while pneumonia saw the least OR 0.87 (95% CI 0.87 to 0.88). The pattern of improvement for most diagnostic groups were similar, however, mortality from stroke and intracranial haemorrhage continues to improve whereas mortality from cardiac arrest appears to have increased over the past 10 years (Fig. 1).
**Conclusions:** There have been substantial improvements in risk-adjusted mortality among ICU patients in Australia and New Zealand over the past 30 years but these improvements appear to have plateaued more recently. Changes in patient factors and admission practices may be an important contributor to this finding. There is heterogeneity in the pattern of improvement according to different diagnostic groups which warrants further investigation.

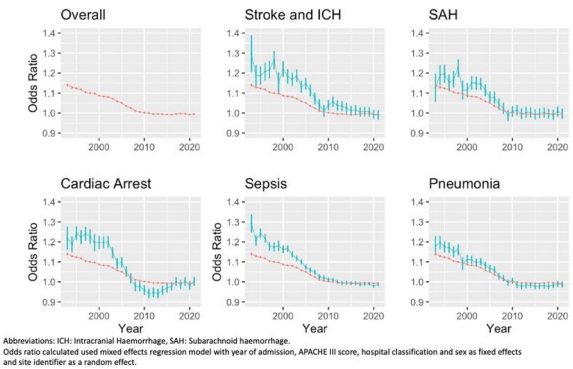


**Fig. 1 (abstract 001665)** Trends in risk-adjusted mortality in all patients and 5 diagnostic groups with the highest mortality rate

**Topic:** Health Services Research and Outcome

## 001666

### The effects of lung recruitment and inflation on intracranial compliance and autoregulation in mechanically ventilated brain-injured patients. A prospective, observational pilot study

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**Introduction:** The effect of positive end-expiratory pressure (PEEP) on cerebral perfusion and autoregulation in mechanically ventilated patients affected by acute brain-injured (ABI) has been largely debated and evidence is still not conclusive.
Invasive neuromonitoring variables as intracranial pressure (ICP), compliance (estimated by the second ICP peak, P2) and cerebral autoregulation (assessed through pressure reactivity index, PRx) can be continuously followed during mechanical ventilation.
The recruitment-to-inflation (R/I) manoeuvrer differentiate the potential of lung recruitability from the inflation of the already open lung across a standardized 10 cmH2O increase in PEEP [1]. Electrical impedance tomography (EIT) detects changes in regional distribution of gas consequent to different PEEP settings.
**Objectives:** The aim of this study was to investigate the association between lung recruitability and changes in mean ICP, P2 and PRx consequent to a delta PEEP of 10 cmH2O.
**Methods:** The study included ABI patients, requiring invasive mechanical ventilation, invasive ICP and systemic blood pressure monitoring and admitted to the neurosurgical intensive care unit (NICU) of Uppsala University Hospital, Uppsala, Sweden. Inclusion and data acquisition were performed within 72 h from ABI. During sedation, muscle relaxation and volume control ventilation (tidal volume 6–8 ml/kg predicted body weight, respiratory rate to keep the clinical target of PaCO2) and after a standardized lung recruitment, the R/I manoeuvrer was performed. Thereafter, combining the physiological background of R/I [2] and EIT, the changes in end-expiratory lung volume (ΔEELV) as well as its two components: the inflating volume (Vinfl) and the recruiting volume (Vrec), were estimated at both a global (the whole lung) and a regional level (pixelwise, based on EIT analysis) (Fig. 1A). Changes of each variable (ΔICP, ΔP2, ΔPRx) were calculated as (value at high PEEP) – (value at low PEEP), negative changes of ΔICP, ΔP2, ΔPRx indicating a worsening at low PEEP. Vrec was expressed as percentage of ΔEELV. Clinical data were collected from medical records. Data were reported as median (interquartile range). Correlations were sought using Spearman rank correlation. F-test statistics ($\alpha = 0.05$) was used for linear regression analysis.
**Results:** Ten patients were included (three females), with a median age of 62 (61–67) years. Volume recruitability was significantly correlated with ΔICP (rho = − 0.7, R2 = 0.6, $p < 0.01$), ΔP2 (rho = − 0.6, R2 = 0.7, $p < 0.01$), and ΔPRx (rho = − 0.8, R2 = 0.6, $p = 0.01$), (Fig. 1B).
**Conclusions:** The recruiting portion of lung volume gain induced by 10 cmH2O of PEEP in mechanically ventilated ABI patients affects intracranial compliance and autoregulation. The higher the potential of lung recruitment, the better intracranial compliance and autoregulation at high PEEP. R/I and EIT, together with neuromonitoring, can guide bedside assessment of the intracranial effects of PEEP.

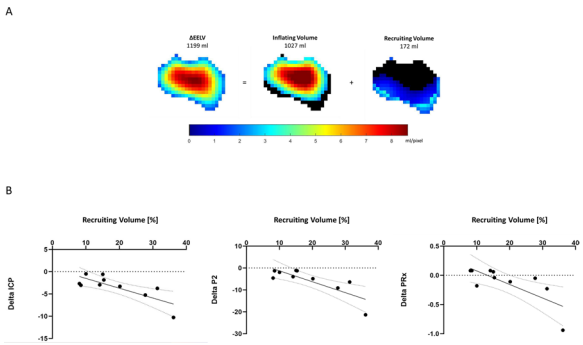


**Fig. 1 (abstract 001666)** A) Representative example of regional distribution of delta end-expiratory lung volume (ΔEELV), inflating volume (Vinfl) and recruiting volume (Vrec). ΔEELV = Vinfl + Vrec. B) Linear regressions plots between the recruiting volumes [% of ΔEELV] on the x-axis and on the y-axis: 1) left: changes in mean intracranial pressure (ΔICP); 2) middle: changes in ICP second peak (ΔP2) as index of intracerebral compliance; 3) right: changes in pressure reactivity index (ΔPRx) as index of cerebral autoregulation

**Reference(s)**

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**Topic:** Acute respiratory failure and mechanical ventilation

## 001668

### Incidence, causes and time course of moderately elevated carboxyhemoglobin (HbCO) in a large cohort of critical patients

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001668

**Introduction:** Hemoglobin has an affinity for CO that is approximately 200 times that of oxygen. The fraction of hemoglobin bound to carbon monoxide (carboxyhemoglobin; HbCO) can now routinely measured with blood gas analysers. HbCO can be elevated in smoking, respiratory failure, resorbing hematoma, hemolysis or liver failure. The causes and kinetics of moderate HbCO increases have not been widely studied in large ICU cohorts.
**Objectives:** We explored the incidence and main causes of moderately elevated HbCO (i.e. > 5%), on ICU admission or during ICU stay. We also examined the causes of secondarily increased HbCO.
**Methods:** In a cohort of adult patients admitted to our ICU between mid 2015 and mid 2020 we examined all HbCO levels determined in blood gas samples, there were measured with point-of-care Radiometer ABL90 Flex analyzers.
We selected all patients with an HbCO > 5% that was deemed valid when repeat BGAs showed similarly elevated HbCO. Reason for admission and smoking status were recorded. In patients with ICU-acquired increase of HbCO the probable cause was sought.
**Results:** We examined 13,000 ICU patients in whom 305,000 BGAs with HbCO were determined. Overall, median (IQR) HbCO was 1.0 (0.7–1.4) %.
In 102 admissions (0.8%)—including 7 readmissions—an admission HbCO of > 5% was seen that ranged from 5.1 to 29.1%. In 4% of the cases inhalation injury was present. The other main reasons for admission were auto-intoxication (26%), severe exacerbation of COPD (chronic obstructive pulmonary disease; 20%), cardiogenic shock (18%), severe trauma (11%) and major bleeding (7%).
At least 69 of the cases (63%) were also documented smokers.
The typical half-life of the initially elevated CO was 4.5 h.
In only 7 patients (0.05%) we observed an HbCO > 5% that developed in the ICU. Of these patients, 4 were treated with extracorporeal membrane oxygenation (ECMO), 2 had complicated liver transplantation and 1 sustained severe trauma.
**Conclusions:** Moderately elevated HbCO defined as a level of more than 5% was seen in a small fraction of critically ill patients we studied. Elevated HbCO at admission was in most cases caused by autointoxication or COPD, often combined with smoking.
The half-time of correction of initially elevated HbCo is short.
Marked HbCO-elevation that is ICU-acquired is rare and mainly associated with very severe gas-exchange disorders that require ECMO or with liver failure.

**Reference(s)**

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**Topic:** Poisoning/Toxicology/Pharmacology

## 001670

### Investigation of risk factors for prolonged mechanical ventilation upon ICU admission

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001670

**Introduction:** Prolonged mechanical ventilation (PMV) is typically described as the need for mechanical ventilation (MV) lasting at least 21 consecutive days for a minimum of 6 h per day (1). However, while the 21-day cut-off is commonly accepted, a significant portion of research on PMV employs different durations, ranging between 1 h to 1 year (2). Some authors have suggested considering MV lasting at least 14 days as PMV, especially since many studies have found that tracheostomy is often performed before the 15 days (3–4). Identifying universal risk factors for PMV has proven to be challenging due to diverse definitions of PMV, variations in study methodologies, and the heterogeneity of patient populations.
**Objectives:** To define the risk factors for PMV on the day of intensive care unit (ICU) admission.
**Methods:** A retrospective cohort study was conducted on patients admitted to a Tertiary University Medical ICU over a span of 15 years, from January 1, 2008, to December 31, 2022. The study focused on patients who required invasive mechanical ventilation (IMV),

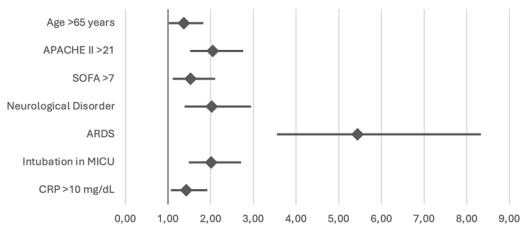
excluding those under 18 years old, those intubated in other ICUs, individuals dependent on chronic MV, and those who died within 14 days of IMV initiation. Prolonged mechanical ventilation (PMV) was defined as IMV lasting 14 or more consecutive days. Patients were categorized into PMV (IMV ≥ 14 days) and non-PMV (IMV < 14 days) groups. Data on demographic characteristics, comorbidities, clinical and laboratory parameters upon admission were collected. A logistic regression model was employed to identify independent risk factors for PMV based on statistically significant variables.

**Results:** 1016 of 1698 patients with IMV were enrolled. Mean age was 62.5 ± 18.7 and 54.6% of patients were male. Median IMV duration was 13 days. Significant differences were observed between two groups (Table 1). The PMV group was older in age (64.1 ± 17.8 vs. 60.8 ± 19.2 years), had higher APACHE II (23.7 ± 6.8 vs. 19.7 ± 6.) and SOFA (7 [5–10] vs. 6 [4–9]), higher baseline CRP (12 [6.3–20.7] vs. 8.6 [3.1–15.3]), higher ratios of ARDS (31.3% vs. 6.8%), sepsis/septic shock (23.4% vs. 17.5%) and lower PaO2/FiO2 (176 [124–250] vs. 230 [167–310]) compared to non-PMV group. PMV patients were mostly intubated in the medical ICU (MICU) and received vasopressors on first day. In logistic regression analysis (Fig. 1), independent risk factors for PMV were: age > 65 years (OR = 1.37; CI 95% [1.02–1.83]; $p$ 0.036), APACHE II > 21 (OR = 2.05; CI 95% [1.52–2.76]; $p < 0.001$), SOFA > 7 (OR = 1.53; CI 95% [1.11–2.10]; $p$ 0.009), neurological disorders (OR = 2.02; CI 95% [1.39–2.96]; $p < 0.001$), ARDS (OR = 5.44; CI 95% [3.55–8.33]; $p < 0.001$), intubation on MICU (OR = 2.01; CI 95% [1.49–2.71]; $p < 0.001$) and CRP > 10 mg/dL (OR = 1.43; CI 95% [1.07–1.92]; $p$ 0.015).

**Conclusions:** Age > 65 years, APACHE II > 21, admission SOFA > 7, neurological disorders, ARDS at admission, intubation in medical ICU and CRP > 10 mg/dL were independently associated with PMV.

| *Variables* | PMV n =501 | non-PMV n =515 | *p* value |
|---|---|---|---|
| Age (years) | 64.1±17.8 | 60.8±19.2 | **0.009** |
| Age >65 years | 285 (56.9%) | 261 (50.7%) | **0.047** |
| Admission from medical wards | 201 (40.1%) | 153 (29.7%) | **<0.001** |
| Neurological Disorder | 111 (22.2%) | 77 (15.0%) | **0.003** |
| Sepsis/Septic Shock | 117 (23.4%) | 90 (17,5%) | **0.020** |
| Vasopressors in 24h | 196 (39.1%) | 110 (21.4%) | **<0.001** |
| ARDS | 157 (31.3%) | 35 (6.8%) | **<0.001** |
| Intubation in MICU | 282 (56.3%) | 197 (38.3%) | **<0.001** |
| SOFA Score | 7 [5-10] | 6 [4-9] | **<0.001** |
| SOFA >7 | 245 (48.9%) | 179 (34.8%) | **<0.001** |
| APACHE II Score | 23.7±6.8 | 19.7±6.2 | **<0.001** |
| APACHE II >21 | 291 (58.1%) | 183 (35.5%) | **<0.001** |
| $PaO_2/FiO_2$ Ratio | 176 [124-250] | 230 [167-310] | **<0.001** |
| CRP in mg/dL | 12 [6.3-20.7] | 8.6 [3.1-15.3] | **<0.001** |
| CRP >10 mg/dL | 278 (58.0%) | 203 (43.8%) | **<0.001** |

**Fig. 1 (abstract 001670)** Differences between PMV and non-PMV groups upon ICU admission day




| *Variables* | OR | (95% CI) | *p* value |
|---|---|---|---|
| Age >65 years | **1.37** | 1.02-1.83 | **0.036** |
| APACHE II >21 | **2.05** | 1.52-2.76 | **<0.001** |
| SOFA >7 | **1.53** | 1.11-2.10 | **0.009** |
| Neurological Disorder | **2.02** | 1.39-2.96 | **<0.001** |
| ARDS | **5.44** | 3.55-8.33 | **<0.001** |
| Intubation in MICU | **2.01** | 1.49-2.71 | **<0.001** |
| CRP >10 mg/dL | **1.43** | 1.07-1.92 | **0.015** |

**Fig. 2 (abstract 001670)** Independent risk factors for prolonged mechanical ventilation

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5. None.

**Topic:** Acute respiratory failure and mechanical ventilation

## 001672

### Sharing is caring: a systematic review of publicly available intensive care data sets

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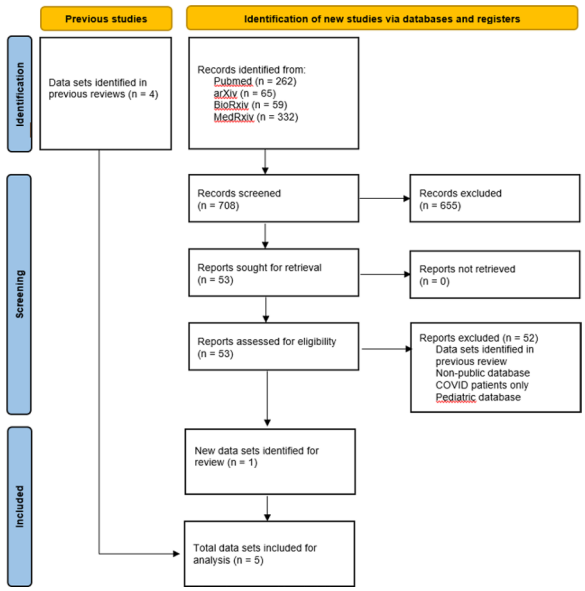
**Introduction:** Multiple Intensive Care Unit (ICU) databases have been publicly released to advance data driven intensive care medicine. However, these public ICU datasets are prone to changes, updates and new releases. Therefore, the goal of this review is to provide clinicians and data scientists with a state-of-the-art overview and guide for choosing the relevant ICU datasets for their respective research questions.

**Methods:** A systematic search was carried out in PubMed, Arxiv, MedRxiv and BioRxiv to identify all publicly available intensive care datasets of adult patients. After data extraction of database characteristics, a qualitative synthesis of results was carried out.

**Results:** 708 publications were identified. After the screening, 5 publicly available ICU databases were included for analysis: AmsterdamUMCdb, eICU Collaborative Research Database (eICU-CRD), HiRID, Medical Information Mart for Intensive Care (MIMIC)-IV and Salzburg Intensive Care database (SICdb). A qualitative synthesis showed notable differences in number of patients, usage of organ support, admission types and frequency of measurements.

**Conclusions:** Each public ICU dataset differs due to differences in medical practice, information technologies and approach to legal restrictions. This systematic review provides clinicians and data scientists with an overview of available public ICU data sets and their characteristics.




**(abstract 001672)** Article selection process. 1 new public ICU data set was identified and included. Reporting was based on the PRISMA statement guideline for systematic reviews

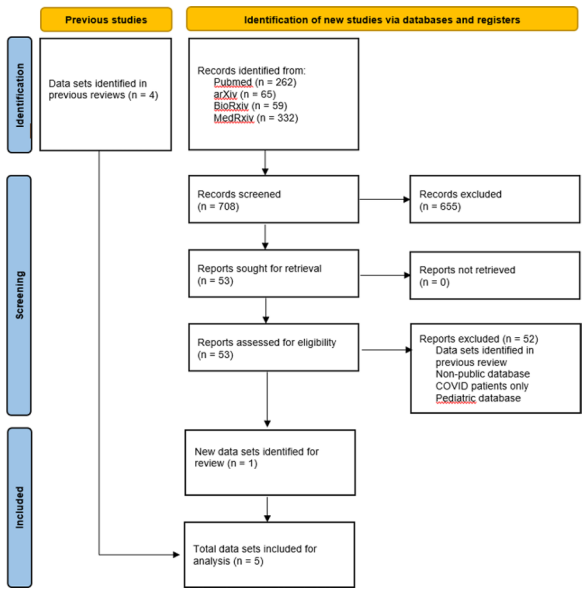



**Fig. 2 (abstract 001672)** Visual comparison of ICU data set characteristics. ALAT = alanine aminotransferase, CRP = C-reactive protein, FiO2 = fraction of inspired oxygen, PEEP = positive end-expiratory pressure, pO2 = partial pressure of oxygen

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7. C.M. Sauer is supported by the German Research Foundation funded UMEA Clinician Scientist Program, grant number FU356/12–2. C.M. Sauer received consulting fees from Pacmed B.V. unrelated with this work.
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**Topic:** Information systems and Data Science

## 001673

### Early versus late initiation of beta-blocker therapy in critically ill patients:a propensity score-based analysis study

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**Introduction:** Tachycardia is independently associated with the mortality of critically ill patients. Previous studies showed a beneficial effect of beta-blockers in septic shock patients. Nevertheless, the optimal initiation time of beta-blockers is not determined.
**Objectives:** The study aimed to determine whether an early beta-blocker administration correlates with improved outcomes in a general ICU population.
**Methods:** This is a single-center, retrospective, observational study from a 56-bed ICU of a university hospital. Propensity score matching (PSM) was used to balance the baseline differences. Kaplan–Meier survival curves and Cox regression analyse were performed to analyze the 28-day hospital mortality. The primary outcome was the ability to decrease heart rate (HR) during the first week of ICU admission. The secondary outcomes include: i) the hemodynamic stability during the infusion time; ii) the hospital length of the stay (HLOS), the ICU length of stay (ICULOS), the vasopressor-free days; iii) mortality rate between early and late group. We defined an early beta-blocker initiation as starting the administration within 24 h after admission.
**Results:** From June 2016 to December 2022, a total of 1606 patients were included in the study. After PSM, 466 patients were included in analysis, with 233 in early group and 233 in late group. From the ICU admission to the initiation of beta-blocker infusion time was 10.0 (3.5, 17.6) hours in early group and 45.7 (32.8, 79.5) hours in the late group ($p < 0.001$). The median age was 55.0 (42.0, 66.8) y.o., with 34.3% of whom were females. Among them, 41.8% was admitted for sepsis/septic shock. After PSM, the baseline HR was 108.5 (102.2, 119.3) beats per minute (bpm) in early group and 109.7 (102.3, 118.8) bpm in late group ($p = 0.858$). During the first seven days of ICU admission, the HR of the early group was 5.98 (3.84, 8.12) bpm lower than that of the late group ($p < 0.001$). In addition, the percentage of HR < 95 bpm is

also significantly higher in the early group compared to the late group after 24 h. There is no difference regarding the type of beta-blocker used in these two groups ($p=0.165$) and the duration of beta-blocker use ($p=0.454$). The proportion of norepinephrine use and its doses decreased in both groups and the decline slopes of the early group are greater than the late group ($p=0.012$). There was no difference regarding the the baseline and the maximal lactate level during 72 h (Baseline: early: 3.2 (2.0, 6.0) µmol/L vs. late: 2.9 (1.8, 4.8) µmol/L, $p=0.068$); Maximal lactate during 72 h: early: 3.8 (2.2, 6.8) µmol/L vs. late: 3.1 (2.1, 5.6) µmol/L, $p=0.101$). The ICULOS and HLOS of patients in early group was 5.1 (2.3, 11.0) days and 21.0 (10.0, 37.0) days, which was shorter than that of the late group (7.1 (4.2, 12.9) days, $p<0.001$; 28.0 (16.0, 44.0) days, $p<0.001$, respectively). The vasopressor-free days was similar between two groups: early: 21.1 (0.0, 26.1) days vs. late: 22.0 (0.0, 26.4) days, respectively, $p=0.275$). The hospital mortality of patients in early group is 33.5%, similar with the late group (35.2%) ($p=0.696$). In survival analysis, there exists no statistical difference in 28-day hospital mortality compared to the early group (HR 0.77 (0.53, 1.11), Log-rank $p=0.162$). The ICU mortality is 26.6% and 26.2% two groups, respectively ($p=0.679$).
**Conclusions:** In critically ill patients with tachycardia, heart rate is better controlled in the early beta-blocker initiation group with shorter ICULOS and HLOS. Nevertheless, no survival benefit was observed for patient outcomes.

**Topic:** Cardiovascular issues in ICU

### 001674
### Optimising symptom control in end-of-life care on the intensive care unit

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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001674

**Introduction:** Despite a reduction in recent decades, mortality rates remain significant in UK critical care at 15–20% (1). Additionally, a further 5.9% of patients later die on the wards during the same hospital admission (2). This highlights the importance of good quality end-of-life care (EOLC) which should incorporate an individualised care plan, optimisation of symptom control and involvement of the patient and those important to them (1).
**Objectives:** To improve the provision of EOLC in the intensive care and high dependency unit (ICU) at Worthing Hospital, in particular for symptom control of patients and staff confidence in providing this care.
**Methods:** Electronic patient records (EPR) were reviewed of consecutive deaths in Worthing ICU to identify the following; use of existing EOLC documentation, prescription of anticipatory medications and specialist palliative care involvement. Two round of quality improvement have been completed with interventions in between. The interventions consisted of—creation of a new multi-disciplinary EOL care plan, the introduction of a comfort observation chart, the creation of an EOL care bundle and presenting the project at the ICU multi-disciplinary team meeting and ICU nursing training days. In addition to EPR review, the second round invluded multi-disciplinary staff survey for feedback on interventions, provision of EOLC on ICU and training.
**Results:** In the first round ($n=50$), 18% of deaths had used the pre-existing 'last days of life form', in none of these instances was the form completed fully. 41% had anticipatory medication prescribed and 6% had specialist paliaitve care involvement. In the second round ($n=42$) 21% of deaths used the EOL daily care plan. Fig. 1 outlines the differing rates of use of the comfort observation chart, prescription of symptom control medications and involvement of specialist palliative care when the EOL daily care plan was used and when it was not used.
Staff survey results ($n=16$) showed that 69% rated their confidence in looking after EOL patients as 4/5 (1 = not confident, 5 = very confident). Quantity of training amongst staff was variable, with some reporting having had no specific training on EOLC whilst others report a full day of training. Staff comments highlighted potential areas for training and development; drug management, communication and managing complex patients.
Findings were presented locally to ICU and hospital palliative care teams.
Further planned interventions include amendments to the daily care plan according to staff feedback, inclusion of EOLC provision within ICU induction for rotational staff, palliative care simulation training and creation of a link nurse role for palliative care on the unit.
**Conclusions:** Staff on ICU often look after palliative patients, however, there is scope to further optimise symptom control on the unit. Our developed electronic EOL care plan has been shown to increase the use of comfort observations, prescription of anticipatory medication and involvement of specialist palliative care services. However, uptake of the care plan is still low and further interventions are planned to increase awareness and further develop the tool. The staff survey not only identified areas for educational training but also highlighted the enthusiasm and compassion of staff to care for these patients and thus their interest to further develop their skills and understanding.

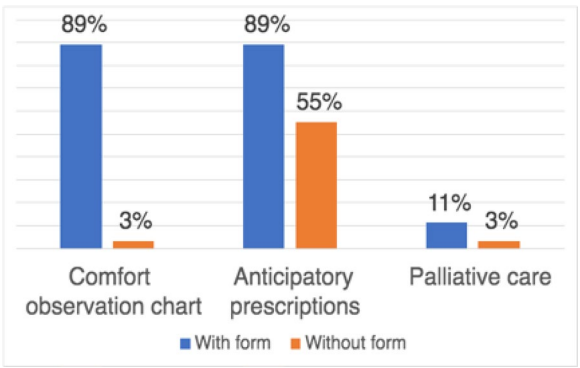


**Fig. 1 (abstract 001674)** Does the use of the EOLC daily plan improve outcomes?

**Reference(s)**
1. ICNARC Key statistics from the Case Mix Programme: 1 April 2019 to 31 March 2020
2. CARE AT THE END OF LIFE: A guide to best practice, discussion and decision-making in and around critical care, FICM 22/10/2021, https://www.ficm.ac.uk/documents/care-at-the-end-of-life-a-guide-to-best-practice-discussion-and-decisionmaking-in-and-0

**Topic:** Ethics and end of life care

### 001675
### Evaluation of nurse practitioner round with AI-based early warning score for in-hospital cardiac arrest

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*Intensive Care Medicine Experimental* 2024, **12 (suppl 1)**: 001675

**Introduction:** Our hospital had implemented a Rapid Response System (RRS) using a single-parameter activation criteria. To further improve the quality, from January 2023, we introduced the Visensia Safety Index (VSI), an AI-based early warning score (EWS), and nurse practitioners (NPs) conducted rounds for high-risk patients. VSI-based NPs rounds were conducted only during weekday daytime. Night-time and holidays were covered by existing RRS. This study aimed to clarify the impact of NPs rounds using VSI on in-hospital cardiac arrest (IHCA).
**Methods:** The subjects were adult inpatients who experienced IHCA from January 2023 to August 2023. Electronic medical records were retrospectively reviewed to assess the presence of pre-arrest rounds by NPs and the potential preventability of cardiac arrest. The

predictability of cardiac arrest was evaluated by two NPs and two intensivists.
**Results:** During the study period, there were 15,969 patients and 1,585 (99.3/1000 admissions) NPs rounds were activated based on VSI. There were 31 cases of in-hospital cardiac arrest, accounting for 0.2% of all inpatients. Among them, 5 out of 31 cases (16.1%) had prior VSI alerts with NPs rounds. Additionally, 2 out of 5 cases (40%) met single-parameter activation criteria before cardiac arrest. 26 out of 31 cases (83.9%) didn't have prior VSI alerts with NPs rounds before cardiac arrest. All 26 cases occurred only in the nighttime, weekends, or on holidays. Male accounted for 53.8% (14/26) and the average age was 68.7 ± 13.8 (SD). Among the 26 cases without VSI-based NPs rounds, 17 out of 26 cases (65.4%) met single-parameter activation criteria before cardiac arrest, but RRS was not activated in this population. Twelve out of 26 cases (46.2%) met VSI activation criteria when using the threshold score of 2.8. VSI criteria detected 3 out of 12 cases (25%) that could not be identified by single-parameter activation criteria.
**Conclusions:** NPs rounds using VSI could enable the identification of cases not actioned by single-parameter criteria. However, all IHCA cases where NP rounds using VSI were conducted represented intractable IHCA scenarios. Nevertheless, there were preventable IHCA cases among those without VSI alerts, indicating the need for further investigation into cases undetectable by VSI criteria.

**Topic:** Cardiac arrest

## 001676

### Evolution of admissions due to attempted suicide in the Intensive Medicine Service of the Mútua Terrassa University Hospital after the COVID-19 pandemic

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001676

**Introduction:** In Spain, there has been an increase in suicides in recent years compared to previous years of the COVID-19 pandemic. It has been confirmed that during the COVID-19 pandemic there was a decrease in ICU admissions due to external causes, mainly trauma patient and suicide attempts. After the pandemic, the number of admissions due to trauma reached the previous figures but with an increase of suicide attempts as a cause.
**Objectives:** Analyze the admissions due to external causes, mainly trauma patient (with or without associated TBI) and attempted suicide, in the Intensive Care Department of the Hospital Universitari Mútua Terrassa (HUMT), before and after the COVID-19 pandemic.
**Methods:** A descriptive and retrospective study carried out between January 1, 2018 and December 31, 2023. All patients admitted to the intensive care of HUMT for external causes (trauma patient any cause and suicide attempt, for any reason), were collected. Statistics: Qualitative variables are expressed as percentages and quantitative variables are expressed as means and standard deviations (SD).: descriptive and retrospective study carried out between January 1, 2018 and December 31, 2023. All patients admitted to the intensive care of HUMT for external causes (trauma patient any cause and suicide attempt, for any reason), were collected. Statistics: Qualitative variables are expressed as percentages and quantitative variables are expressed as means and standard deviations (SD).
**Results:** 561 patients were included for external causes. Table 1 shows the main characteristics of the study population. Of the 561 patients, 492 (87%) were admitted for trauma, of these, 466 (94.7%) had an unintentional accidental cause and 26 (5.7%) were for suicide attempt (precipitate patient).
The remaining 69 (13%) patients were admitted for a suicide attempt for another cause than precipitation, 68 for drug overdose with suicidal intention and 1 for suicidal intent hanging attempt.
Figs. 1 and 2 show the total number of patients admitted by: trauma patient due to unintentional accidental cause, suicide attempts by precipitation, and drug overdose of medication (suicide attempt). In addition, in the pre-COVID period stage, 27% of the patients had a psychiatric history and 12.4% of admissions for external causes were due to attempted suicide, rising to 39% and 20%, respectively, in the post-COVID period.
**Conclusions:** In our hospital, during 2020 (the COVID-19 european pandemic period) there was a decrease in patient admissions due to external causes, this figure has been progressively increasing until reaching, in 2023, similar figures to the pre-COVID period. The main cause of this increase is suicide attempts, both due to intentional drug overdose and precipitation. Given the data obtained, we propose expanding the study to other hospitals to confirm both the situation in other sites and the trend in the coming years.

**Table 1 (abstract 001676)** .

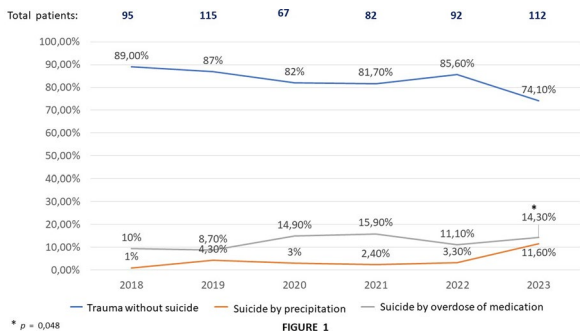


**Fig. 1 (abstract 001676)** .

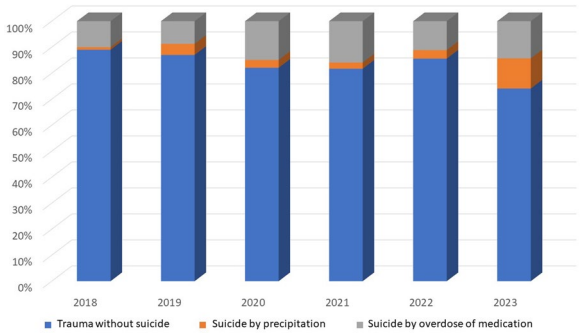


**Fig. 2 (abstract 001676)** .

**Reference(s)**

1. Defunciones según la Causa de Muerte—Primer semestre 2023 (datos provisionales) y año 2022. https://www.ine.es/prensa/edcm_2022_d.pdf

**Topic:** Trauma

## 001677

### Leveraging large language models to generalize electronic health record concept mapping for semantic interoperability

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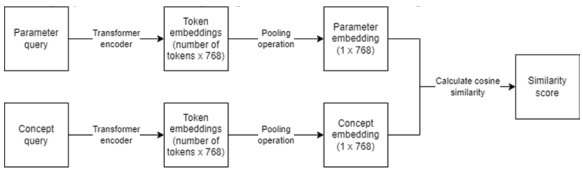
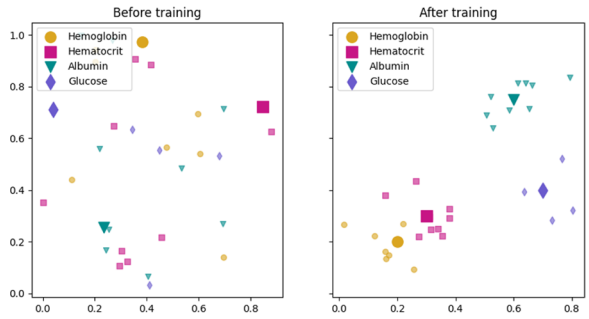
***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001677

**Introduction:** Intensive care units (ICUs) generate vast amounts of structured medical data. Harmonizing underlying databases across medical institutions is crucial for big data research. This process involves converting data formats and terminology according to a Common Data Model (CDM), enabling semantic interoperability, effective data sharing, and big data research. However, existing Electronic Health Record (EHR) systems often lack direct compatibility with CDMs, necessitating a labor-intensive manual mapping process. This challenge hinders the formation of large multi-center research databases.
**Objectives:** This study aims to address the challenges of manual data mapping in ICU databases by leveraging Large Language Models (LLMs) to create a generalized model for concept mapping, potentially reducing the time and resources needed for data unification.
**Methods:** The study involved developing a transformer model to output semantically meaningful numerical representations for parameter-concept mappings. Using the SentenceTransformers framework, the model was pre-trained on a diverse multilingual dataset and fine-tuned on manually mapped ICU datasets to improve accuracy and generalizability. The model's performance was evaluated through three experiments, comparing its accuracy with previous state-of-the-art models.
**Results:** The model achieved significant performance improvements in concept mapping. In the first experiment, using data from three hospitals, the model achieved a top-5 accuracy of 90.3%. The second experiment, with data from 26 hospitals, reached a top-5 accuracy of 93.8%. The final experiment, using a larger ICU dataset not previously seen by the model, achieved a top-5 accuracy of 86%, indicating its potential for generalization.
**Conclusions:** The transformer-based model demonstrated a notable improvement in the efficiency and generalizability of concept mapping in ICU databases. These results suggest that the approach can substantially accelerate the data unification process, enabling broader research opportunities and eventually enhancing data-driven decision-making in intensive care. Further studies should focus on extending the model's scope to other healthcare domains and languages, as well as scaling computational resources to boost performance.




**(abstract 001677)** Implementation of a sentence transformer. Token embeddings capture the contextualized meaning of a character or word within the full query




**(abstract 001677)** Simplified illustrative visualization of two-dimensional embeddings before and after training. The larger shapes represent concept embeddings, while the smaller shapes represent parameter embeddings. Before training, the embeddings are random. During training, the model gradually learns to output similar embeddings for parameters and concepts, clustering those that represent the same entity

**Reference(s)**

1. Reimers N, Gurevych I. Sentence-BERT: Sentence Embeddings using Siamese BERT-Networks. arXiv. 2019; https://doi.org/10.48550/arXiv.1908.10084.
2. None.

**Topic:** Information systems and Data Science

## 001681

### Evaluation of the effect of norepinephrine on cardiac contractility after the initial phase of septic shock

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***Intensive Care Medicine Experimental*** 2024, **12 (suppl 1)**: 001681

**Introduction:** Norepinephrine (NE) is recommended as the first-line vasopressor in the management of septic shock. Early introduction of NE has a beneficial effect on cardiac contractility (1). This latter effect may be linked to a direct inotropic action of NE via the stimulation of myocardial β1-receptors and/or an improvement in left ventricular perfusion via increased diastolic arterial pressure (DAP). Data are lacking on whether the inotropic effect of NE persists beyond 24 h after the start of management insofar as a down-regulatory mechanism of myocardial β1-receptors could negate this effect.
**Objectives:** The aim of our study is to examine, by transthoracic echocardiography (TTE), the effects of NE dose escalation on left ventricular systolic function in hypotensive patients, more than 24 h after the Start of septic shock.
**Methods:** Prospective, single-center study (medical intensive care unit), including patients with hypotension (mean arterial pressure (MAP) < 65 mmHg) requiring an increase in NE dose, more than 24 h after the start of septic shock management. TTE was performed at T0 and T1 (one hour after restoration of MAP > 65 mmHg).
**Results:** 17 patients were included (median age 68 years [IQR, 50–78]). MedianSAPSII was 57 [43–71], 16 patients were on mechanical ventilation and septic shock was mainly of respiratory origin (10/17). Between T0 and T1, NE dose, MAP, systolic arterial pressure (SAP) and DAP increased significantly (Table 1). TTE showed a significant increase between T0 and T1 in left ventricular ejection fraction (LVEF), respectively: 56% [48–63] vs. 59% [53–65] ($p = 0.048$), and subaortic time-velocity integral ( VTI subAo): 15 cm [12–18] vs. 18 cm [16–22] ($p < 0.01$).
**Conclusions:** In hypotensive septic shock patients, increasing the dose of NE during the late phase of septic shock (more than 24 h)

corrected arterial hypotension and significantly increased VTIsubAo and LVEF. The increase in LVEF that occurs despite the increase in SAP and hence left ventricular afterload, suggests that NE improves cardiac contractility even after the initial phase of septic shock.

**Table 1 (abstract 001681)** HR, Heart rate; LVEF Left ventricular ejection fraction; VTIsubAo, velocity time integral of the subaortic-flow; MAPSE, mitral annular plane systolic excursion; DAP, diastolic arterial pressure; MAP, Mean arterial pressure; SAP, systolic arterial pressure; SV, Stroke volume.

| n=17 | T0 | T1 | *p* |
|---|---|---|---|
| **Norepinephrine, µg/kg/min** | 0.29 [0.21-0.53] | 0.42 [0.28-0.70] | <0.01 |
| **Hemodynamic parmeters** | | | |
| HR, bpm | 93 [78 -122] | 93 [79-119] | 0.17 |
| SAP, mmHg | 92 [82-112] | 116 [107-134] | <0.001 |
| MAP, mmHg | 60 [57-62] | 70 [67-75] | <0.001 |
| DAP, mmHg | 45 [42-49] | 52 [46-60] | <0.005 |
| Lactate mmol/L | 1.30 [1.10-2.40] | 1.35 [0.90-2.45] | 0.54 |
| **Echocardiographic parameters** | | | |
| LVEF, % | 56 [49-63] | 59 [53-65] | <0.05 |
| MAPSE, mm | 12 [10-16] | 13 [11-17] | 0.05 |
| SV, mL | 45 [35-53] | 50 [42-66] | 0.03 |
| VTIsubAo, cm | 15 [12-18] | 18 [16-22] | <0.01 |

**Reference(s)**

1. Hamzaoui O, Jozwiak M, Geffriaud T, Sztrymf B, Prat D, Jacobs F, et al. Norepinephrine exerts an inotropic effect during the early phase of human septic shock. Br J Anaesth. mars 2018;120 (3):517–24.

**Topic:** Cardiovascular issues in ICU

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