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Implementation of the PulsePoint smartphone application for crowd-sourcing bystander resuscitation

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Critical Care 2014, **18(Suppl 1):**P484 (doi: 10.1186/cc13674)

Introduction Only a minority of patients suffering out-of-hospital cardiac arrest receive any bystander cardiopulmonary resuscitation (CPR). Bystander CPR is associated with improved odds for survival. The PulsePoint smartphone application alerts users in the vicinity of a cardiac arrest to facilitate immediate citizen bystander resuscitation. Addressing implementation barriers may provide an opportunity to increase effectiveness of the application. PulsePoint is currently active in over 400 communities in the United States. Our objective was to identify modifiable barriers to optimal implementation of the PulsePoint smartphone application.
Methods We conducted a structured survey delivered via Survey Monkey optimized for mobile devices. All alerted PulsePoint users between 28 June 2012 and 1 November 2013 were sent an invitation to participate in the survey. Survey responses associated with test activations and emergency medical services (EMS) professionals on active duty were excluded from the analysis.
Results Of 4,827 survey requests sent, 995 responded and completed our survey (response rate 21%). Respondents identified themselves as firefighters (30%), paramedics (19%), EMTs (16%), nurses (4.4%), MDs (0.83%) and other professions (50%). Of those who received a PulsePoint alert, 23% (157/690) responded by making their way towards the location of the emergency. Of those who responded, 70% (110/157) arrived on scene. Most of those who did not arrive said they saw professional rescuers already on scene and turned back (52%, 24/47). Of those who arrived on scene, only 34% (37/110) found a person unconscious and not breathing normally. The majority found a person on scene who was not suffering cardiac arrest. Of those who arrived on scene prior to EMS and also found a cardiac arrest victim on scene who required resuscitation, 80% (8/10) performed bystander CPR.
Conclusion We observed a very high proportion of bystander CPR (80%) for victims of out-of-hospital cardiac arrest when PulsePoint users arrived before EMS. This suggests that optimized PulsePoint implementation may increase community bystander CPR rates. Alert specificity for cardiac arrest may be too low (the cry wolf scenario) with current default activation criteria. Also, the current activation radius (0.5 mile) may be too large because EMS frequently arrive before the PulsePoint responder.

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Emergency room advanced life support after cardiac arrest: outcomes and survival, nursing care and team response

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Critical Care 2014, **18(Suppl 1):**P485 (doi: 10.1186/cc13675)

Introduction An organized team response and trained nursing staff in the emergency room critical patient area (ER-CPA) are the main factors to determine cardiopulmonary resuscitation (CPR) success rates. The objective was to evaluate outcomes in the emergency room after advanced life support (ALS) by reanimation teams, to improve nursing care, quality of resuscitation and survival.
Methods We included all adult patients receiving ALS in the ER-CPA during 1 year. Cases not allowed CPR are excluded. A retrospective design, multivariate with ALS performed, gender, age, cause of arrest, precedence, outcome and hospital derivation, and 100% of cases studied.
Results A total of 149 patients were attended in the ER-CPA with ALS maneuvers during the studied period (9.23% of a total 1,613). Thirty-four of them were nonheart-beating donors. The protocol was performed with 23 effective donors and 31 organs were obtained for transplant. Respiratory arrest (n = 31) was the best outcome group, with 100% survival and in-hospital ICU transfer. The cardiac arrest (CA) group depended on cause of CA: cardiac arrhythmia (n = 12), survival 50%; surgical etiology (nontraumatic), survival 50%, mean age 70; myocardial infarction (n = 12), survival 83%, mean age 61; sepsis (n = 6), survival 67%, mean age 48; drugs overdose (n = 2), survival 100%; traumatic cardiac arrest (n = 15), 89% mortality, mean age 41; and CA with unknown etiology, survival 38%, mean age 68.
Conclusion Emergency room cardiac arrest arrivals are not correlated with ER-CPA total activity. Good survival rates are probably related to a special quick response protocol and trained teams. Outcomes research to detect potential improvement in nurse care is needed, and should be evidence guided. Worst results in survival rates must be detected as the main topics for nursing care development.

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What is the role of head computed tomography in post-resuscitation care?

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Critical Care 2014, **18(Suppl 1):**P486 (doi: 10.1186/cc13676)

Introduction Guidelines recommend to perform head computed tomography (CT) in nontraumatic cardiac arrest only if the patient remains unconscious after return of spontaneous circulation [1]. Nevertheless, in cardiac arrest due to neurological causes, head CT would dramatically change the therapeutic strategy in these patients [2]. The aim of this study is to present the experience of our ICU in nontraumatic out-of-hospital cardiac arrest (OHCA) patients and to demonstrate that neurological abnormalities can be the primary cause of cardiac arrest.
Methods We collected data for all patients with nontraumatic OHCA admitted to the ICU from 1 January 2012 to 31 December 2012. We recorded mean age, male-to-female ratio, cause of cardiac arrest and mortality in the ICU.
Results Thirty-four survive cardiac arrest patients were admitted to the ICU. Mean age was 66 years. The male-to-female ratio was 2:1. Sixteen patients died in the ICU. Head CT scans obtained in the immediate post-arrest period found significant abnormalities in four patients (three subarachnoid hemorrhage and one ischemic ictus) with immediate modification of treatment.
Conclusion Head CT abnormalities can be found in cardiac arrest patients. Further investigations are necessary to evaluate the impact of cardiac arrest from neurological causes and to establish the role of neuroimaging in these patients.
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To see or not to see: does video CPR perform better than telephone CPR?

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Critical Care 2014, **18(Suppl 1):**P487 (doi: 10.1186/cc13677)

Introduction The ALERT algorithm, a simple and effective compression-only telephone CPR (t-CPR) protocol, has been previously demonstrated to help bystanders initiate CPR. According to their worldwide availability, mobile phone communications may play an increasing role in emergency calls. Preliminary studies suggest that they might improve dispatcher's understanding of the rescuer's situation. However, there is currently no validated protocol for videoconference-assisted CPR (v-CPR). We initiated the present study to validate an original protocol of v-CPR based on the ALERT algorithm and to evaluate the potential benefit of this assistance in comparison with classical t-CPR.
Methods We developed a strictly worded algorithm for v-CPR, adapted from the ALERT t-CPR protocol, with additional re-evaluation loops,

every 2 minutes. A total of 120 students without prior CPR training were recruited from upper secondary school, during regular class hours, and randomly assigned to the t-CPR group (n = 60) versus the v-CPR group (n = 60). The Resusci®Anne SkillReporter™ manikin was used to evaluate CPR performance. Data were transferred from the manikin into a computerized database using the Laerdal SkillReporting System V.2.2.1 software. Further analysis was based on audio-recordings and video-recordings. Primary outcome measures were the results of the Cardiff evaluation test; the secondary measures were global scoring of a complete 7-minute period of CPR.

Results The mean chest compression rate increased significantly in the v-CPR group as compared with t-CPR (110 ± 16 vs. 86 ± 28; P <0.0001), while depth remained constant (48 ± 13 mm vs. 47 ± 16 mm, P = NS). Hand positioning was correct in 91.7% of cases with v-CPR, but only in 68% with t-CPR (P = 0.001). The hands-off period was almost nonexistent in the v-CPR group (0 vs. 7 seconds; P = 0.0016), but the median no-flow time was significantly greater in the v-CPR group (146 vs. 122 seconds, P < 0.0001). As a consequence, global evaluation of CPR performance revealed a significant improvement in v-CPR group score as compared with the t-CPR group (6 vs. 5, P < 0.001).

Conclusion Video-assisted CPR using this original algorithm allows bystanders to reach compression rates and depths close to international guidelines and to reduce hands-off events during CPR.

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Initial anticoagulation strategy for extracorporeal cardiopulmonary resuscitation patients

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Critical Care 2014, **18(Suppl 1):**P488 (doi: 10.1186/cc13678)

Introduction Extracorporeal cardiopulmonary resuscitation (ECPR) is increasingly being used in emergency and critical care medicine in Japan. Although a major complication of this procedure is bleeding, the optimal heparin dose and activated coagulation time (ACT) remain unknown.

Methods We retrospectively evaluated the initial heparin doses, ACT values, and complications of patients who received ECPR between February 2011 and November 2013 at the Emergency and Critical Care Center, Mie University Hospital, Japan.

Results ECPR was performed in 45 patients, and the ACT was evaluated in 32 patients. All patients were administered 3,000 U unfractionated heparin at the time of priming the circuit. Patients for whom cannulation took a longer time received an additional 2,000 to 3,000 U unfractionated heparin. The average heparin dose administered was 53.6 U/kg body weight. The average ACT was 231.3 seconds. In 17 of the 32 patients, the ACT exceeded 200 seconds. Three patients experienced fatal bleeding in the chest wall, which could not be stabilized by conservative treatment. One patient developed a cerebral infarction. There were no significant differences between the patients with fatal bleeding and those without fatal bleeding with regard to the heparin dose, ACT, and duration of CPR.

Conclusion According to the Extracorporeal Life Support Organization guidelines, the target ACT should be around 1.5 times the normal ACT. However, it is difficult to obtain the normal ACT in emergency situations. Many of our patients' ACTs exceeded 200 seconds, and three patients experienced fatal bleeding that was possibly due to chest compression. Post-cardiac arrest patients often experience coagulopathy due to either cardiac arrest or hypothermia therapy. Therefore, an anticoagulation protocol other than the pulmonary extracorporeal membrane oxygenation protocol is required for ECPR patients. We evaluated our anticoagulation protocol for ECPR and observed that our patients' ACTs frequently exceeded the target value and some experienced fatal bleeding. The anticoagulation protocol for post-CPR patients may need to be reconsidered.

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Predictors of poor outcome in out-of-hospital cardiac arrest

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Critical Care 2014, **18(Suppl 1):**P489 (doi: 10.1186/cc13679)

Introduction Out-of-hospital cardiac arrest (OOHCA) causes 60,000 UK and 300,000 US deaths each year. Survival to hospital discharge in the developed world has historically been 7 to 10% with obvious cognitive impairment in 10% of survivors. Primary percutaneous coronary intervention (PPCI) and targeted temperature management (TTM) (or at least hyperthermia avoidance) have been shown to improve survival in comatose patients post OOHCA. There is no reliable method to predict poor outcome on presentation. We aimed to identify factors associated with poor outcome in our single-centre regional referral OOHCA population.

Methods We performed a pragmatic single-centre retrospective review over 18 months commencing 1 January 2011 of all patients admitted to our regional OOHCA centre ICU following successful resuscitation from OOHCA. In keeping with guidelines, all patients were assessed for suitability for PPCI and TTM. A good outcome was defined by a Pittsburgh Cognitive Performance Category (CPC) score of 1 to 2 (independence, mild impairment) on hospital discharge. A poor outcome was defined as death or CPC 3 to 4 (moderate to severe impairment, coma) on hospital discharge. CPC scoring was determined

Table 1 (abstract P489). Presenting features and outcome at hospital discharge of ICU OOHCA patients

	Good outcome (CPC 1 to 2)	Poor outcome (dead or CPC 3 to 4)	Total	*P* value
Age	63.3 ± 16.8	63.6 ± 14.4	63.5 ± 14.7	NS
Male sex	21/26 (81%)	29/43 (67%)	50/69 (72%)	NS
Arrest occurring 08:00 to 20:00	14/19 (74%)	16/36 (44%)	30/55 (55%)	<0.05
VF/VT as initial rhythm	25/26 (96%)	25/43 (58%)	50/69 (72%)	<0.001
Bystander CPR	12/26 (46%)	24/43 (56%)	36/69 (52%)	NS
Time from collapse to ROSC (minutes)	18.3 ± 11	32.3 ± 26	27.1 ± 23	<0.05
Advanced airway management	14/24 (58%)	38/42 (90%)	52/66 (79%)	<0.005
Cardiac cause	24/26 (92%)	30/43 (70%)	54/69 (78%)	<0.05
Angiography	19/26 (73%)	23/43 (53%)	42/69 (61%)	NS
Therapeutic hypothermia	24/26 (92%)	41/43 (95%)	64/69 (93%)	NS
Presenting pH	7.21 ± 0.11	7.08 ± 0.18	7.13 ± 0.17	<0.01
Presenting base deficit (mmol/l)	−7.9 ± 6.2	−13.8 ± 5.9	−11.5 ± 6.7	<0.001
Presenting lactate (mmol/l)	4.3 ± 3.0	8.3 ± 4.5	6.8 ± 4.4	<0.0005