

ISPRM CONGRESS 2022 ABSTRACTS

KEY NOTE LECTURES

Leadership: What I did and what I wish I had done

John L. Melvin

Department of Rehabilitation Medicine, Sidney Kimmel Medical School, Thomas Jefferson University, Philadelphia, USA
E-mail: john.melvin@jefferson.edu

My day job was being the chair of three academic programs from 1973-2016, but I also held many leadership positions in professional organizations. These included being the President or Chair of twelve major national and international organizations. The aim of this lecture is to provide to attendees some observations from this experience that might be of value to their own planning. **Funding and Research:** When I first became a chair, I was able to support the expansion of the department's teaching, research, and clinical service programs through hospital support and fees for physician clinical services. Later, I was chair at Thomas Jefferson University during a period when these sources barely covered the clinical activities of the faculty. A department needed consistently successful grant applications to have resources for the development of research programs. Sometimes I wish that I had developed a consistently funded focused research interest. I first became a chair at age 38. At times, I wonder whether I should have delayed becoming a chair and developed a more robust research portfolio first even though I had made substantial contributions. Ernie Johnson and I developed the first practical clinical technique for measuring sensory nerve potentials. This resulted in early papers describing carpal tunnel in pregnancy, residual changes in postoperative carpal tunnel patients, and the response of carpal tunnel patients to wrist steroid injections. **Publication:** I have presented 465 lectures throughout the world. I wish that I had taken the time to publish many of the ideas included in these presentations. **Communication:** My first and last chair positions were for 18 years. Each of them had three deans during my tenure. Although I participated in all of the activities expected of chairs, I found that this was not enough contact for new deans to get to know me as an individual or the special problems of the PRM Department. I was able to manage the departments without outside help or advice, so did not push for additional time with the deans. I now believe this was a mistake and that I should have arranged individual communication sessions with these deans. Even if they did not result in additional resources, such visits would have clarified the dean's knowledge of the department. In conclusion, personal leadership reviews can identify alternative paths. Selecting one may preclude another. A different alternative might not be of sufficient value to warrant change.

Functional Prototypes in Applied Biomechanics

Luís Roseiro

Department of Mechanical Engineering, Polytechnic Institute of Coimbra, School of Engineering, Coimbra, Portugal
E-mail: lroseiro@isec.pt

Links between medicine and engineering have been present throughout the history of human civilization. Since their origin, these

two domains have acted as mutual catalysts, as well as complementing each other's development and advancement. Technology enables the use and application of tools and scientific knowledge within various domains, to address a broad-range of humanity's problems. In the current context, during the era of COVID-19, it has been observed that a large proportion of applied research has been focused on preservation of health and life. However, the success in developing and implementing this strategy will become more significant as the different areas of knowledge and know-how combine efforts and work together with an interdisciplinary perspective. The link between medicine, particularly physical and rehabilitation medicine and engineering, is a clear example that this type of synergy is possible. This link is welcomed as it has the potential to enable the development of technological solutions that improve the quality of life. This interdisciplinary perspective is also considered an asset when aligned with teaching methodologies in higher education institutions. An engineering student who contributes to developing a solution to be applied in the domain of health will surely see their skills reinforced. This presentation provides a set of examples of applied research, that demonstrate the interaction between doctors, academic researchers, and engineering & medical students. Resulting in an interdisciplinary line of work that contributed to the development of functional prototypes in biomechanics. This is demonstrated with a particular emphasis on physical medicine and rehabilitation.

Swallowing exercise, how we can consider it

Eiichi Saitoh¹, Yoko Inamoto²

¹Fujita Health University, Toyoake, Japan, ²Faculty of Rehabilitation, Fujita Health University, Toyoake, Japan

Exercise, which is core methodology in dysphagia rehabilitation, is a treatment that improves a patient's impairments and disability through behavioral intervention.

The history of dysphagia rehabilitation is not long. And initially, the trainability of dysphagic patient was thought to be questionable for several reasons. But now we are fully aware of the effectiveness of swallowing exercise.

Generally, swallowing exercise is divided into two types, indirect exercise without bolus and direct exercise with bolus, mainly from the viewpoint of risk management.

However, from the perspective of behavioral intervention, it is rational to divide it into "element-oriented exercise" that aims to improve the functional elements necessary for swallowing, and comprehensive "task-oriented exercise" that is motor learning such as creating new swallowing patterns. Exercise design seeks a rational combination of element-oriented exercises and task-oriented exercises. This is because the total amount (exercise time) of both in clinical situation is limited.

The principle that activity changes function and structure is called the "activity-function-structure relationship." Functions such as muscle strength, range of motion, physical capacity, and dexterity

are improved by stronger activity than usual usage level using the organ in charge, and structures are remodeled such as muscle hypertrophy during muscle strengthening exercise. This principle is used for element-oriented exercise to train each functional element. The nervous system, which is also a major factor in improving coordination, also plays a major role in motor learning and generally follows the above principles. However, motor learning means a task-oriented systematic solution, given its purpose is defined as the achievement of a criterion task. In this process, not only coordination but also many other functions should be involved, and also the use of assistive devices is also taken into consideration.

In behavioral science context, motor learning is a relatively permanent change in motor behavior caused by experience. And there are main factors, 1) transferability, 2) motivation, 3) performance changes, and, 4) retention and application. In addition, the main factors of performance change are, 5) feedback, 6) amount of exercise, and 7) difficulty of exercise. The therapist can be said to be a designer who understands the learning tasks and designs efficient exercises while considering these factors. In particular, achieving the targeted task requires multi-step practice with high transferability and appropriate difficulty. The role of video fluorography (VF), which was essential for the development of dysphagia rehabilitation, is due to its treatment-oriented nature. In other words, beyond the meaning of risk management, knowledge of the results (KR) obtained by VF provides proper design of task difficulty, and knowledge of performance (KP) provides useful hints for exercise way. In this presentation, we will show clinical cases and new methodologies explaining above mentioned concepts.

Therapeutic approaches using stem cells secretome in spinal cord injury regenerative medicine

António J. Salgado^{1,2}

¹Life and Health Sciences Research Institute (ICVS), School of Medicine, University of Minho, Braga, Portugal, ²ICVS/3Bs, PT Government Associated Laboratory, Braga/Guimarães, Portugal
E-mail: asalgado@med.uminho.pt

The low regeneration potential of the central nervous system (CNS) represents a challenge for the development of new therapeutic strategies. Mesenchymal stem cells (MSCs) have been proposed as a possible therapeutic tool for CNS disorders, namely due to the beneficial actions of their secretome. Indeed, the latter possesses a broad range of neuroregulatory factors that promote an increase in neurogenesis, inhibition of apoptosis/glial scar, immunomodulation, angiogenesis, neuronal and glial cell survival, as well as relevant neuroprotective actions into different pathophysiological contexts. Considering their protective action in lesioned sites, MSCs, and their secretome, might also improve the integration of local progenitor cells in neuroregeneration processes. In this sense their use could represent an important vehicle for the establishment of future CNS regenerative therapies. In the present talk the role of MSCs, and their secretome, on phenomena such as in vitro and in vivo neuronal/glial survival will be addressed. Additionally, their possible applications, for Spinal Cord Injury regenerative medicine will also be presented.

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STROKE

Transcutaneous spinal electrical stimulation for gait rehabilitation among patients with stroke

Toshiyuki Fujiwara

Department of Rehabilitation Medicine, Juntendo University Graduate School of Medicine, Tokyo, Japan
E-mail: t-fujiwara@juntendo.ac.jp

Transcutaneous spinal electrical stimulation (TSS) is newly developed neuromodulation for gait rehabilitation among patients with stroke. Locomotive movement consists of spinal reflexes as crossed extensor reflex, flexor reflex, spinal reciprocal inhibition, monosynaptic reflex. There is spinal locomotive circuit which can induce locomotive movement with using these spinal reflexes. TSS can activate the locomotive circuit with posterior root stimulation. We developed newly transcutaneous spinal stimulation (FAST walk) system for gait rehabilitation of stroke patients. One hundred Hz transcutaneous electrical stimulation was applied at mid-late stance and initial swing phase of paretic lower extremity. The stimulation intensity was set at two times of sensory threshold. We found significant improvement of 10m walk speed, stride and TSS. We found significant modulation of spinal reciprocal inhibition after gait training with FAST walk system. In this lecture, I would like to present the basic mechanism of TSS and clinical application of TSS for patients with stroke.

Management of the subacute painful hemiplegic shoulder with reduce range of motion

Paul Winston^{1,2}, Alessandro Picelli^{1,3}

¹Canadian Advances in Neuro-Orthopedics for Spasticity Congress, Victoria, BC, Canada, ²Division of Physical Medicine and Rehabilitation, University of British Columbia, Victoria, BC, Canada, ³Department of Neurosciences, Biomedicine and Movement Sciences, Neuromotor and Cognitive Rehabilitation Research Center, Section of Physical and Rehabilitation Medicine, University of Verona, Verona, Italy
E-mail: pauljwinston@gmail.com

Hemiplegic shoulder pain (HSP) is the most common pain disorder after stroke with incidence estimates of 30%-70%, and associated with reductions in function, interference with rehabilitation, and a reduced quality of life. Onset may occur as soon as a week after stroke in 17% of patients. Management of HSP represents a complex treatment pathway with a lack of evidence to support one treatment. The pain has heterogeneous causes. In the acute setting, decreased range of motion in the shoulder can be due to early onset spasticity, capsular pattern stiffness, glenohumeral pathology, or complex regional pain syndrome (CRPS). As contracture can form in up to 50% of patients after stroke, effective management of the painful shoulder and upper limb with decreased range of motion requires assessment

of each possible contributor for effective treatment. The anesthetic diagnostic nerve block (DNB) is known to differentiate spasticity from contracture and other disorders of immobility and can be useful in determining an appropriate treatment pathway.

We have created the ViVe (Victoria-Verona) algorithm as diagnostic algorithm to differentiate between the causes of HSP in the stiff, painful shoulder in the subacute setting, using diagnostic techniques including the Budapest Criteria for CRPS, and DNB for spasticity and pain generators. Through the examination of each joint in the upper extremity with HSP may differentiate each diagnosis with the use of an algorithm. Pain and stiffness isolated to the shoulder may be differentiated as primary shoulder pathology; sensory suprascapular DNB or intraarticular/subacromial injection can assist in differentiating adhesive capsulitis, arthritis, or rotator cuff injury. CRPS may affect the shoulder, elbow, wrist and hand, and can be evaluated with the Budapest Criteria. Spasticity can be differentiated with the use of motor DNB. A combination of these disorders may cause HSP, and the proposed treatment algorithm may offer assistance in selecting a systematic treatment pathway.

CHRONIC PAIN

Pain perception among PRM specialists. Are regional differences in Europe? A comparison of national surveys from Greece, Italy, Portugal and Slovenia

R. Casale, F. Antunes, C. Aguiar Branco, P. Boldrini, P. Cantista, N. Christodoulou, K. Grabljevec, Z. Kuret, J. Lains, N. Majdič, X. Michail, J. Páscoa Pinheiro, K. Petropoulou, P. Podbregar, Z. Symeonidou, M. Sgantzos; On behalf of the National PRM Societies of Greece, Italy, Portugal, and Slovenia and the ESPRM SIG on "Pain and Disability"

E-mail: robertocasale@opusmedica.org

In the last decade, the leading role of PRM in the therapy and management of patients with chronic pain has emerged more and more clearly. This is even more true when the disability comes from pain. From a patient perspective the importance of any form of rehabilitation has been assessed by a European survey estimating that more than 30% of its interviewees with chronic pain had undergone some form of physical or rehabilitation therapy. Two-thirds of whom had undergone non-pharmacological treatment or used treatments as manual therapy, physical therapies, or other form of rehabilitation treatments. Up to now no data were available on the perception of the burden of pain as perceived by PRM specialists. For this reason, in recent years, in cooperation with the Special Interest Scientific Committee for Pain and Disability of the European Society for PRM, the National scientific societies of PRM of Greece, Italy, Slovenia and Portugal have launched surveys to determine the extent and characteristics of pain in a rehabilitation setting. Through an online survey platform, a questionnaire was emailed to all the PRM specialists' members of the respective national societies. The questionnaire initially developed in English was translated and adapted in the National language of the four above mentioned Nations. The questionnaire was constructed to acquire objective insights related to a) dimension of the problem (number of patients; type of pain -acute, chronic, neuropathic, nociceptive/inflammatory-); b) burden of pain on disability; c) pain assessment (i.e. use of questionnaires) and management (i.e. presence of a pain management programme in or outside a rehabilitation setting) and adherence to guidelines; d)

prescribing habits for medications and physical therapies. From the aggregation of the data collected, some homogeneous data emerge in the four national realities alongside with some flaw. There is agreement that pain affects the outcome of rehabilitation with an impact of pain on rehabilitation outcome estimated between 50% to 75%. PM&R specialists are well aware of the relevant number of patients with pain in a rehabilitation setting as well as of the need to improve knowledge about differential diagnosis and the use of drugs with special emphasis on opioids. Indeed, although the most frequently used pharmacological therapies are NSAIDs and paracetamol, differences emerge in the use of opioids, physical modalities, and invasive or minimally invasive techniques between Nations. The merged data of the four National Surveys highlight the need to implement continuous medical training on a European basis to make the management of chronic pain conditions more homogeneous in compliance with the indications of the European Community and at the same time, reaffirming the centrality of the rehabilitation management of these patients.

New insights in physical and rehabilitation medicine: The relevance of nociplastic pain

Marta Imamura

Departamento de Medicina Legal, Ética Médica, Medicina Social e do Trabalho, Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil
E-mail: martaimf@gmail.com

Nociplastic pain is recently defined as pain that arises from altered nociception despite no clear evidence of actual or threatened tissue damage causing the activation of peripheral nociceptors or evidence for disease or lesion of the somatosensory system causing the pain. Prevalence is estimated to be between 5% and 15% of the general population (Fitzcharles *et al.*, 2021). A recent nationwide survey identified nociplastic pain in 23% and mixed nociplastic and neuropathic pain in 27% of multiple sclerosis patients with chronic pain (Kratz *et al.*, 2021). Nociplastic pain derives from augmented pain processing and altered pain modulation in the central nervous system and should be considered in any patient with chronic pain. It is a phenotypic expression of multifactorial processes originating from different inputs, both as a response to a peripheral nociceptive or neuropathic trigger and reduced pain inhibitory mechanisms. Main clinical features of nociplastic pain conditions include combined peripheral and central sensitization, spinal cord reorganization, hyper-responsiveness to painful and non-painful sensory stimuli, associated with fatigue, sleep and cognitive disturbances, hypersensitivity to environmental stimuli, anxiety and depression mood. It is crucial that the Physical and Rehabilitation Medicine specialist is capable of recognizing this type of pain, as it responds to different therapies than nociceptive and neuropathic pain. Patients diagnosed with nociplastic pain presents with a decreased responsiveness to peripherally directed therapies such as anti-inflammatory drugs, opioids, surgeries and invasive procedures. First line interventions include non-pharmacological treatments, patient education, promotion of self-management control measures, including proper lifetime habits and psychological therapies.

MEDICAL REHABILITATION IN DISASTER RELIEF

Strengthening rehabilitation in disaster settings: The crucial role of Disaster Rehabilitation Committee (DRC)

Bhasker Amatya^{1,2}

¹Department of Rehabilitation Medicine and Australian Rehabilitation Research Centre, Royal Melbourne Hospital, Melbourne, Australia, ²Department of Medicine, Royal Melbourne Hospital, University of Melbourne, Melbourne, Australia
E-mail: bhasker.amatya@mh.org.au

With the increasing frequency of natural disasters and the high prevalence of survivors with disabling conditions, there is a greater focus on the importance of rehabilitation in disaster management. Rehabilitation-inclusive management program is required at all phases of the disaster management continuum, which comprises: mitigation/prevention, preparation, response, and recovery phases. Rehabilitation plays a crucial role in natural/man-made disasters providing appropriate care to persons with previous and newly-acquired complex injuries. It provides structure and standardization of care, aligned with a set of overarching principles to prepare, plan and provide effective and coordinated care during disasters and in the longer term. Strong medical leadership and effective action from national and international bodies for comprehensive rehabilitation-inclusive disaster management are required to strengthen national capacity, foster an environment of self-empowerment of rehabilitation personnel/teams and local health services; and work within defined coordination mechanisms in the disaster-affected area. The main challenges remain timely and adequate coordinated response that supports an 'overwhelmed' local health system; processes and systems allowing for rapid rehabilitation triage of affected patients; provision of evidenced-based care in resource-limited settings; adequate skilled workforce on the ground, and culturally and linguistically appropriate care. The World Health Organization, ISPRM, and other organizations have established various initiatives to improve disaster response/rescue, field management, and best evidence-based practice. The ISPRM endorsed disaster rehabilitation as one of its main missions and recognizes it as an integral component of disaster response and management plans. The Disaster Rehabilitation Committee was established to advocate the physical and rehabilitation medicine perspective in minimizing disability and optimizing functioning and health-related quality of life of disaster victims. Since its establishment, it has developed formidable expertise to provide organizational and technical advice to relevant stakeholders including the WHO, UN, local governments, NGOs and others regarding disaster management and global humanitarian rehabilitation disaster response. The DRC activities on the global stage are embedded in a strategy that includes coordinated activities of ISPRM member National Societies and the WHO-ISPRM Liaison Committee. This presentation will highlight the synergistic position of the Disaster Rehabilitation Committee (DRC), ISPRM to provide crucial leadership and governance role in liaison and coordination with the WHO and other stakeholders, to provide rehabilitation input during disasters. Key priority areas that need to be considered to strengthen disaster rehabilitation will be elaborated. Further, current developments in disaster rehabilitation, the evidence to support rehabilitation in emergency settings, the challenges faced in terms of skilled workforce, training and education needs, will also be discussed.

Longitudinal trajectories of functional recovery and pain in earthquake victims with disabilities

Jan Reinhardt

Institute for Disaster Management and Reconstruction, Sichuan University, Sichuan, China
E-mail: jan.reinhardt@paraplegie.ch

Purpose: There is a paucity of research on the longitudinal development of functional outcomes and pain in disaster survivors. We aimed to identify classes of dual trajectories of functioning and pain in earthquake survivors with impairments over an eight year period. **Methods:** We analyzed data from 531 survivors of the 2008 Wenchuan earthquake survivors with impairments sustained from the disaster. Data on functional independence in activities of daily living measured with the Barthel Index and pain measured with a 10-point numerical rating scale were available from four assessment points in 2008, 2010, 2012, and 2016. We jointly estimated longitudinal trajectories for functioning and pain using group-based dual trajectory modelling. **Results:** While functional independence improved over time for the majority of patients, pain remained a frequent problem. We identified three prevailing dual trajectory groups: 1) Low baseline functioning with moderate initial improvement followed by flattening of the curve, combined with low pain; 2) High functioning at baseline with ceiling effect in follow up, combined with constantly high pain; 3) Moderate functional improvement, combined with moderate reduction of initially high pain over time. **Conclusion:** Pain is a pivotal intervention target for continuous rehabilitation of earthquake victims. Pain and functioning trajectories do not necessarily converge and possibly need to be addressed with different interventions.

Rehabilitation for refugees with disability in Middle East: Overwhelmed resources

Khalil Al Abbadi, Bilal F. Shanti, Ali Al Rjoub, Jaber Al Daod, Ihsan F. Shanti, Zaynab Shanti

Department of Physical Medicine and Neurorehabilitation, Amman Hospital, Amman, Jordan
E-mail: drkhalil-alabbadi@hotmail.com

The World Health Organization (WHO) promotes rehabilitation as "an essential part of universal health coverage along with promotion of good health, prevention of disease, treatment and palliative care." It is estimated rehabilitation services can benefit about 2.4 billion people worldwide, especially in areas suffering refugee's crisis like the Middle East, which remains a boiling lava, with internal and external conflicts, and proxy wars, and subsequent outflux of humans from their native homes, fleeing wars, atrocities, and eminent death. Disabilities are mounting and rehabilitation services are exhausted and barely provided to natives let alone the refugees. The UN Disability Inclusion Strategy (UNDIS) was launched in 2019 to promote 'sustainable and transformative progress on disability inclusion through all pillars of the work of the United Nations.' Whether that has been accomplished or not is a different story. Non-Gulf countries in the Middle East are suffering the consequences of poor financial resources along with conflicts' destruction of infrastructure and waves of internal and external migration. Yemen, Syria, Libya and Palestine are living examples. The health systems in these hot areas are destructed and the consequences are exhausting neighboring countries. In this scope, Jordan is an example. In Jordan, despite the limited resources and scarce financial support, millions of refugees are hosted. This has resulted in Jordan's healthcare system becoming under severe pressure threatening an overstressed health system even for its natives. Rehabilitation services are provided to all including people with disabilities by a wide spectrum of entities including Ministry of Health, Ministry of Social Development and Ministry of Education along with the below mentioned ones. Despite this variety, Rehabilitation services in the scope of refugees especially those with disabilities remain lacking a stronger, more continuing support and expansion. In that area, WHO, UNHCR, Governmental and Non-

Governmental Organizations, Disabled Persons Organizations, the Arab Forum for Rights of Persons with Disabilities, Convention on the Rights of Persons with Disabilities, and many others are trying to address the need of People with Disabilities, but the need remains very high. Rehabilitation healthcare providers are delivering beyond their capacity, working in an overwhelmed environment and in continuous need for training and knowledge building. COVID-19 pandemic has further compounded rehabilitation services in the Middle East. The already-limited budgets are drained, health care professionals are fatigued, and systems are struggling. Our pessimistic view on rehabilitation disasters in the Middle East remains logic and non-emotional. Solutions are decreasing by the day. These issues will not be addressed unless further hemorrhage caused by wars stops and international donors step up to the plate and meet their responsibilities.

Physiatrists and rehabilitation professionals must address climate change

Marcalee Alexander

University of Alabama, Birmingham School of Medicine, Birmingham, USA
E-mail: spinalcordmd@live.com

Climate change is the greatest public health concern of the 21st century and physiatrists need to implement adaptation and mitigation into their practices. Adaptation is important because persons with disabilities and the elderly, who comprise a large percentage of rehabilitation clients, will be amongst the most affected. Weather disasters and wildfires are increasing in frequency and with the 2.7 degree C increase in temperature anticipated by 2100, the situation will worsen. These concerns disproportionately impact people with disabilities with variable effects based upon location, type, and extent of disability. Persons with neurologic illnesses are particularly vulnerable to extreme temperatures and weather disasters, yet athletes, persons with neurodiversity and other chronic illnesses are also impacted by these events. Individuals with respiratory illnesses are especially susceptible to degraded air quality and mental health issues are increasing due to climate change. Moreover, the population physiatrists treat often have other concerns such as being impoverished, living in vulnerable locations and being female, thus developing adaptation measures for persons with disabilities is paramount. Diagnostics and therapeutics contribute to greenhouse gases and climate change mitigation needs to be implemented in our practices. Health care systems contribute 4.4% of CO₂ emissions around the world, yet the impact of the rehabilitation sector is unknown. To date, 14 countries have committed to carbon neutral health care systems and more will follow. Therefore, mitigation efforts such as telerehabilitation, decarbonization through transition to renewable energy sources, nature prescribing or home therapy in lieu of travelling to clinics, considering whether medications and laboratory studies are necessary at the frequency prescribed, and other activities such as waste audits are increasingly important. Rehabilitation students and professionals in active practice must be educated about climate change and health and communicate the risks to their patients and colleagues. Research is necessary to understand the nuances of specific disabilities, the specific impacts of climate change on health and function in these populations, and optimal methods of adaptation. Mitigation and sustainability research is also necessary for inpatient and outpatient rehabilitation services and techniques for lifelong care for persons with disabilities. Still, our responses to the existential threat of climate change must not be limited to our professional practices. Physicians are some of the most trusted communicators in society and it is important we act

to diminish our personal carbon outputs and advocate for a rapid response to the climate crisis. Online education is an excellent method to decrease carbon expenditures and Day for Tomorrow events that include education can be an optimal way to inform and engage communities in preparedness and response to climate change.

Rehabilitation services and the impact of COVID-19 pandemic on people with disabilities in Pakistan: Lessons learned and way forward

Sahibzada Nasir Mansoor

Department of Rehabilitation Medicine, Armed Forces Institute of Rehabilitation Medicine, Rawalpindi, Pakistan
E-mail: drnasirmansoor@gmail.com

Background: COVID-19 Pandemic exposed the low- and middle-income countries healthcare capacity. The social distancing and associated lockdown restrictions led to their increased difficulties and barriers for disabled and magnified their problems. The World Health Organization specified protective measures for people with disabilities and recommended continuing services for the disabled. Pakistan has approximately 22 million people with disabilities. They were isolated in terms of access to information, healthcare, education, financial support and home-based services. Although the management of the COVID-19 by the Pakistani Government has been appreciated by the WHO and international community but the government official guidelines for the management of COVID-19 does not mention disabled population anywhere and have been totally overlooked in decision making. There is no available data of disability related infectivity and deaths. **Pakistan Ground Realities:** During this pandemic the largest rehabilitation institute in the country was converted into a 130-bed dedicated isolation facility. The Rehabilitation services in Pakistan are mostly outdoor in day clinics and very few indoor centers that too based in major cities. Majority were either shut down or handed over to acute care. All routine and elective services were stopped considering elective and hence discriminated the disabled. This led to lack of functioning, increased dependencies and problems in access to routine medications leading to infections, increased spasticity, increased blood pressures and other complications. Pain management, speech and psychotherapy services were adversely affected. Patients with chronic neurological conditions were unable to continue services and regressions of functional gains were observed. Lack of prosthetic repair and maintenance services led to mobility issues and complications. Few of our disabled spinal cord injury patients got infected with COVID-19 while travelling to spinal cord injury rehabilitation centers. The psychological impact of COVID-19 on disabled population was even worse leading to anxiety and depression. Telerehabilitation and online consultations were encouraged but they did not get wide acceptance due to the lack of physical face to face interaction required in most of the rehabilitation interventions. **Recommendations:** Development of database for disabled population with detailed information of the type of disability and the assistance required. Priority of handling medical and other needs of disabled population in disasters. Development of telerehabilitation services and local mobile apps for the disabled. Development of a hotline for disabled. Development of regional and home-based services programs and financial aid by the government. **Conclusion:** We can convert this adversity of pandemic into an opportunity to improve care, rehabilitation services and legislation for our disabled population to reduce their miseries and improve their quality of life and health.

SPMFR SESSION

Rehabilitation in critical patients – Intensive unit care

Catarina Aguiar Branco¹, Carolina de Miguel²

¹Portuguese Society of PRM (SPMFR), ²Spanish Society of PRM (SERMEF)
E-mail: catarina.aguiar.branco.mfr@gmail.com

Rehabilitation in critically ill patients is significant for patient's clinical and functional recovery, during the stay in the intensive care unit (ICU), in the critical patient's hospital pathway and for the medium and long-term outcomes, including activity and participation. It is important in the scope of multi-professional and inter-multidisciplinary rehabilitation team interventions and performance [including Physical and Rehabilitation Medicine (PRM) Physicians, Rehabilitation Nurses, Physiotherapists, Speech Therapists and Occupational Therapists] and of interdisciplinary work, with other medical and surgical specialties. The evolution in Critical Patients Rehabilitation and team knowledge and procedures, has been remarkable in the last 20 years, supported by clinical and scientific evidence, with one last boost with the COVID-19 Pandemic. PRM Physician's intervention in critical patients (evaluation, diagnosis, prescription, therapeutic and rehabilitation team guidance and intervention exams and procedures) has been supported and promoted in several and different areas as: immobility syndrome prevention (in mechanically or noninvasively ventilated patients), functional respiratory reeducation, ventilatory weaning promotion, management in the approach of the tracheostomized patient, early mobility, gait, electrical stimulation, cardio-respiratory and muscular reconditioning, as well as, in ventilation, cardiorespiratory, swallowing and neurological dysfunctions prevention or treatment and surgical sequelae handling, in a large range of multimodal and multi-professional inter-collaborative interventions. The importance of PRM interdisciplinary with the specialty of Intensive Care Medicine, but also with other surgical and medical specialties and with the areas of nutrition and psychology (in patients with longer hospitalization) denotes the holistic and integrated characteristic of our intervention in the medical and technical field. The continuum of rehabilitation care after hospitalization in ICU is a good practice and mandatory to the best outcomes. The critical patient's evaluation performance by metric instruments (with scales, questionnaires, health indicators) should be recommended and developed to evaluate medical activity and rehabilitation team outcomes, in the clinical, functional, activity and subsequent medium and long terms participation and quality of life. This allows the support of the effectiveness and efficiency in terms of health management, concerning PRM physician and the rehabilitation team interventions in critical patients, and so their importance. It should be promoted in PRM Services/Departments in inter-collaboration with ICU Services. The (continuous) education and training of PRM/Rehabilitation health professionals in their fields of competence, it is a key and mandatory requirement for the best quality and safety of critical patient rehabilitation care, owing to the clinical specificity of these patients. Information to other health professions about our interventions and higher value is quite relevant and useful. New trends in Critical Patients Rehabilitation arises the importance of this medical and health field for PRM specialty and for the rehabilitation team, as an added value for patient (family and caregivers) and health systems.

What's new in quantification biomechanics

Carolina de Miguel, Catarina Aguiar Branco

¹Spanish Society of PRM (SERMEF), ²Portuguese Society of PRM (SPMFR)
E-mail: catarina.aguiar.branco.mfr@gmail.com

Biomechanics is the scientific discipline in the field of anatomy, physiology, biophysics and mechanics, that applies the laws of mechanics to living organic structures, namely the locomotor system of the human body in the context of physical description, evaluation and (quantitative and qualitative) analysis, regarding the mechanics of human movement (performance and function) - kinesiology. Biomechanics is applied to many pathologies and health states, with varied semiology, and particularly in clinical situations of permanent or transient functional limitations, with interference in the ability to move and as such in the limitation of activity and restriction of participation. Its applicability, objectivity, and reproducibility, important in Rehabilitation, is transversal to age groups and to many neurological pathologies, as spinal cord injury and stroke, or to orthopedic and neuro-orthopedic ones, including recurrent microlesions. It is associated with clinical and functional metric evaluation, with an important investigation approach, in direct translation to clinical practice (evaluation, diagnosis, guidance and readjustment of therapy/rehabilitation and results monitoring). Criteria, indicators and metric determinants in biomechanics include physics concepts (such as mass, inertia, gravity, speed, force, torque). It contains the concepts and dimensions of anthropometry, static, dynamics; kinematics and kinetics; kinetic chains and movement; posture and postural segments relationship; dynamometry. It is a multidisciplinary and integrated vision and approach. New trends and technological and digital evolution increasingly give biomechanics the innovative character necessary for Rehabilitation. Biomechanics in Rehabilitation demonstrates the importance of technology and equipment, but also of human resources. The education and training of rehabilitation health professionals, and in particularly of PRM Physicians, is important for robustness in performing procedures and interventions, for the best clinical objectification, for clinical and scientific strength in the interdisciplinary relation between PRM and other medical and surgical specialties or other health professionals (including those from the Rehabilitation Team). Education and Training in Biomechanics in the scope of Rehabilitation should be promoted. Biomechanics in Rehabilitation supports its interventions and procedures, objectives the effectiveness and efficiency of those, from the clinical and health management point of view. *Biomechanics Strengthens Rehabilitation.*

SPMFR/SERMEF/CONO SUR SESSION

Results measurement in rehabilitation: New lines for education, training and professional skills

Catarina Aguiar Branco¹, Carolina de Miguel²

¹Portuguese Society of PRM (SPMFR), ²Spanish Society of PRM (SERMEF)
E-mail: catarina.aguiar.branco.mfr@gmail.com

Rehabilitation is crucial for clinical and functional improvements and for the activity, participation and quality of life of individuals with permanent or temporary disabilities in a large assortment of medical and surgical pathologies and various health status. Rehabilitation is a right of individuals with permanent or temporary disabilities and health professionals should defend and promote it. Rehabilitation is a central dimension in the XXI Century Health, in the fields of pre and post graduated medical education, of professional qualifications, competences, skills and interventions. The holistic characteristic of patient's approach in Physical and Rehabilitation Medicine (PRM) obliges to a wide medical education,

to a specific PRM specialty education, to a large clinical and functional dialectic vision and approach. PRM patient's evaluation, assessment and management associated to its proper methodology, in a biopsychosocial health model, with a multi-professional, interdisciplinary and multidisciplinary teamwork model supports the necessity of education, training, skills and measurement. Rehabilitation assessment and outcomes measurement is a demanding issue for the PRM Physician regarding clinical, functional and health economic and financial purposes to support our specialty and team rehabilitation interventions. Medical evolution wires new lines for education, training, and professional skills for PRM specialty and for the individual PRM trainee and specialist. Rehabilitation measurement can involve a large range, but many times simple procedures, metric instruments, and equipment. PRM education, training and skills have a common basis in all countries, differing in the years and models of training, health systems typologies and health care services organization. It's important to have worldwide information about these subjects, in order to improve PRM education and PRM efficiency in health management, as well as to sustain PRM specialty's value added to the patient (family and caregivers) and to the health systems. These results measurement in Rehabilitation cover very different areas as muscle-skeletal, rheumatological, traumatological, neurological, cardiorespiratory, reconditioning, oncological, pediatric, pain syndromes... The new trends in rehabilitation measurements obliges to innovative and well planned strategies in developing or continuing forward PRM Education, Training and Professional Skills, as important health areas and dimensions in the XXI Century.

NEUROLOGICAL DISORDERS

Action observation via telerehabilitation to promote arm function in Parkinson's disease

Marianna Capecci

Department of Experimental and Clinical Medicine, Politecnica delle Marche University, Ancona, Italy
E-mail: m.capecci@staff.univpm.it

Parkinson's disease (PD) is a chronic neurodegenerative disease that involves progressive impairment of motor and non-motor functions. PD affects patients' daily lives and reduces participation and quality of life at all stages of the disease, and impaired dexterity has been reported as the second major contributor to PD disability, after gait problems. Early exercise may mitigate the effects of symptoms, and continued or intensive access to specialist care is recommended to maintain the long-term effect, in a condition characterized by retention learning disabilities. Tele-rehabilitation is now a viable option for managing people with PD (pwPD) and provides the possibility of sustainable long-term rehabilitation care. Few studies have investigated the use of telerehabilitation, a recent review (Vellata *et al.*, 2021) found that it is effective in maintaining and/or improving some clinical and non-clinical aspects of pwPD, namely balance and gait, speech and voice, quality of life, and patient satisfaction, but there are currently no data on dexterity rehabilitation. It is a well-accepted concept, that the observation of finalized actions performed by others activates (i.e., "resonates") in the perceiver the same neural structures responsible for the actual execution of those same actions. (Rizzolatti *et al.*, 2001) Areas endowed with this action observation-action execution matching mechanism are defined as the mirror neuron system (Buccino *et al.*, 2001). This motor resonance can drive learning and the acquisition of motor skills in analogous ways as physical exercise. (Rizzolatti *et al.*, 2001) Studies on single-

session experiments suggest that Action Observation (AO) based Treatments (AOT) in subjects with Parkinson's Disease (pwPD) can facilitate the performance of spontaneous movements (Pelosin *et al.*, 2013; Castiello *et al.*, 2009) and that the simultaneous observation and execution of a movement can produce motor facilitation (Tremblay *et al.* 2008). AOT was demonstrated to induce clinical improvements on gait at 4-week and a more lasting effect in improving motor function, gait, and quality of life in pwPD compared to physical therapy alone, changing cortical plasticity (Agosta *et al.*, 2017). Finally, imitative compatibility effects did not differ between people with PD and healthy subjects, indicating intact motor resonance in the people with PD (BeK *et al.*, 2017). In this lecture, preliminary results from a controlled study of 20 AOT sessions proposed for the recovery of arm dexterity and delivered at home through a web-based platform in 18 pwPDs will be reported: compared with equivalent face-to-face treatment conducted in 18 other pwPDs, telerehabilitation provides a non-inferior outcome in the immediate post-treatment period and a possible superior outcome after 4 months in terms of dexterity. The telerehabilitation service remained available to pwPDs after the end of experimental training.

What do we learn from clinical practice guidelines? The WHO be4rehab project

Maria Gabriella Ceravolo

Department of Experimental and Clinical Medicine, Politecnica delle Marche University, Ancona, Italy
E-mail: m.g.ceravolo@staff.univpm.it

The World Health Organization (WHO) has the strategic priority of achieving Universal Health Coverage (UHC), which means "all people receive quality health services that meet their needs without being exposed to financial hardship in paying for the services." UHC includes rehabilitation among the services to be provided. As part of the WHO Rehabilitation 2030 call for action, the WHO Rehabilitation Programme is developing a Package of Interventions for Rehabilitation (PIR) to support ministries of health in integrating rehabilitation services into health systems. The development of the PIR takes a stepwise approach. The second step, referred to as "Best Evidence for Rehabilitation" (be4rehab), requires the identification of interventions for rehabilitation and related evidence for the health conditions selected in the first step. Parkinson's disease (PD) is one of the 20 diseases included in the PIR due to its high prevalence and associated levels of disability. Globally in 2019, 3.9 million [3.3-4.7] PD patients in need of rehabilitation contributed to 1.2 million [0.8-1.2] years of life lived with disability. This number has increased by 155% [149-161] since 1990. To face this great health challenge, actions aimed at preventing the disease, containing its progression, and improving the quality of life of those affected by PD are urgently required. As a "be4rehab" action, we conducted a systematic review of the existing Clinical Practice Guidelines (CPGs) for Parkinson's disease (PD) published over ten years, from 2009 to 2018. Data extraction was performed using a standardized form that informs on the recommendation type (Service, Assessment, Intervention), target population, the strength of recommendation, and quality of the evidence used to inform the recommendation. Out of 287 papers, 5 guidelines were selected, delivering a total of 422. **Recommendations:** 66 (16%) on Assessment, 293 (69%) on Interventions, and 63 (15%) on Service organization. Only 8% of the recommendations were strong, based on a Level 1 body of evidence. Conventional physiotherapy, and more specifically, muscle strengthening, treadmill training and cueing strategies for improving functional mobility, Tai-Chi for

improving motor symptoms, and voice treatment for hypokinetic dysarthria were strongly recommended. **Discussion:** The quality of rehabilitation research applied to PD is largely low and especially focused on testing physiotherapy intervention efficacy. There is still poor evidence supporting the management of non-motor disabling features, and the emerging evidence on the use of digital technologies for the assessment and treatment of people with PD is not mentioned.

Telerehabilitation in people with Parkinson's disease: Preliminary results of a multicentre randomized controlled trial

M. Franceschini, F. Baglio, A. Turolla, C. Pagliari, S. Pournajaf, L. Pellicciari, M. Goffredo

Department of Neurological and Rehabilitation Sciences, IRCCS San Raffaele Roma, Rome, Italy
E-mail: marco_franceschini@hotmail.com

Introduction: Since the Parkinson's Disease (PD) has a significant long-term impact on Activities of Daily Living (ADL), thus progressively reducing the Quality of Life (QoL), new knowledge is required to develop effective prevention and treatment strategies [1], and the implementation of a regular prolonged training program. However, people with PD may have difficulty in achieving outpatient rehabilitation services because of economic, geographic, and social-distancing barriers. In these scenarios, a solution to guarantee the continuity of care may be the TeleRehabilitation (TR), i.e., the delivering of clinical rehabilitation services for evaluation and treatment at distance. **Objective:** Randomised controlled trial to assess the efficacy of a telerehabilitation system compared to conventional therapy in people with PD. **Method:** 39 subjects (Hoehn & Yahr = 1.5-3.0; 6mwt > 200 m) were enrolled and were randomly allocated to Experimental Group (EG; N=20) or Control Group (CG; N=19). Subject followed 40 sessions (45 minutes; 5 times/week) of motor TR with the VRRS Tablet system (Khyemeia s.r.l., IT) or conventional home-based conventional physical therapy. Clinical assessments were performed before (T1) and after the treatment (T2) included: H&Y; UPDRS; 6MWT; TUG; TUG dual task; Mini BES Test and MoCA. Paired t-test and chi-squared test was used ($p < 0.05$) for statistical analysis. **Results:** No between group difference was found at baseline. Changes between T2 and T1 were registered significant in Mini-BEST test ($0.78+1.54$; $p=0.039$) and UPDRS ($-5.89+6.95$; $p=0.002$), only in EG. All other outcomes were not significant. Regarding UPDRS, between-group difference was significant in favour of EG ($p=0.002$). **Conclusion:** TR is feasible to apply for motor treatment of people with PD with similar outcomes as conventional therapy. General clinical status (UPDRS) and balance (Mini-BEST test) showed a significant improvement in EG. Preliminary results are encouraging for TR implementation which emerges particularly important in this pandemic period in order to support the continuous rehabilitation for people with chronic progressive neurological diseases.

Robotic rehabilitation for Parkinson's disease: From evidence to clinical consensus

Alessandro Picelli

Department of Neurosciences, Biomedicine and Movement Sciences, University of Verona, Verona, Italy
E-mail: m.capecchi@staff.univpm.it

Parkinson's disease (PD) is a common neurodegenerative disorder due to the loss of dopaminergic neurons in the substantia nigra

pars compacta, which alters the function of basal ganglia (and in particular of the putamen) that is involved in control of upright stance, movement performance, motor learning and motor control. Its main features are rest tremor, rigidity, bradykinesia and postural instability. Rehabilitation is an adjuvant treatment to pharmacological and surgical procedures for PD in order to maximize functional ability, level of mobility and independence, also minimizing secondary complications. To date, a number of rehabilitative approaches has been proposed to treat the disabling features of PD, including physiotherapy (i.e. stretching procedures, muscle strengthening, therapeutic exercises), occupational therapy, treadmill training and advanced technologies. Unfortunately, it remains unclear which intervention is the most effective. In the last decades, there was a growing diffusion of robotic devices in rehabilitation facilities. The main aim of robots is to assist the training of patients with neurological disabilities. As to patients with PD, robotic training has been proposed to treat the impairments involving walking and the upper limbs. Based on the evidences about the beneficial effect on balance skills of rehabilitation procedures aimed at improving gait (such as treadmill training), robot-assisted gait training has been proposed also as a treatment approach for postural instability in PD. This was also because robotic machines for walking training may improve the safety profile of treatment in patients with balance impairment by means of exoskeleton or end-effector devices with harness for supporting body weight and controlling body sway. Despite the amount of evidence about robot-assisted training for treating patients with PD, to date the use of robotic procedures in daily clinical practice for PD is still debated. This was probably because of the wide range of devices and protocols used. This is the reason why the Italian Society of Physical and Rehabilitative Medicine (SIMFER) and the Italian Society of Neurological Rehabilitation (SIRN) promoted the Italian Consensus Conference on "Rehabilitation assisted by robotic and electromechanical devices for persons with disability of neurological origin" (CICERONE). The conclusions of CICERONE will be published in the first few months of 2022.

SPASTICITY

Spasticity outpatient evaluation via telemedicine

Monica Verduzco-Gutierrez

Department of Rehabilitation Medicine, Long School of Medicine, UT Health San Antonio, Texas, USA
E-mail: gutierrezm19@uthscsa.edu

The COVID-19 global pandemic resulted in significant changes to delivery of care in the field of physiatry. Most prominently, some in-person visits have fast-tracked to virtual visits. This rapid adoption of telemedicine in the last two years has allowed for novel ways to bring physiatric care locally and abroad with the use of synchronous telemedicine platforms. Spasticity, a sensorimotor disorder characterized by intermittent or sustained involuntary muscle activation, is a common consequence of upper motor neuron disorders. Early identification and treatment of problematic spasticity improves quality of life and limits known associated complications. It is thus important to utilize telemedicine to assess patients with spasticity. This presentation will review structuring telemedicine visits for optimal outcomes, provide tips on how to conduct the visit, specifically a person-centered virtual examination assessment, and how to document goals related to the virtual assessment. The format for a telemedicine visit may vary depending on the patient situation and needs of the physician and the practice. For instance, a two-way synchronous audio/visual platform is preferred for a visual interpretation of physical exam measures whereas some patient interactions may only require a

phone call for a quick check-in or a conference call between the patient and multiple providers. A telemedicine follow-up may be scheduled while the patient is at a therapy appointment. The telemedicine assessment should begin with the patient's concerns, needs, and goals. This approach improves the patient-provider relationship by promoting patient/caregiver ownership over the management plan. The exam will depend on the type and quality of camera set-up, the patient's cognitive and physical abilities, as well as the availability and skill set of the caregiver. In an evaluation, you must begin with inspection of the patient to evaluate resting posture, deformities, skin integrity. Ultimately, a clinician should use assessment scales they are most comfortable with and will be discussed more in the presentation. Finally, setting goals which are specific, measurable, achievable, realistic, and time-bound (SMART) help guide the action plan. Beyond assessment and evaluation, telemedicine can assess the effect of an intervention such as evaluating neurotoxin effectiveness, assessing side effects after starting a new medication, or checking in with the patient before changing a medication dose. There should be delivery of individualized educational material to achieve the desired goal in understandable patient language. Finally, will discuss potential for future bioperipherals and remote monitoring and adjustment of systems related to spasticity management. In conclusion, telemedicine offers the ability to provide patient and caregiver education regarding diagnosis, treatment options and rehabilitation recommendations in spasticity and should continue to be utilized beyond the pandemic.

Recommendations on intrathecal drug infusion systems best practices and guidelines

Michael Saulino

Department of Rehabilitation Medicine, Moss Rehab and Sidney Kimmel Medical College, Thomas Jefferson University, Philadelphia, PA, USA
E-mail: docsaulino@msn.com

Intrathecal therapy has been used for over three decades in the management of spastic hypertonia and chronic pain. This technique involves direct administration of liquid agents to the cerebrospinal fluid where the delivered agent has more direct access to its therapeutic targets. For severe spasticity, baclofen, a GABA-B agonist, is the predominant molecule for intrathecal delivery. Currently, there are two major pump types available for clinical use worldwide. The four major components of this therapy are: patient selection, trialing, device implantation, and chronic maintenance therapy. While this intervention can be highly effective in the control of the spastic condition, the therapy also has the potential for serious adverse effects. Clinicians who interact with patients who have spastic hypertonia should have the ability to recognize the potential for these events. Centers that implant and actively administer these systems should identify practitioners who can evaluate and manage these scenarios. This presentation will review proper patient selection, trialing methodology, oversight of the implanted patient, the nature of chronic maintenance therapy, the procedures for managing intrathecal baclofen overdose/withdrawal and techniques for evaluating system malfunction.

Expert highlights on the management of spasticity

Levent Özçakar

Department of Physical and Rehabilitation Medicine, Hacettepe University Medical School, Ankara, Turkey
E-mail: lozcakar@yahoo.com

Muscle overactivity (spasticity, dystonia or spasm) encountered in various neuromuscular disorders has been treated effectively with

the use of botulinum neurotoxins (BTXs). Since they act in the nerve terminals, toxins must be transported to the neuromuscular junctions who are commonly clustered in one or more restricted areas i.e. innervations zone(s) in a skeletal muscle. Likewise, targeting these zones during BTX injections under guidance is highly recommended to achieve an optimal therapeutic goal - for sure with possibly lower doses and fewer side effects. Accordingly, detection of the injection sites should be based on the knowledge about the localization of these aforementioned innervation zones. Additionally, awareness regarding the transport mechanism of BTX in the skeletal muscle is crucial for intramuscular applications. This presentation will comprise discussion on the innervation zones of skeletal muscles, distribution of BTX, proper sites and guidance for the injections - with special emphasis/consideration concerning the muscle structure and architecture. Indisputably, the use of ultrasound guidance during these interventions will be illustrated/exemplified in light of the established protocols by EURO-MUSCULUS/USPRM.

ASSESSMENT AND ELECTRODIAGNOSIS

Poliomyelitis epidemics in France during the 20th century: What contribution for the birth and grow of PRM?

Isabelle Laffont^{1,2,3,4}

¹Montpellier/Nimes Medical Faculty, Montpellier University Hospital, Montpellier University, Montpellier, France, ²Euromov Digital Health in Motion, Montpellier University, Montpellier, France, ³ISPRM General Secretary, ⁴SOFMER
E-mail: i-laffont@chu-montpellier.fr

Poliomyelitis epidemics ravaged Europe in the 20th century, affecting thousands of children whose survivors had to cope for their entire lives with more or less severe neuro-orthopedic sequelae and, for part of them, with significant functional disabilities. The traumatism of polio is still present in our modern society, despite its eradication at the end of the 80's in northern countries. Poliomyelitis gave birth to major medical practices all around the world, especially in infectiology, critical care, orthopedic surgery and rehabilitation medicine. Its input in PRM will be detailed, based on historical documents and on our collective knowledge: neurological and musculoskeletal rehabilitation, respiratory and swallowing rehabilitation, neuro-orthopedic reasoning, spine deformity prevention and treatment, spa and hydrotherapy, physiotherapy, technical aids and orthosis, creation of the first rehabilitation institutes, emergence of rehabilitation professions (PRM doctors, physical therapists, occupational therapist), structuring of user associations. Lessons of polio are still alive in our collective medical memory. Based on worldwide epidemiological data predicting a dramatically increasing number of people with long lasting sequelae of polio and functional decline, improvements of care of post-poliomyelitis patients are more than ever indispensable. A brief review of these medical issues will be conducted.

COVID-19 AND REHABILITATION

Long COVID: Evaluation, education, multisystemic and PRM coordinated therapies

F. C. Boyer¹, A. Rapin²

¹Pôle Autonomie et Santé, Service de Médecine Physique et de Réadaptation, Hôpital Sébastopol, CHU de Reims, Université Reims Champagne-Ardenne, Reims, France, ²Pôle Autonomie et Santé, Service de Médecine Physique et de Réadaptation, Hôpital Sébastopol, CHU de Reims, France
E-mail: fboyer@chu-reims.fr

Introduction: ‘Syndrome post COVID,’ ‘long COVID,’ ‘long haulers COVID’ are different terms suing to define consequences after a acute infection of SARS-CoV2. How to assess the long-term effects of this viral infection? What are the risk factors for prolonged effects of an acute SARS-CoV2 infection? Have you identified the pathophysiology(ies) responsible for the prolonged post-COVID syndrome? How to educate and coordinate rehabilitation in patients with prolonged and persistent post-COVID syndrome?. **Methods:** Bibliographic searches are carried out on PubMed, Embase and Scopus from January 2020 to March 2022 using the terms ‘rehabilitation,’ ‘post-COVID syndrome,’ ‘long COVID,’ ‘cohort studies,’ ‘randomized controlled studies,’ ‘prognosis,’ ‘pathophysiology,’ ‘physical therapy.’ When reading the studies, the methodological quality and the generalizability of the results are established. **Results:** Definitions of prolonged effects of acute infection vary depending on whether patients were hospitalized, whether there was a critical care intervention, age, number of symptoms in first week, IgG antibody level anti spike, immunosuppression and according to pre-infectious mental comorbidities. The physiopathology is poorly documented. Rehabilitation evaluations are individualized and concern the analysis of physical elements (physical fitness, nutrition, strength, pain, fatigability), mental elements (fatigue, sleep, mood disorders, anxiety, the search for a post-traumatic syndrome) and the primary or secondary cognitive aspects. **Discussion:** The care of patients differs depending on whether the patient has been hospitalized, resuscitated; the physical and mental elements are generally associated. Cognitive impairment is not at all associated with the intensity of physical and mental impairment. The pathophysiology remains poorly documented. Controlled intervention trials testing physical therapy or education are insufficient.

Post-Polio: Insights on PRM effectiveness. Lessons from Post-Polio for long-COVID

Dale Strasser¹, Benjamin A. Abramoff^{2,3}

¹Department of Rehabilitation Medicine, Emory University School of Medicine, Atlanta, Georgia, ²Department of PM&R, University of Pennsylvania, Pennsylvania, USA, ³Post-COVID Assessment and Recovery Clinic
E-mail: dstrass@emory.edu

Dr. Strasser offers a PRM perspective on Long COVID building on extensive experience with post-polio syndrome (PPS). Organizers of an expert panel on Myalgic Encephalitis/Chronic Fatigue Syndrome (ME/CFS) sought his input given the high level of patient dissatisfaction and thematic similarities with PPS. Three overarching themes emerged – validation, partnership, and goal setting. With Disease Validation, patients gain a framework with a baffling condition. A Partnership between the patient, care givers, and clinical providers forms to promote clinician engagement and coordination, and to facilitate development of the patient’s narrative arc. With Goal – Setting, the clinician guides the interactions to promote the alignment of patient expectations within the parameters of the medical and social conditions. Dr. Abramoff discusses similarities across an array of fatiguing illnesses including Long Covid along with emerging management strategies. He also presents a rehabilitation framework for Long COVID and similar fatiguing conditions. PRM offers patient- centered, practical, and effective approaches.

WHO – ISPRM LIASON COMMITTEE ISPRM-WHO Liaison Committee report of activities

Charlotte Kiekens¹, Vanessa Seijas^{2,3,4}

¹IRCCS Multimedica, Milano, Italy, ²Swiss Paraplegic Research, Nottwil, Switzerland, ³Department of Health Sciences and Medicine, University of Lucerne, Lucerne, Switzerland, ⁴Center for Rehabilitation in Global Health Systems, WHO Collaborating Center, University of Lucerne, Lucerne, Switzerland
E-mail: carlotte.kiekens@multimedica.it

Since 1999 ISPRM has held an official relationship with the WHO as a non-State actor. We are collaborating with the WHO Rehabilitation Programme team. As a Non-Governmental Organization (NGO), ISPRM has to contribute substantially to WHO activities according to agreed and accepted collaboration plans, including the participation of ISPRM in WHO meetings and collaboration in the network of WHO partners. Globally, there is an increase in the ageing and non-communicable disease population as well as consequences of injuries. These result in limitations in the everyday functioning of affected individuals. Access to rehabilitation, which has been shown to improve function, independence and the overall quality of life of these affected individuals, is however limited especially in low-middle income countries. Factors contributing to this include limited workforce capacity to meet population rehabilitation needs, under-prioritization of rehabilitation at the policy making level and the low level of rehabilitation incorporation at the primary health care (PHC) level where the identification and long-term management of functioning limitations usually occurs. In 2022 we have been reorganizing the committee, in order to better focus on our core activity: “strengthening rehabilitation in health systems.” The main functions of the committee are to: (1) Liaise with the WHO rehabilitation program to support the goals and activities of the Rehab2030 initiative; (2) Advocating in the WHO Executive Board, the World Health Assembly and the Regional Health Assemblies for the strengthening of rehabilitation in health systems; (3) Support rehabilitation strengthening advocacy activities at regional and country level; (4) Advocate and support for the training of PRM physicians in low-middle income countries; (5) Support and conduct research on strengthening rehabilitation in health systems. In this session we will present the activities carried out by the committee and discuss new actions for the future. A new collaboration plan with the WHO Rehabilitation Programme for 2021-2023 has been established with the following areas within the framework of the “Rehabilitation 2030: a call for action” initiative: implementing the WHO Rehabilitation Guide for Action in WHO selected Member States, support to WHO in the development, testing and implementation of the WHO Package of Interventions for Rehabilitation, support activities with regard to the COVID-19 pandemic. During the last year we attended several Regional WHO meetings as well as the Executive Board meeting and World Health Assembly, during which we presented several statements, often together with other international rehabilitation organizations. We participated with several PRM physicians in the development of the Package of Interventions for Rehabilitation, the Rehabilitation Competency Framework, the Rehabilitation of Post COVID-19 Condition guideline and the Primary Care Informal Consultation Meetings.

My experience working on the development of the packages of interventions for rehabilitation: A WHO tool to strengthen rehabilitation services in the world

Vanessa Seijas^{1,2,3}

¹Swiss Paraplegic Research, Nottwil, Switzerland, ²Department of Health Sciences and Medicine, University of Lucerne, Lucerne, Switzerland, ³Center for Rehabilitation in Global Health Systems, WHO Collaborating Center, University of Lucerne, Lucerne, Switzerland
E-mail: vaneseijas@gmail.com

The Package of Rehabilitation Interventions (PRI) will be a WHO resource containing evidence-based rehabilitation interventions that will facilitate the integration of rehabilitation interventions in all service delivery platforms. The PRI will be an open-access online resource with different target audiences. The Ministries of Health will be able to plan the integration of rehabilitation interventions in their national health system, researchers will be able to identify rehabilitation research gaps, academics will be able to develop curricula for the training of rehabilitation professionals, and service providers will be able to plan and implement specific rehabilitation interventions in their rehabilitation programs. The development of the PRI takes an evidence-based and stepwise approach and draws on the expertise of rehabilitation professionals. The PIR will be developed for 20 health conditions. I will present my experience working at WHO in the development of the PIR for Traumatic Brain Injury, Parkinson's Disease, Intellectual Disability, and Autism spectrum disorder.

Ghana's journey to respond to the rehabilitation needs of its population

Abena Tannor

Rehabilitation Programme Consultant, World Health Organization
E-mail: abbytannor@gmail.com

Ten percent (10%) of Ghana's population has a disability as estimated by the World Health Organization due to trauma-related injuries, non-communicable diseases and genetics. There is therefore an increasing unmet need for rehabilitation in Ghana. However, for many years the only form of rehabilitation available to meet the rehabilitation needs of the population has been physical therapy with a little support from Prosthetics and Orthotics services. In well developed countries, the proven way of solving this need is through multidisciplinary rehabilitation services coordinated by a Physical Medicine and Rehabilitation (PMR) physician.

The journey to provide multidisciplinary rehabilitation services led by a PRM physician began in Ghana in 2015 with the establishment of the first locally led service. Together with the International Rehabilitation Forum (IRF), a curriculum for a 2-year fellowship program for Family Physicians in PRM was developed for the Ghana College of Physicians and Surgeons. This included both online lectures and in-country visits for hands-on practices by PRM physicians from other countries. The official PRM fellowship program in Ghana began in 2018 with one fellow. Despite challenges faced during the training as a result of the COVID-19 pandemic, Ghana's first trained PRM physician graduated in 2021. This huge milestone was achieved with support from the IRF which provided human resource and the International Society for Physical and Rehabilitation Medicine (ISPRM) which provided sponsorships to ISPRM congresses as part of continuous medical education. Currently, there are four other fellows in training with the aim of setting up and coordinating more multidisciplinary rehabilitation services to expand the care being provided. One major challenge has been getting adequate PRM trainers who will travel to Ghana for hands-on and practical training. Other challenges include poor understanding of the role of PRM physicians in meeting rehabilitation needs especially in a country

where physical therapy has dominated the rehabilitation scene and is basically equated to rehabilitation. Access to PRM textbooks and resources has also been a challenge due to the unavailability in the country and the high cost of shipping. Ghana is on course to increase the number of PRM physicians required to meet the rehabilitation needs of its population. This can be replicated in other countries in sub-Saharan Africa and other low to middle income countries (LMICs) where there are similar needs. ISPRM is strategically placed to support the training of PRM physicians in LMICs through the provision of learning materials, coordination of human resource for training and sponsorship to ISPRM congresses to improve knowledge. The organization's sub-committee on Strengthening Rehabilitation in Health Systems as well as Education committee are well equipped to carry out this role.

Cameroon's journey to respond to the rehabilitation needs of its population

Kambou Sinforian¹

¹Center for Promotion of Rehabilitation Medicine and Disability Research, Yaoundé, Cameroon
E-mail: kambou.sinforian@yahoo.fr

The World Health Organization (WHO) defines rehabilitation as "a set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environment." It is a relevant health strategy alongside promotion, prevention, treatment, and palliative care. Formulation and implementation of health-related rehabilitation policies remain an important challenge worldwide especially in low and middle income countries. In 2019 in Cameroon, WHO's Rehabilitation Needs Estimator reported that 5.3 million people experienced conditions that could benefit from rehabilitation, 670 thousand years were lived with disability, corresponding to an increase of 195.5% of years lived with a disability between 1990 and 2019. Regarding this situation, it is now crucial for the government and different stakeholders to embed and expand rehabilitation in health policies. In this way, "Rehabilitation 2030: A call for Action" initiative launched by WHO in 2017, appears as an interesting opportunity for policy makers to improve rehabilitation in health system to address the significant unmet rehabilitation needs of Cameroonians. Our presentation aims to share the achievements, strengths, weaknesses, lessons learned and needs for a sustainable provision of rehabilitation services in Cameroon.

Colombia's experience in strengthening the health system to provide comprehensive care to people with amputations: Development of clinical practice guideline, health care pathway and its implementation

Luz Helena Lugo¹

¹University of Antioquia, Medellín, Colombia
E-mail: luzh.lugo@gmail.com

Development of the Clinical Practice Guideline (CPG) for the patient with lower limb amputation, the identification of barriers and facilitators for its implementation, the elaboration of a Comprehensive Health Care Pathway (CHCP) and a proposal of Implementation of this Guideline in Colombia. Between 2008 and 2016, the Colombian Ministry of Health (CMoH) funded the development of 58 national

clinical practice guidelines (CPGs). Those guidelines aimed to reduce unexplained variations in medical care and improve the efficient management of limited resources. One of this national guideline was “Clinical Practice Guide for diagnosis and preoperative, intraoperative and postoperative treatment of the amputee, the prescription of the prosthesis and comprehensive rehabilitation.” The CPG was developed by the MoH in Colombia in 2015 and updated in 2018. It was shared among professionals, scientific societies, service providers, decision makers, and patients. Forty-three recommendations were made based on the quality of the body of evidence which was assessed using the GRADE methodology. Five economic evaluations were made during the development of the CPG. After that, we identified barriers and facilitators for the implementation of the recommendations of the CPG for the amputee included three phases, which complemented each other and were carried out consecutively. Then we proposed a implementation strategy based on the review of literature and a Comprehensive Health Care Pathway project to implement the recommendations of the CPG in Colombia. Developing a national policy that promotes the necessary transformations for the provision of services is necessary to implement a CPG’s recommendations in clinical practice effectively. It is not enough to develop a CPG of excellent quality, elaborate a comprehensive health care pathway and assess the barriers and facilitators for the implementation of the recommendations. It is necessary to coordinate care amongst different providers, to facilitate communications between them, continuity of care, packages of care, referral systems, shared care, multidisciplinary teams, planning the transition of care from hospital to the community, and health information systems development. Financial support and governance are needed to implement strategies targeted at healthcare organizations and healthcare workers. The information obtained from the study will be used to develop a strategy to improve the healthcare process for people with rehabilitation needs.

THE INDIVIDUAL REHABILITATION PROJECT: FROM THEORY TO PRACTICE

Teamwork and IRP; An experience from Romania

Daiana Popa

Rehabilitation Medicine and Public Health, University of Oradea, Oradea, Romania
E-mail: popadv@hotmail.com

Romania inherited an extensive system of segregated services for people with health-related disabilities, from the former communist rule. Since 1989 there has been a continuous concern from local authorities and professional community to set up appropriate legislation and infrastructure to stop these inequalities. European Enlargement brought both opportunities and challenges as the united Europe promotes legislation harmonization; however, gaps persist between legal developments and actual implementation, due to the lack of accountability and communication across public institutions. Despite the continuous endeavor of PRM specialist community in Romania to extend and upgrade rehabilitation services according to the social needs, the health services for disabling condition still remains underdeveloped in the country. Although the WHO’s ICF has already been adopted in Romania since 2004, it was not yet endorsed as a national standard to measure and describe health and disability and authorities are not yet using this terminology consistently. Health services performed by multi-professional teams is a common approach in most of the rehabilitation facilities for patients with disabling condition provided both in hospital and out-patient settings.

Nevertheless, services are sometimes inconsistent, fragmented, and inappropriate structured to provide a continuous of care, as needed. For our National Society of PRM, as part of the UEMS-PRM it is a great opportunity to implement this new ICF-based framework designed to optimize a person’s functioning across the continuum of care. So far, both the Rehabilitation Management Plan and the Rehab-cycle are configured at least conceptually, but in the most of the cases there are gaps between the different phases of the cycle and the communication between the services are inconsistent or disrupted. The duration of rehabilitation care and the number of diagnostic and therapeutic procedures are defined mostly by reimbursement rules and not by the real individual needs according to the functioning potential of each patient. National standards of rehabilitation in certain health conditions are not yet available in the country. The use of standardized functional assessment tools based on ICF has become more popular in the last years but only recently some rehabilitation facilities started to implement them. Multi-professional rehabilitation approach is affected mostly by the availability of health allied professionals. Late introduction of higher education in some health allied fields such as occupational therapy, psychology and social work and the lack of legal regulation of these professions profoundly affects the quality of multi-professional care. The lecture will present both the challenges and barriers we are facing along the implementation process and discuss possible solution to overcome it.

Continuity of care in rehabilitation: Experiences from Israel

Iuly Treger^{1,2}

¹Soroka University Medical Center, Beersheba, Israel, ²President of Israel PRM Association
E-mail: iulyt@clalit.org.il

The rehabilitation management plan is an overarching care provision structure, in which one or more Individual Rehabilitation Project (IRP) may be used. Rehabilitation can be provided at different stages across the care continuum from acute, to post-acute, to long-term. A whole process must be synchronized along the time line while moving from one service to another, and between different goal sets. Employed throughout the rehabilitation process, the IRP is developed for each individual patient, comprises mostly few rehabilitation cycles, while every one of them has a start and an end, and is developed for each service across the care continuum. To support continuity between services, the IRP would ideally incorporate relevant elements from the previous service that would facilitate transition from one service to the next. Such continuity is essential to reach the optimal functional result at the end of the whole rehabilitation plan. According to the law, the medical system in Israel is completely based on State Health Insurance. The rehabilitation services are provided by Health Fund, which is in charge of all stages of the rehabilitation management plan in all types of settings. In this situation building an effective continuity of care model is essential for whole system general administration and implementation of individual rehabilitation project of the single patient. Throughout the years of practice, optimal principles of communication and inter-stage management from acute care through subacute in-patient or outpatient rehabilitation to supportive treatment were developed. In the south region of the country the rehabilitation system was established 8 years ago and was built as a unified “Regional Rehabilitation Service.” The model helps to manage the continuity of care in rehabilitation in an optimal manner from professional and economical point of view. Different aspects of this model will be discussed during the lecture.

General concept of the individual rehabilitation project

Mauro Zampolini

Department of Rehabilitation, USL Umbria 2, Perugia, Italy
E-mail: mzampolini@gmail.com

A reference system for operationalizing functioning and standardizing the process is the International Classification of Functioning, Disability and Health (ICF) - for assessing functioning needs, defining rehabilitation goals and outcomes.

The Individual Rehabilitation Project (IRP) is a multi-element, person-centered rehabilitation management provided by a multi-professional team under the leadership of a physical and rehabilitation medicine (PRM) physician that is used to organize a systematic approach. The team works in an interprofessional manner and with the patient or/and caregiver. The project is focused on the person's needs. The concept of "individual," means that the rehabilitation provided is tailored to the needs and goals of the specific person for whom the IRP is developed. The IRP model is congruent with clinical rehabilitation as described in the White Book of PRM in Europe. It is applied on the set of short, intermediate, and long-term goals, together with the patient in shared decision-making, considering their needs the aspiration. The goals should be defined in a specific timeframe, intervention planning and evaluation of goal achievement. An essential component of the IRP model is the rehabilitation cycle. The Rehab-Cycle can be iterative, i.e. at the end of each cycle, a new cycle can be initiated if needed to reach desired functioning outcomes, adjusting the goals and the interventions.

The goal of IRP should consider the potential of the recovery of the patient related to the disease and the functional consequences. Another important aspect is to assess the outcome based on the Patient-Reported Outcome Measure (PROM) based on a specific questionnaire related to the ICF Assessment schedule. The IRP should be documented with an "Individual Rehabilitation Pathway Sheet," which allows the rehabilitation team to establish a patient's diagnoses and positive (facilitator) and/or negative (barrier) impact of selected environmental factors. This is important to create a functioning profile based on ratings of problems in functioning chosen domains. Realistic goals and the post-discharge care pathway should be identified according to the functional profile. This documentation sheet can inform the development of an IRP scheme for Europe and beyond. The IRP is a part UEMS-PRM Section system-wide quality management implementation initiative that aims to facilitate clinical quality management in rehabilitation at the macro-, meso- and micro-levels of care. A demonstration project using the EUR-IRP will be conducted during the following months.

The UEMS-PRM defines the EUR-IRP as a tool for documenting patients' functional outcomes, rehabilitation needs and prognosis, personalizing rehabilitation management, improving clinical quality management in rehabilitation and strengthening national policy on rehabilitation.

ICF and IRP: A Russian experience

A. A. Shmonin¹, M. N. Maltseva¹, G. E. Ivanova²

¹First St. Petersburg Pavlov State Medical University, St. Petersburg, Russia,
²Pirogov Russian National Research Medical University, Moscow, Russia
E-mail: langendorff@gmail.com

The Individual Rehabilitation Project (IRP) – A functioning-based framework for clinical work in Europe. With the development of rehabilitation, there is a need to standardize rehabilitation methods and transfer information between clinics, since the patient needs three-stage care. Our aim is to present the experience of Russia in the implementation of an individual rehabilitation project. **Methods:** The experience of information exchange between clinics and patient management at three stages of rehabilitation was collected in the leading clinics in Russia. **Results:** We have identified the following methods and principles of information exchange to maintain a unified strategy for patient rehabilitation: (1) The final meeting of the multidisciplinary team is held online between the clinic that completes the rehabilitation stage and the clinic that accepts the patient for the next stage. This allows the team to communicate the patient's purpose and wishes. Communication was conducted with the permission of the patient. The clinics used the ZOOM platform. (2) The ICF-reader program is a program that allowed collecting information at the stage of rehabilitation and transferring it to the next stage. At the next stage of rehabilitation, a rehabilitation specialist sees a rehabilitation diagnosis and the goal of rehabilitation, an assessment on scales, data from laboratory and instrumental studies. It is possible to use the rehabilitation diagnosis at the previous stage to plan a new rehabilitation cycle. (3) The PRM professional community develops and implements throughout the country standard forms for assessing the ICF and scales, patient examination forms for transferring data between stages of rehabilitation. Difficulties in implementing an individual rehabilitation project: (i) The problem of patient data protection and information transfer; (ii) Specialists of multidisciplinary teams have different skill levels. This affects the assessment of the patient and the determination of the rehabilitation potential. The score may not match; (iii) The purpose of rehabilitation may change at different stages of rehabilitation, which may be due to the emergence of new diseases (for example, COVID-19), complications or the emotional reaction of the patient or his relatives; (iv) The different composition of the rehabilitation teams leads to different opinions on the tactics of rehabilitation; however, these tactics may differ, but be correct; (v) The problem of IRP coordination - there is no service that would monitor how the patient moves and how information is transmitted between stages. Usually the transfer of information about the patient is an initiative of the rehabilitation team who want to get a good result. The project is not finished: data collection continues. **Conclusion:** IRP is needed to improve the effectiveness of rehabilitation and standardize approaches to rehabilitation care.

The European framework for rehabilitation services and the clinical assessment schedule: Background for the individual rehabilitation project

Gerold Stucki

¹Department of Health Sciences and Medicine, University of Lucerne, Lucerne, Switzerland, ²Swiss Paraplegic Research, Nottwil, Switzerland
E-mail: gerold.stucki@paraplegie.ch

The European Union of Medical Specialists Physical and Rehabilitation Medicine (UEMS-PRM) Section and Board has developed a package of standards and frameworks for rehabilitation in Europe that can serve as a model for rehabilitation worldwide. This package encompasses the European framework for rehabilitation service types, corresponding clinical assessment schedules (CLASs)

and the Individual Rehabilitation Project (IRP). This talk will introduce these three interwoven elements and how they facilitate the continuous improvement of rehabilitation service provision and the accountable reporting of functioning outcomes at all levels of healthcare.

SPINAL CORD INJURY

Pulmonary rehabilitation in spinal cord injury

Seong Woong Kang

Pulmonary Rehabilitation Center, Gangnam Severance Hospital, Yonsei University, Seoul, Korea
E-mail: kswoong@yuhs.ac

Although the overall mortality rate has been declining, the incidence of respiratory morbidity and mortality remains relatively high in cervical spinal cord injury (SCI). Pulmonary rehabilitation is consisted of breathing retraining, respiratory muscle rest, airway secretion elimination, reconditioning exercise, psychosocial support, nutritional support, adequate ventilator support, and patient education. And there are many techniques and devices to alleviate and control the symptoms of respiratory diseases and to prevent from respiratory complications. Among them, the point of pulmonary rehabilitation is the non-invasive respiratory care by using respiratory muscle aids. Respiratory muscle aids can improve patient's quality of life (QOL) and maximize function like the other aids in other rehabilitation fields. The fundamental respiratory problem in SCI is respiratory muscle weakness. Therefore, management is related directly to support respiratory muscle weakness as we do to compensate weakened muscles of extremities. Respiratory muscles divided into inspiratory muscles and expiratory muscles. Thus, it is necessary to provide the proper inspiratory and expiratory muscle aids after a careful evaluation of pulmonary function considering the characteristics of SCI to support adequate respiratory function. We can minimize the respiratory complications through pulmonary rehabilitation including non-invasive ventilation support and assisted coughing. Reduced respiratory complications can actually decrease the mortality rate of the patients with cervical SCI. In conclusion, proper pulmonary rehabilitation, taking into account the characterization of respiratory pathophysiology, has made it possible to enhance QOL as well as prolong the life span of the patient of SCI.

BALNEOLOGY

Effects of water immersion and hydrotherapy prescription

Pedro Cantista

Department of Physical Medicine and Rehabilitation, Centro Hospitalar Universitário do Porto, Porto, Portugal
E-mail: pedro.cantista@gmail.com

Body water immersion determines adaptive physiological changes, sometimes very useful for therapeutic purposes, namely in Physical and Rehabilitation Medicine. Hydrotherapy presupposes a set of known physical effects (thermal, hydrostatic and hydrodynamic) which modify our body's surroundings and, in many cases, may favour our motor skills. However, it should also be taken into account that regardless these hydrotherapeutic principles there are reflexes resulting from water immersion that may affect its therapeutic use. We refer in particular the cardiovascular effects of immersion, the diving reflex and the effects triggered by the stimulation of different

peripheral neurological receptors, with the trigeminal nerve as an example. The purpose of this communication is to present a synthetic review of the principles of hydrotherapy and the physiological effects of immersion, with a view to establish a rational of treatment indications for the various hydrotherapeutic techniques, as well as their contraindications or limitations, pointing out some practical examples.

Aquatic versus land exercise: A systematic review

Ana Zão, Pedro Cantista

Department of Physical Medicine and Rehabilitation, Centro Hospitalar Universitário do Porto, Portugal
E-mail: anazao100@gmail.com

Exercise is a promising nonpharmacological therapy for several diseases, and positively interferes in various physical and psychological domains. Several studies suggest that even small amounts of physical exercise show considerable reductions in mortality and improve health outcomes when compared with sedentary control subjects. The aim of this lecture is to discuss the role of aquatic exercise in musculoskeletal and neurological disorders, and its additional therapeutic effects when compared to land exercise. We systematically review the literature published until February 2022 in Medline, Embase, Cochrane Library, Web of Science and Scopus databases and included randomized controlled trials comparing the effect of aquatic and land-based exercise for the management of patients with musculoskeletal and neurological disorders. The majority of the studies included participants with knee osteoarthritis, ankylosing spondylitis, fibromyalgia, Parkinson Disease and stroke. Aquatic exercise seems to present additional benefits when compared to land-based exercise programs, with significant improvement in pain, disability and quality of life. Literature also has shown significant less adverse effects with aquatic exercise. This lecture highlights the important role of exercise, particularly aquatic exercise, in the management of musculoskeletal and neurological disorders, therefore it should be encouraged and individually prescribed. More studies with good methodological quality are needed to strengthen the results and to define the specific characteristics of exercise programs that determine better results.

PAIN

Is vibration good for pain? Translating basic science to pain control in rehabilitation

Roberto Casale

ESPRM Ambassador and Chair of the ESPRM SIG "Pain and disability"
E-mail: robertocasale@opusmedica.org

The aim of this lecture is a) provide a broad neurophysiological insight of the mechanisms underlying the ways in which afferent activity set up by localize vibration (LV) induces analgesia through interactions at various levels of the nervous system; b) translate basic science knowledge to daily practice. To achieve these two integrated objectives and for sake of simplicity the lecture is divided in subheadings: (1) How to best activate the spinal gate: The spinal gate control mechanism through A β -fibers activation seems to be the most effective antinociceptive system activated by LV at frequencies between 100 and 250 Hz (High frequency HF-LV) when applied in the same segment as the pain but also when it is applied contralaterally

to the painful site or to adjacent dermatomes. (2) Vibration illusion of movement and pain control: Kinesthetic illusions of movement induced by HF-LV may induce a stronger analgesic effect. (3) Limbic system and C-mechanoreceptors: their activation induced by a massage-like LV of low frequency (LF) and low intensity may interfere with pain through the activation of the limbic system. This action doesn't involve any gating mechanism. (4) Opioids: The release of opioidergic neuropeptides (analgesia not reversed by naloxone) as well as a reduction in Substance P in the CSF doesn't seem to play a major role in the HF-LV action. (5) The importance of stimulation parameter: Frequency is more important than intensity as different frequencies induce activity in different cortical and cerebellar areas possibly related to plastic cortical changes. (6) The placebo effect: Distraction/shift of attention or cortisol-mediated stress-induced analgesia doesn't seem to be involved in LV analgesic action in humans for both LF and HF. **Conclusion:** The poor translation between basic knowledge and practice seems the main cause of an incorrect practical application of LV as well as of almost all therapies using physical agents. To learn how correctly prescribe LV in relationship to the type of pain, its pathophysiological background and which antinociceptive mechanisms may be better exploitable may implement the ability to prescribe tailored pain therapy and to avoid scanty clinical results.

Update on the pharmacological treatment of neuropathic pain

Ayşe A. Küçükdeveci

Department of Physical Medicine and Rehabilitation, Faculty of Medicine, Ankara University, Turkey
E-mail: ayse.kucukdeveci@medicine.ankara.edu.tr

Neuropathic pain (NP) develops as a result of a lesion or disease affecting the somatosensory nervous system either in the periphery or centrally. It affects 6%–10% of the population. NP syndromes include diabetic polyneuropathies, post-herpetic neuralgia, trigeminal neuralgia, phantom limb pain, other polyneuropathies, plexopathies, radiculopathies, peripheral nerve lesions, neuropathic cancer pain, entrapment neuropathies, HIV-related neuropathy and central pain. Management of NP requires a multidisciplinary, patient-centered, holistic approach, and includes pharmacological, non-pharmacological and interventional treatments. Pharmacological agents used in NP are tricyclic antidepressants (TCAs), serotonin-norepinephrine reuptake inhibitors (SNRIs), gabapentinoids, carbamazepine and other anticonvulsants, opioids, capsaicin, lidocaine, cannabinoids and botulinum toxin. When establishing the medical treatment plan with the patient, the severity of pain as well as its impact on lifestyle, emotional status, daily activities (including sleep disturbance) and participation, the underlying cause of NP, the benefits and possible adverse effects of pharmacological treatments, comorbidities, and concurrent medications should be taken into consideration. First-line pharmacological agents for NP in guidelines (except trigeminal neuralgia) are usually TCAs, SNRIs and gabapentinoids. For trigeminal neuralgia, carbamazepine/oxcarbazepine is recommended as the first-line. In French recommendations, pregabalin stands as the second-line. Second-line treatment options are tramadol, and usually topical lidocaine and capsaicin patch. Topical agents are used only in peripheral NP. For the third-line treatment, strong opioids are recommended. There is no consensus for the use of cannabinoids; some guidelines are against its use, whereas it stands as the third-line in Canadian recommendations. Botulinum toxin is suggested as the second, third or fourth-line in various guidelines. There is

not a consensus on the use of combination drug treatment in NP, although antidepressant-opioid, antidepressant-gabapentinoid, and gabapentinoid-opioid combinations are reported to be administered. Combination treatment has been found superior to monotherapy in some randomized controlled trials and French guidelines recommend antidepressant-gabapentinoid combination as the second line treatment. It is well-established that pharmacological agents have a moderate effect on pain relief in NP. Therefore drugs acting on new pain targets, including sodium channel isoform-specific antagonists and monoclonal antibodies, are currently under development. Phenotype-dependent treatment effects have also been shown. In this respect, ongoing studies regarding the mechanism-based individualised therapy for maximal analgesic effect are promising in the management of NP.

Cochrane rehabilitation: A new action plan for 2022-2026

Charlotte Kiekens¹, Chiara Arienti², Stefano Negrini³

¹IRCCS MultiMedica, Milan, Italy, ²IRCCS Fondazione Don Carlo Gnocchi, University of Milan, Milan, Italy
E-mail: carlotte.kiekens@multimedica.it

Cochrane Rehabilitation celebrated its 5th anniversary in December 2021. Its vision is: “A world where high-quality evidence on rehabilitation is available and applied for decisions by all rehabilitation stakeholders.” The anniversary provided an excellent occasion to look back at the previous activities and verify to which extent the goals set in 2016 have been achieved. Most of the initial six goals were achieved to a large extent. However, some need more effort, and new goals should be set in order to work towards our vision. In this presentation, the new action plan with updated goals, based on the reports for the six workshops that were held on December 16th 2021 will be presented. The main themes are: 1. How to involve more the rehabilitation community; 2. How to be better disseminate and produce evidence in low- and middle-income countries; 3. How to impact health policies with evidence in rehabilitation; 4. How to provide education efficiently to the global rehabilitation community; 5. How to further improve the methodology for evidence production and synthesis in rehabilitation. Also, the organization has been revised to improve our efficacy and efficiency. While the advisory board and executive committee did not change in time, we started in 2016 with five committees (communication, reviews, methodology, publication and education) that evolved to working areas in 2020 when we added an advisory committee. From 2022, the ongoing activities will be moved forward by our headquarters, while the methodology working group will remain active. New activities will be developed as projects until they are fully operational. In this session, some ongoing projects will be presented.

WHO interim guidance for rehabilitation of post COVID-19 condition

Wouter De Groot

WHO Rehabilitation Programme, Geneva, Switzerland
E-mail: degrootew@who.int

Following a consultation with patients experiencing persistent symptoms and impairments after COVID-19, WHO Director General Dr. Tedros Ghebreyesus engaged with 3 R's: Recognition, Research, and Rehabilitation. Therefore, the WHO Rehabilitation Programme embarked towards the development of a guideline for the

Rehabilitation of Post COVID-19 Condition which is targeting both program planners and rehabilitation workers. It involved collaboration with many stakeholders such as the WHO Steering Committee, WHO Guideline Review Committee, Cochrane Rehabilitation and a Guideline Development Group. This presentation describes the process and methodology of development, the contribution of stakeholders such as the provision of the evidence base by Cochrane Rehabilitation, and lessons learned.

The REH-COVER action: An update

Maria Gabriella Ceravolo

Department of Experimental and Clinical Medicine, Politecnica delle Marche University, Ancona, Italy
E-mail: m.g.ceravolo@staff.univpm.it

In 2020, the outbreak of COVID-19 epidemics challenged the provision of health care worldwide highlighting the main flaws of some national health systems concerning their capacity to cope with the needs of the frailest subjects and people with disability. Although COVID-19 related mortality and morbidity risks are now mitigated by public health campaigns including vaccination, so that a high proportion of SARS-CoV-2 patients survive the infection, the prevalence of chronic sequelae and resulting disability is increasing. These survivors need clinical management and rehabilitation to facilitate good health outcomes. The best available research evidence is warranted to estimate the resources needed to plan for setting appropriate and adequately delivered post-acute and long-term rehabilitation services. In April 2020, WHO Rehabilitation Programme and Cochrane Rehabilitation launched a joint initiative called REH-COVER (Rehabilitation for COVID-19: an Evidence-Based Response) Action, a pool of evidence-based strategies to support decision making and face the emerging health needs of the population. The Action included: a) the definition of proper Research questions to map rehabilitation needs in COVID-19 patients and assess intervention efficacy; b) rapid living systematic reviews (RLSR) of the scientific literature on rehabilitation needs and COVID-19; c) the publication of an interactive living evidence map on Rehabilitation and COVID-19; d) a Cochrane Library Special Collection: Coronavirus (COVID-19): rehabilitation of patients with functional consequences of acute illness and its treatments. The first rapid living review presented the results of a systematic scientific literature search performed up to March 31st, 2020. Since then, the review has been monthly updated and the search progressively refined, by the application of stricter and stricter inclusion criteria. Moreover, an internal peer review process has been implemented through the establishment of a Multi-professional International Steering Committee. Starting with its 2nd Edition, the RLSR has excluded all expert opinions focusing on primary studies; with its 3rd Edition, the RLSR has excluded all descriptive studies and introduced the quality appraisal for experimental and analytical observational studies. Over two years and across 3 different editions, 467 papers have been extracted by the RLSR on rehabilitation needs and COVID-19. Most of them focus on the epidemiology of disability, reporting the limitations of functions suffered by patients at various intervals from infection onset. Over the last 6 months, we observed a definite increase in the proportion of studies reporting on the so-called post-COVID condition, i.e. on symptoms and functional status of COVID-19 survivors after the first 12 weeks of disease onset.

A rehabilitation definition for research purposes

S. Negrini^{1,2}, M. Selb^{3,4}, C. Kiekens⁵, A. Todhunter-Brown⁶, C. Arienti⁷, G. Stucki^{3,4,8}, T. Meyer⁹

¹Department of Biomedical, Surgical and Dental Sciences, University "La Statale", Milan, Italy, ²IRCCS Istituto Ortopedico Galeazzi, Milan, Italy, ³Swiss Paraplegic Research, Nottwil, Switzerland, ⁴ICF Research Branch, Nottwil, Switzerland, ⁵IRCCS MultiMedica, Milan, Italy, ⁶Nursing Midwifery and Allied Health Professions Research Unit, Glasgow Caledonian University, Glasgow, UK, ⁷IRCCS Fondazione Don Carlo Gnocchi, Milan, Italy, ⁸Department of Health Sciences and Medicine, University of Luzern, Switzerland, ⁹School of Public Health, Bielefeld University, Germany
E-mail: stefano.negrini@unimi.it

Background: Since its foundation, Cochrane Rehabilitation has faced challenges with rehabilitation definitions because existing definitions did not indicate what rehabilitation includes and what it excludes. We aimed to develop a comprehensive and shared rehabilitation definition for research purposes to 1) support the conduct of primary studies and systematic reviews, and 2) identify relevant systematic reviews for knowledge translation purposes. **Methods:** We performed a multimodal study including seven preliminary research and discussion papers, four Consensus Meetings and three Delphi rounds with 80 rehabilitation stakeholders. The Delphi study aimed to obtain agreement, refine and complete the items composing the definition and meanings of rehabilitation. These stakeholders covered 5 continents, representing 11 global and continental rehabilitation organisations, 11 scientific journals, 4 Cochrane Networks and 3 Cochrane Groups, and included invited experts, and representatives of low middle-income countries (LMICs) and consumers. **Results:** We had a 70% to 82.5% response rate to the three Delphi rounds, during which participants responded to all items (100%) and provided relevant comments (range 5.5% - 50% per item). This participation led to several refinements to the rehabilitation definition through three preliminary versions, and the final items reached an agreement between 88.9% and 100%. We structured the definition using the PICO (Population, Intervention, Comparison, Outcome) framework. We concluded that "In a health care context", rehabilitation is defined as a "multimodal, person-centred, collaborative process" (Intervention-general), including interventions targeting a person's "capacity (by addressing body structures, functions, and activities/participation) and/or contextual factors related to performance" (Intervention-specific) with the goal of "optimising" the "functioning" (Outcome) of "persons with health conditions currently experiencing disability or likely to experience disability, or persons with disability" (Population). Rehabilitation requires that all the items of the definition are satisfied. We defined a "rehabilitation intervention" as "any intervention provided within the rehabilitation process". **Conclusion:** We developed a rehabilitation definition for research purposes achieving a broad agreement with global stakeholders. This definition provides explicit criteria to define rehabilitation. Using the proposed definition will improve rehabilitation research by standardizing the description of interventions. Our definition may require revision in the future, as further research enhances understanding and communication of the essence and complexity of rehabilitation.

ISarcoPRM HIGHLIGHTS ON SARCOPENIA

ISarcoPRM diagnostic algorithm

Levent Özçakar

Department of Physical and Rehabilitation Medicine, Hacettepe University Medical School, Ankara, Turkey
E-mail: lozcakar@yahoo.com

Sarcopenia is an important public health problem which is characterized by age-related loss of muscle mass/function. It predisposes to physical frailty, mobility limitation, and premature death. Muscle loss ensues

mainly due to the loss of Type II muscle fibers whereby progressive loss of motor neurons is thought to be the primary underlying factor. Anterior thigh muscles undergo atrophy earlier and, therefore, anterior thigh muscle function loss may be the preceding finding. Providing an in-depth (and holistic) neuromusculoskeletal approach to sarcopenia, under the umbrella of the International Society of Physical and Rehabilitation Medicine (ISPRM), a novel diagnostic algorithm is proposed and developed with the consensus of experts in the special interest group on sarcopenia (ISarcoPRM). The superiorities of this algorithm over the previous/other ones are; special concern on the renin-angiotensin system at the case finding step, emphasis on anterior thigh muscle mass/function loss, incorporation of ultrasound (for the first time) to measure the anterior thigh muscle, and addition of chair stand test as a power/performance assessment tool for the anterior thigh muscle function. Future research to refine and test this novel algorithm remains a priority in the agenda.

SARAH, SARCOG, SARCOB, SARCOS, SARCO X studies

Murat Kara

Department of Physical and Rehabilitation Medicine, Hacettepe University Medical School, Ankara, Turkey
E-mail: mkaraftr@yahoo.com

Recently, the ISPRM special interest group on sarcopenia (ISarcoPRM) included the quadriceps muscle thickness as the indicator for loss of muscle mass in the diagnostic criteria of sarcopenia. They mentioned that sarcopenia affects muscles rich in type II (fast-twitch) fibers e.g. quadriceps. As the quadriceps muscle is also important for power-requiring activities, the use of anterior thigh muscle mass and pertinent function is strongly suggested in the diagnostic algorithm. In this regard, using ISarcoPRM diagnostic algorithm, several multicenter studies have been started/performed to explore the relationships between sarcopenia and age-related other disorders as follows: SARAH - SARcopenia Assessment in Hypertension (N=2613); SARCOG - SARcopenia and COGnition (N=1542); SARCOB - SARcopenic OBesity and knee osteoarthritis (N=140); SARCOS - SARcopenia and OSteoporosis (N=700); SARCO X - SARCOpenia Risk Assesment Tool (N=5000). With these studies, we have found that hypertension increased the risk of sarcopenia at least two times. Cognitive impairment may unfavorably affect muscle function and physical performance, but not muscle mass. Sarcopenic obesity increased the risk of knee OA three times. Low grip strength independently increased the risk of osteoporosis, about two times. Finally, we investigated the relationship between sarcopenia and demographic, anthropometric and chronic comorbid diseases, and estimated the risk of sarcopenia for each subject with SARCO X study. With these studies, there will be many innovations in the management of sarcopenia in the coming future.

CHILDREN WITH DISABILITY

Neuro orthopedic medical and surgical approaches applied to neurological patients

Isabelle Laffont^{1,2,3,4,5}, Bertrand Coulet^{2,3}

¹Montpellier/Nimes Medical Faculty, Montpellier, France, ²Montpellier University Hospital, Montpellier University, Montpellier, France, ³Euromov Digital Health in Motion, Montpellier University, Montpellier, France, ⁴ISPRM General Secretary, ⁵Past President of the SOFMER
E-mail: i-laffont@chu-montpellier.fr

Neuro-orthopedic medical and surgical approaches concern limbs and spine deformities related to various neurological diseases, most often in a context of spastic disorders. PRM and surgeons have been working together in this field for decades, starting with poliomyelitis at the beginning of the last century. The term “neuro-orthopedics” illustrates the close link between these two specialties, which are familiar with these deformities that often lead to serious functional consequences, making today their prevention and treatment more essential than ever, given the rapid growth of neurological diseases throughout the world. The better understanding of the musculoskeletal and neurological physiopathology underlying these phenomena has enabled us to improve our preventive and curative approaches. The clinical assessment of spasticity and neuro-orthopedic deformities is based on a shared rigorous anatomical and physiological knowledge, deeply rooted in our PRM and orthopedic clinical examination. The evaluation of their functional consequences relies on a patient-centered approach including fine-grained analysis of gait and of upper limb function. Motor blocks, dynamic EMG and movement analysis raised an increasing interest in these indications. The treatment of spasticity and its consequences is based on an integrative multimodal program including rehabilitation, drugs, local treatments like botulinum toxin injections and neurolysis, micro-invasive treatments like percutaneous tenotomies or neurotomies, and conventional surgery in a multidisciplinary perspective. The future of such activities relies on five main perspectives: (1) Conduct basic science research on the pathophysiological mechanisms underlying the onset of deformities in order to develop non-pharmacological, pharmacological and surgical studies to prevent these late deleterious consequences of neurological damage; (2) Build specific assessment strategies, based on dedicated clinical scales and instrumental assessment that are reproducible and easily used in clinical settings; (3) Improve our preventive and curative medical strategies based on new drugs, new procedures, and new approaches by acting on the neurological process itself (neuromodulation, functional electrical stimulation, robotics); (4) Build a core of specific surgical procedures to improve our practices by conducting international studies to increase the number of patients and the reliability of our functional results; (5) Develop and share treatment guidelines internationally based on our scientific and educational collaborations.

GUIDELINES

The impact of COVID-19 pandemic regarding the interest of PRM physicians in pulmonary rehabilitation

Aydan Oral

Department of Physical Medicine and Rehabilitation, Istanbul Faculty of Medicine, Istanbul University, Istanbul, Turkey
E-mail: aydanoral@yahoo.com

Chronic respiratory conditions are major causes of death and disability. Despite the statistics that chronic obstructive pulmonary disease ranked the sixth among the top causes of years lived with disability in 2017, the delivery and utilization of pulmonary rehabilitation is low world-wide. Physical and rehabilitation medicine (PRM) physicians who have expertise in the rehabilitation of chronic respiratory diseases are encouraged to lead pulmonary rehabilitation programs in the context of dedicated multiprofessional teams working in collaboration with other disciplines. Due to the respiratory decline associated with COVID-19, pulmonary rehabilitation needed to be integrated and prioritized in the PRM program of care of the

patients hospitalized with COVID-19 along with outpatient post-hospitalization pulmonary rehabilitation if needed. Regarding the interest in the delivery of pulmonary rehabilitation in PRM, planned trials may be a good indicator. When ClinicalTrials.gov was consulted with the search terms, “COVID-19 and pulmonary rehabilitation” for identifying trials on pulmonary rehabilitation specifically for COVID-19, fifty registered trials were found as of February 25, 2022. Among these, 35 trials were intervention trials, 37% of which were led by rehabilitation professionals. When these studies are completed and published, a detailed analysis of the pulmonary rehabilitation programs including the outcomes will be possible.

Additionally, a recent guideline on pulmonary rehabilitation in COVID-19 which was produced by PRM physicians reflected the interest of PRM physicians in this significant rehabilitation topic as well as other papers indicating the importance of pulmonary rehabilitation in PRM for COVID-19. It seems that due to COVID-19 pandemic, interest in pulmonary rehabilitation in PRM is growing as reflected by planned trials and the delivery of pulmonary rehabilitation in PRM is increasing.

Rehabilitation guidelines in the patient with obesity

Paolo Capodaglio^{1,2}

¹Department of Physical and Rehabilitation Medicine, University of Torino, Turin, Italy, ²Rehab Unit, Laboratory for Research in Biomechanics and Rehabilitation, Istituto Auxologico Italiano IRCCS, Verbania-Piancavallo, Italy
E-mail: p.capodaglio@auxologico.it

Given the rates of persons with disabilities or postacute conditions who are also obese, it appears of importance for PRM specialists to familiarize with principles in Rehabilitation of Metabolic conditions. Obesity is a chronic condition often associated with multiple comorbidities which can have disabling consequences. Most research on obesity treatment has focused on life-style modification, pharmacological treatment and on bariatric surgery. Unfortunately, being severe obesity chronic and disabling, such “weight centered” approach has excluded those patients with advanced disease stage (with established/end stage organ damage, significant/severe psychopathology and functional limitations), who are either poor candidates for surgery or in whom weight loss alone (especially in sarcopenic obesity) is unlikely to significantly reverse quality of life reduction and disability. If advanced-stage obesity represents a disabling disease in a multidimensional perspective, therefore a multidisciplinary and integrated rehabilitative approach is required. According to current guidelines, the management of severe obesity in a rehabilitative setting should be multidisciplinary and characterized by the integration of nutritional, physical/functional rehabilitation, psycho-educational, and rehabilitative nursing interventions in relation to the clinical complexity of obesity. The intensity of the rehabilitative interventions should depend on the level of severity and comorbidities, frailty of the psychic status, degree of disability and quality of life of the patient. The rehabilitative setting must be structurally adequate to the needs of patients with excess of body mass with availability of bariatric lifting and transferring aids. The existing recommendations in Rehabilitation of patients with obesity will be revised and the current advances in guide lines development according to the GRADE method and WHO recommendations will be presented.

Efficacy of rehabilitation for the prevention and treatment of sarcopenia in patients with cardiovascular disease

Milica Lazovic

Medical Faculty University of Belgrade, Institute for Rehabilitation, Belgrade, Serbia
E-mail: lazovicmilica15@gmail.com

With the progressive aging of the population, cardiovascular diseases (CVD) have become the leading cause of mortality, morbidity and disability. The aging of the world’s population has also led to an increase in the incidence and prevalence of geriatric syndromes such as fragility and sarcopenia. Sarcopenia is a syndrome characterized by progressive and generalized loss of skeletal muscle mass and strength, with a risk of weakness and poor quality of life. The paper aims to clarify the clinical characteristics of sarcopenia and to investigate the effects of cardiac rehabilitation (CR), including primarily diet and exercise in patients with CVD. Interest in the assessment of sarcopenia in patients with cardiovascular disease has increased and many instruments have been adopted that have shown prognostic value. Each of the proposed instruments has its role in assessing the complexity of the syndrome and provides prognostic information. Elderly patients with sarcopenia are referred to cardiac rehabilitation (CR) programs after acute coronary syndrome (ACS), however, rehabilitation plans must be individually tailored to each patient in terms of adequate assessment of functional capacity, nutritional status, comorbidity and cognitive status. Current findings from published studies suggest that a well-designed, progressive CR program, which includes resistance exercises, has a beneficial effect on improving muscle mass and muscle strength. Resistance training should be considered the first line of treatment strategy for the management and prevention of sarcopenia. Although there are many components of optimal recommendations for resistance training, exercise intensity, exercise volume, and progress, critical factors deserve careful consideration because they relate to following best practice guidelines.

Rehabilitation guidelines in the patient with cardiovascular diseases

Carmen Terzic

Rehabilitation Medicine Research Center, Cardiac Rehabilitation Program, Mayo Clinic, Rochester, USA
E-mail: terzic.carmen@mayo.edu

The most well-established model for healthy lifestyle interventions and control of cardiovascular risk factors for patients with cardiovascular diseases is Cardiac Rehabilitation (CR). CR is a comprehensive and multidisciplinary approach focusing on therapeutic education, individualized exercise training, risk factors management, nutrition counseling, and optimization of functional status and mental health through regular patient evaluation, coordination of health-related care, and monitoring and support of compliance and adherence. CR participants include individuals with acute coronary syndrome, patients post-cardiac surgery (CABG, valve replacement/repair, heart transplant, ventricular reductions surgery, and congenital heart repair), patients with LVAD, congestive heart failure, and peripheral vascular disease. Benefits of CR include improvement of symptoms of exertion (dyspnea, fatigue, and claudication), antithrombotic effect, peripheral adaptation (skeletal muscles function), enhanced endothelium-dependent vasodilation (arteries, coronary microcirculation, improves autonomic function, improves cardiorespiratory fitness, decreases anxiety and depression, improves overall patient function. CR programs are divided into three phases to establish a plan to help patients regain strength, reduce the risk of future heart problems, and control cardiovascular risk factors. Research has found that CR programs can reduce the risk of death from heart disease by

approximately 46%. Overwhelming scientific evidence supporting the role of CR programs.

Rehabilitation guidelines in pulmonary conditions

Yeşim Kurtaiş Aytur

Department of PMR, Faculty of Medicine, Ankara University, Ankara, Turkey
E-mail: kurtaiş@medicine.ankara.edu.tr

Pulmonary rehabilitation (PR) is defined as “a comprehensive intervention based on a thorough patient assessment followed by patient tailored therapies that include, but are not limited to, exercise training, education, and behavior change, designed to improve the physical and psychological condition of people with chronic respiratory disease and to promote the long-term adherence to health enhancing behaviors” by ATS/ERS Task Force on PR and widely accepted. This definition and the practice of PR aims to achieve an independent and functioning individual with a chronic respiratory disease as much as possible with a holistic, patient-centered approach and a multi-interdisciplinary team. Furthermore, it is also aimed to get patients maintain their health status and functioning in the long-term. A comprehensive PR program include facilitating smoking cessation, optimizing pharmacotherapy, assisting with early identification and treatment of acute exacerbations, managing acute dyspnea, increasing physical activity, improving body composition, promoting mental health, and facilitating advance care planning. However, the content of PR programs may vary across countries and centers due to infrastructural and budgetary differences. The effectiveness of PR mainly in COPD and in other chronic respiratory conditions is well-established. There are also many PR guidelines developed according to the needs of the patients and the existing infrastructure, of which predecessors being mostly for COPD. Despite the available evidence and guidelines, the practice of PR remains very limited. The success of PR depends on whether the essential components are delivered and on whether the expected patient outcomes, including improved exercise capacity, reduced dyspnea, enhanced health-related quality of life, and reduced hospital admissions, are achieved. To accomplish these, PR programs should be delivered by interpretation and the use of multiple PR guidelines, recommendations, and the quality indicators as much as possible taking into account the limitations of the PR center/unit. On the other hand, available guidelines have some drawbacks. Guidelines are mostly for adults and from North America and Europe. An analysis using AGREE II instrument showed that although the domains with the highest scores were “scope and purpose” and “clarity of presentation”, the domain with the lowest score was applicability. There are also uncertainties about the effectiveness of the guidelines in particular domains and the compliance and adherence to the guidelines. Taking into account all these aspects, in this talk, the general outlines and common recommendations of PR guidelines will be discussed.

AMPUTATIONS

Global consensus on core data and outcome measures for people with lower limb absence

Friedbert Kohler^{1,2,3}

¹UNSW, Sydney, Australia, ²Aged Care and Rehabilitation, South Western Sydney Local Health District, Warwick Farm, Australia, ³Rehabilitation Medicine, Braeside, Liverpool and Fairfield Hospitals, Prairiewood, Australia
E-mail: friedbert.kohler@health.nsw.gov.au

Background and Aims: The United Nations and the World Health Organization are focusing on prioritizing assistive technology, including

prosthetics and orthotics (P&O). Service provision and access is limited particularly in low and middle income countries. The Convention on the Rights of Persons with Disabilities obliges jurisdictions to promote the availability, knowledge and use of assistive devices and technology designed for persons with disabilities. As there is no universal approach to data collection and outcome measurement this is a challenge for many states. The International Society for Prosthetics and Orthotics received a grant managed by UNOPS and funded by USAID in support of ATScale to develop a lower extremity amputation data set (LEAD) and Consensus Outcome Measures for Prosthetic and Amputee ServiceS (COMPASS). **Methods:** Development of the LEAD included a scoping literature review to establish details of current registries and their elements; semi-structured interviews with database or registry owners and a series of consensus meetings. Development of the COMPASS included a systematic review of outcome measures used in patients with lower limb amputation, using the Consensus-based Standards for the selection of health Measurement Instruments (COSMIN), the categorization of the outcome measures based on their psychometric properties into acceptable/non acceptable by an expert panel and a series of consensus meetings. Participants of the consensus meetings included users, clinicians, researchers/academics, prosthetic manufacturers (industry), health administrators, policy makers and representatives of NGOs and professional bodies. **Results:** For the LEAD data elements considered included demographics, surgical/limb absence and level, rehabilitation interventions, confounders and outcomes. Discussions and recommendations were also made on the purpose and objectives of a registry, eligibility criteria including inclusion and exclusion criteria, recruitment methods, data collection methods, data handling, data privacy, security and access, stakeholders, and funding. The COMPASS includes three PerFOMs, the AMP, the TUG, 2MWT, and three PROMs, the PEQ Utility, PEQ Residual Limb Health and the TAPES-R. For the highly active two PerFOMs, the CHAMP and the 6MWT define the COMPASS+. The COMPASS Adjunct contains the PSFS due to its significant clinical utility, despite its limitations with comparability between individuals. A generic HRQoL measure such as the PROMIS or EQ-5D-5L is recommended to be used to enable broader comparison across different health conditions. **Conclusions:** The COMPASS and LEAD can be used to standardize data collection and reporting which facilitating direct comparisons and the possibility of aggregation of data to demonstrate effects of rehabilitation of people with LLA, potentially underpinning the argument for further investment and development of the lower limb prosthetic sector and serving as a prototype for other areas of assistive technology and rehabilitation.

PEDIATRICS

Trends in neuromuscular diagnostics in pediatric population

Dejan Nikolic^{1,2}

¹Faculty of Medicine, University of Belgrade, Belgrade, Serbia, ²Department of Physical Medicine and Rehabilitation, University Childrens Hospital, Belgrade, Serbia
E-mail: denikol27@gmail.com

Neuromuscular diseases present heterogenous group of diseases that affect nervous system, neuromuscular junction and muscles. In pediatric population some neuromuscular conditions are specific and more frequent then in adults, particularly myopathies. Additionally special attention should be focused on physiological changes in neuromuscular system during the growth and development as it is known that particularly myelination formation reaches maturity

around five years of age. Electrodiagnostic studies are used in the assessment of acute and chronic neuromuscular diseases in both pediatric and adult population. Different values in conduction velocities, latencies and amplitudes of motoric units responses during nerve conduction studies are evoked in children particularly in early development. Parameters of electromyography findings can differ as well in children when compared to adults mainly in terms of amplitude and duration of individual motoric potentials. Moreover, technical considerations should be taken when performing electrodiagnostic studies in children. Thus, small electrodes are more adequate when performing nerve conduction studies. Smaller distances between distal and proximal areas of stimulation can result, if measuring error exist, in more inadequate calculation of conduction velocity. Finally it should be underlined that normal findings on electrodiagnostic studies does not exclude possible neuromuscular disorder, particularly conditions such as congenital myopathies. Therefore, this type of examination should be extension to the proper and adequate clinical examination of child.

Growing diseases from rehabilitation perspective

Ivana Petronic^{1,2}

¹Faculty of Medicine, University of Belgrade, Belgrade, Serbia, ²Department of Physical Medicine and Rehabilitation, University Children Hospital, Belgrade, Serbia
E-mail: ivana.pm@live.com

Growing diseases present heterogeneous group of diseases that are reported specifically in pediatric population. In general, the causes of musculoskeletal pain and spine deformities in children can be broadly classified as non-specific and specific. Regarding non-specific causes, postural dysfunction is among rising problems that is frequently diagnosed in school age. Growing pains are characterized by chronic, intermittent and sliding pain with night episodes that are provoked by the movement. There are neither local findings nor systemic symptoms. Considering specific causes of pain and spine deformities, there is wide range of etiological causes among them are: spondylolysis, spondylolisthesis, scoliosis, kyphosis, infections and tumors. Scoliosis usually is presented without apparent subjective symptoms except in cases of curve progression, infections or tumors. Aside of the trunk mobility loss, these patients often have vital capacity reduction and pain. For non-specific causes reduction in physical activities is advised along with medicaments treatment and body weight and lifestyle corrections. After the symptom's resolution, muscle strengthening exercises, preventive postural positions and getting back to sport activities is prescribed. For specific causes depending on the etiology in acute pain phase resting and medicaments treatment, while in other stages orthopedic and specific medicaments treatment, orthotics, physical and rehabilitation treatment, surgical and if needed hemato-oncological treatment.

Best practices for the clinical management of chronic pain in children and adolescents

Minna Ståhl

Finnish Center for Pediatric and Adolescent Pain Management and Research, HUS New Children's Hospital, Helsinki, Finland
E-mail: minna.stahl@hus.fi

Prevalence of non-specific chronic pain has increased in western pediatric populations over the last three decades. In some, chronic pain is associated with functional impairment such as inability to attend school. More and more such patients with families are seeking

help from pediatric hospitals. Multidisciplinary approach in treatment and rehabilitation would be needed. However, multiprofessional teams specialized into pediatric pain management and working interdisciplinary way are still scarce. Such unmet need was discovered some years ago in pediatric hospitals in Finland. For this reason, a national pediatric pain center was recently established with 2.7 million euros donation money. This session will present best practices for the clinical management of chronic pain in children and adolescents by making synthesis of the current scientific evidence and guidelines coupled with our clinical expertise and experience.

Last results on rehabilitation for idiopathic scoliosis: Exercises and shared-decision making for adolescents, and braces for infants

Stefano Negrini

University of Milan, Milan, Italy
E-mail: stefano.negrini@unimi.it

Three major studies have been published in the last year that will influence PRM practice on adolescent idiopathic scoliosis and will be presented in this lecture Cochrane review on therapeutic exercises – submitted, under review. The objective was to evaluate the effectiveness of Generic therapeutic exercises (GTE) and Physio Scoliosis Specific Exercises (PSSE) in the treatment of adolescent idiopathic scoliosis. The search in all databases was up to 15 December 2020 and standard Cochrane methodological procedures were used. We included 9 RCTs (467 participants). 82% of participants were female; the mean age was 13.3 years; the mean Cobb angle was 33.4° (range 19° to 66°). The results of this review were in line with the recommendations of current SOSORT clinical guidelines. Therapeutic exercises, particularly PSSE over GTE, can be proposed alone or during brace treatment to reduce Cobb angles. PSSE could also be an alternative to bracing in medium degree curves. More randomized controlled trials are needed to strengthen and better specify the current evidence and study other highly clinically relevant outcomes such as QoL, psychological and cosmetic issues, and back pain. Observational benchmarking controlled trial - Combining evidence-based medicine and shared decision making, current guidelines support an evidence-based personalized approach (EBPA) for idiopathic scoliosis in adolescents (AIS). EBPA is considered important for adolescents' compliance, which is particularly difficult in AIS. Benchmarking to existing Randomized Controlled Trials (RCTs) as paradigms of single treatments, we aimed to check the effectiveness and burden of care of an EBPA in high-risk AIS. Participants consisted of 1938 AIS, 11-45° Cobb, Risser stage 0-2, who were studied until the end of growth. EBPA included therapies classified for burdensomeness according to current guidelines. Using the same inclusion criteria of the RCTs on exercises, plastic, and elastic bracing, out of the 1938 included, we benchmarked 590, 687, and 884 participants, respectively. The efficacy of EBPA was greater, and the burden of treatment was frequently reduced, but it had to be increased even more frequently. Results of bracing in infants age 0-2 - We performed a retrospective study in a consecutive prospective cohort. We included 34 infants (16 idiopathic – IIS - and 18 secondary scoliosis - SIS) of age 1·10 ± 0·10 (years·months), 44 ± 17° curves, 27 ± 10° rib vertebral angle difference, average observation 5·05 ± 3·03 years. We found progressive improvement of IIS and stability of SIS patients. Bracing showed promising results in the medium term for high-degree IIS, with very few hold-ups (19%) and failures (12%). Conversely, failures prevail for SIS (full 11%), even if the partial failure (39%) is still a time-buying strategy.

Approach to spinal pain in children and adolescents

Ozden Ozyemisci Taskiran

Department of Physical Medicine and Rehabilitation, Koç University School of Medicine, Istanbul, Turkey
E-mail: ozdenozyemisci@yahoo.com

In children and adolescents, spinal pain is not uncommon, as it was previously thought. Prevalence of back pain may reach to 27% at 11 years, 37% at 13 years and 47% at 15 years. Approximately 9% of them seek medical care and restrict their sports or school participation. Pain usually lasts shorter than 2 days. However, children and adolescents with persistent pain have a greater risk for experiencing chronic pain later in adulthood. "Spinal pain in children usually indicates an important specific diagnosis" which is a previous statement has changed. Spinal pain is commonly musculoskeletal in origin and the clinical course is self-limiting. Growing spine with incomplete epiphyseal fusion makes the inferior and superior portions of the vertebral body and pars interarticularis more vulnerable to injury in children and adolescents. Repetitive overuse injuries (especially extension and rotation) to the posterior elements of the spine, leading to spondylolysis and spondylolisthesis are important etiologic causes for low back pain in school-aged children. Herniated nucleus pulposus, apophyseal ring fracture, and Scheuermann disease are other specific musculoskeletal diagnosis in children and adolescents. Assessment of the pediatric patient merit specific consideration. Fever, weight loss and night pain should raise the suspicion of tumor, infection or inflammatory spinal diseases. Infectious discitis and spondylodiscitis might be observed especially in infants and preschool-aged children. Clinical manifestation is frequently nonspecific and mild. It usually resolves spontaneously. In severe cases, delay in diagnosis might lead to serious neurologic complications like tetraplegia or paraplegia. Osteoid osteoma, osteoblastoma and aneurysmal bone cysts are benign tumors observed in spine. Back pain might be the presenting symptom in leukemia. Remote education during the pandemic accelerated the use of technologies, and prolonged screen time. Inappropriate posture, poor ergonomic furniture, physical inactivity, sedentary life style, psychosocial factors, and family history of spinal pain may also be associated with back pain. In the radiologic evaluation, anteroposterior and lateral view of lumbar spine in standing is considered, especially in pain longer than 3 weeks. Magnetic resonance imaging and computed tomography are advanced imaging studies for the evaluation of soft tissue or bony pathologies. Laboratory investigations including complete blood cell count, peripheral blood smear, erythrocyte sedimentation rate, C-reactive protein, antinuclear antibody, rheumatoid factor and HLA-B27 might be helpful depending on the differential diagnosis. Evidence-based recommendations or guidelines do not exist since research on management and prevention of spinal pain is scant, and the existing studies have high risk of bias. Back education programs including correct posture, ergonomic environment and appropriate use of digital devices, bracing, physical activity, sports, supervised exercise programs and manual therapy are some of the modalities in the prevention and management of spinal issues in children and adolescents.

TELEREHABILITATION

Telerehabilitation and digital health

Mauro Zampolini

Department of Rehabilitation, USL Umbria 2, Italy
E-mail: mzampolini@gmail.com

The pandemic made necessary formal and informal communication systems to communicate with sick people were used. The use of telemedicine systems supported people with chronic diseases and maintained a rehabilitation service at a distance. The development of telemedicine cannot be separated from the development of digital medicine. In this way, can be held with the patient and his caregiver must be developed through a constant interactive updating of his health condition through a general digital medicine platform that continuously updates information. In this context, it will be pretty natural to contact the patient or the doctor through a video call or asynchronous interactions of messaging type or with more articulated texts. A key role in producing information and interaction will increasingly be played by the wearable systems we already use in our daily lives, such as mobile phones or smartwatches. These systems can continuously generate information to monitor various parameters. In addition, they can be used through specific applications that are part of so-called digital therapies. For example, wearable systems help produce more health, and several randomised controlled trials demonstrate their effectiveness. Recently, studies have been published demonstrating efficacy on lower back pain, suggesting appropriate and personalised postural exercises, allowing an improvement in quality of life. Another more complex but still helpful perspective is artificial intelligence within digital medicine. There are already many application areas at different levels of telemedicine and digital medicine tools. The overall analysis of the risk-benefit ratio favours the introduction of digital medicine and telemedicine. However, analytical studies are needed to understand the areas of appropriateness and effectiveness. With these digital health systems, the integration between hospital and community, identified as a priority for many years but has only been marginally enhanced, can be facilitated. Furthermore, the continuous contact between hospital specialists and district professionals, in constant connection with general practitioners and patients, will make it normal to work in a network, improving the prevention, treatment and rehabilitation of the sick. For this reason, the UEMS-PRM Section has promoted an implementation project along three lines: a survey to verify the use of telehealth in Europe, the publication of an Evidence Based Position Paper and guidelines on the implementation of telehealth digital health.

Telerehabilitation in the post-acute continuum of care after stroke in COVID era

Xiaolei Hu

University Hospital of Umeå, Umeå University, Umeå, Sweden
E-mail: xiaolei.hu@umu.se

Stroke is a leading cause of disability among adults with heavy burden for the patients and their families as well as society. Especially during the ongoing COVID pandemic waves, people with stroke may encounter the various challenges not only in the acute phase but also in the post-acute continuum of care after stroke. Stroke rehabilitation, as an important component in the continuum of care after stroke, improves patients' physical, cognitive and emotional and social wellbeing. Telerehabilitation can provide distance support, evaluation and intervention to person with stroke via telecommunication. Isolation precautions during the COVID pandemic have facilitated telerehabilitation's rapid expansion in the clinical care services. Despite the popularity of telerehabilitation, there are still limited evidences in the field. The aim of this presentation is to provide an

overview of current knowledge and developments in telerehabilitation in the post-acute continuum of care after stroke. This presentation will focus on the evidences and effectiveness of telerehabilitation among people with stroke. Various utilizations of the telerehabilitation in the post-acute continuum of care after stroke will be presented in both east and west Europe's perspectives. We will also elucidate the potential facilitators, challenges and barriers on the use of telerehabilitation in the continuum of care after stroke in COVID era. In the end, the future direction of telerehabilitation will be provided.

Telerehabilitation for patient service and residency training

Reynaldo R. Rey-Matias

Department of Physical and Rehabilitation Medicine, St. Luke's Medical Center, Philippines
E-mail: drreymatias@gmail.com

The unprecedented COVID-19 pandemic has brought uncertainty in the different aspects of life, including operations in training hospitals, throughout the world. The increased demand from the medical workforce has severely disrupted the usual delivery of service to patients and training of residents specializing in Physical Medicine and Rehabilitation. The reorganization of roles and change in policies have implications on patient care and training competencies. In a developing country like the Philippines, shortages of health care workers, personal protective equipment and medical equipment, on top of the vulnerable health system, in various hospitals have catalyzed the adoption of telemedicine to mitigate the risks brought about by face-to-face contact. Consequently, various specialties, including Physical Medicine and Rehabilitation, have eventually found ways to transition to the "new normal." The Physical Medicine and Rehabilitation curriculum of residency training programs, composed of service, training and research arms, must continually evolve with the changing milieu. The pandemic has catalyzed the adoption of telerehabilitation. However, since no guidelines were in place pre-pandemic, many physiatrists, consultants and residents alike, at least in the Philippines and in other developing countries were at a loss as to how to conduct telerehabilitation for their patients and/or students. Telerehabilitation adoption is indeed affected by lack of awareness and training. Telerehabilitation can be taught and practiced during residency to ensure observance of appropriate telehealth principles, including tele-presentation, respect for patient privacy, and information security. We hope to inform future physiatrists and their current faculty of the need for telerehabilitation to prepare for similar unprecedented situations in the future. At the end of the session, the learners will be able to achieve the following objectives: 1. To describe telerehabilitation as to definition, scope, forms, methods, process, and ethical issues; 2. To explain the potential need, benefits and risks, as well as facilitators and barriers, with regards to telerehabilitation as part of residency training programs.

EDUCATION AND RESEARCH

Clinical trial governance and conduct – Ethics, guidelines, trial registration and reporting

Farooq Azam Rathore¹

¹Armed Forces Institute of Rehabilitation Medicine, Rawalpindi, Pakistan
E-mail: farooqrathore@gmail.com

Human research and experimentation has a dark history with respect to ethical violations that have occurred in the pursuit of science. For

thousands of years, experimentation on human beings was being performed without any formal mechanism for institutional oversight, safeguard for research participants or concept of an informed consent. This resulted in events which today would be classified as a breach of human research ethics, research misconduct and/or human rights violations. Such instances have been performed not only by individuals and institutions but also at the level of governments. Some of these include the pre-World War II eugenics movement supported by many prominent scientist and physicians of that time, U.S. government-sponsored radiation research on humans (1945-1975), Japan's medical experimentations on prisoners of war (POW) and medical field testing on Chinese civilians (1941-1943) German Nazi's human experimentation on Jews and other POW resulting in the death of a large number of the research subjects, Tuskegee Syphilis study, and Milgram obedience experiments. Over the years, clinical research has become more formal and organized. Human research ethics principles have been identified and many guidelines published across the globe. Nuremberg code for the first time stressed on the importance of voluntary participation in research. The 1964 declaration of Helsinki is based on the report "Ethical Principles for Medical Research Involving Human Subjects". The Belmont Report: Principles of Ethical Research on Human Subjects was published in 1979. It discussed informed consent for patient recruitment in research, assessment of risks and benefits for the research participants and ensuring reasonable, non-exploitative, and well-considered procedures are administered fairly. Nowadays a full-informed consent without any coercion or exploitation is a mandatory requirement to conduct a clinical trial involving human subjects. Other ethical aspects that need attention are use of placebo, risk analysis, post-trial care and the issue of compensation. The reporting of the clinical trial should follow certain guidelines called reporting guidelines. A reporting guideline is defined as "a checklist, flow diagram, or structured text to guide authors in reporting a specific type of research, developed using explicit methodology." It provides a minimum list of information needed to ensure a manuscript can be understood by a reader, replicated by a researcher, used by a doctor to make a clinical decision, and included in a systematic review. It is important that clinical trial should be conducted in a transparent manner with an appropriate administrative and ethical review committee oversight. In addition, emphasis should be made on following the ethical principles and adhering to the appropriate guidelines and standards of reporting. This will ensure that the research is ethical and beneficial both to the society and the participants resulting in data that can be used to make a positive difference in patients' lives.

US funding resources for global rehabilitation research

Theresa Cruz

National Center for Medical Rehabilitation Research, Washington, USA
E-mail: cruzth@mail.nih.gov

Background and Aims: The US National Institutes of Health (NIH) is the largest funder of biomedical research in the world. In 2021, the National Center for Medical Rehabilitation Research at NIH led the publication of a new NIH Research Plan for Rehabilitation. This plan is used to inform the field of scientific topics of interest and high priorities for NCMRR and the many other Institutes and Centers at NIH who support rehabilitation research. NIH welcomes research applications from non-domestic institutions for many funding opportunities including rehabilitation and brain disorders. **Methods:** NIH solicited input from the field through multiple requests for

information and a crowdsourcing platform. They also engaged outside stakeholder input through the National Advisory Board for Medical Rehabilitation Research. NCMRR has also tracked funding since 2016 when the previous Research Plan was published. **Results:** The NCMRR Director, Dr. Theresa Cruz will present the new Research Plan themes and research objectives. She will provide updates from the 2016 Plan and describe major investments in rehabilitation research by NIH. Dr. Cruz will also inform the community of current activities aligned with the Research Plan including special funding opportunities. She will describe current and ongoing funding opportunities from NIH to support global rehabilitation goals and collaborations with WHO to advance Rehabilitation 2030. **Conclusions:** Rehabilitation research support by NIH is strong and growing. More research and training applications, including those from non-domestic institutions, are encouraged in scientific areas that align with the 2021 NIH Research Plan on Rehabilitation.

SHOCKWAVE THERAPY

Scientific evidence of extracorporeal shock wave therapy and new applications

Elena Ilieva, Aleksandra Ilieva

Department of Physical and Rehabilitation Medicine, Medical University of Plovdiv, Bulgaria
E-mail: elena_md@yahoo.com

Since the first application of extracorporeal shock wave therapy (ESWT) in musculoskeletal disorders in the 90-ties, there has been growing evidence about its efficacy and effectiveness in these conditions. Thanks to basic research nowadays the mechanisms of the effect of ESWT and the changes during the different phases of action / physical, physicochemical, chemical, biological / are well understood. The induction of functional proteins promoting chondro-protective effect, neovascularization, anti-inflammation, anti-apoptosis, tissue and nerve regeneration is discussed by the authors. Despite the methodological issues in current effectiveness base for ESWT associated with tremendous heterogeneity in application (high versus low energy), lack of dosing precision, great variety of comparators and outcome measures, difference of outcomes for proportions versus mean change in scores, a great number of studies, including meta-analyses of randomized control trials provided good evidence about the effectiveness of extracorporeal shock wave treatment in chronic tendinopathies and other musculoskeletal disorders. The updated evidence and grade of recommendations in different disorders based on the level of evidence are presented. There is growing number of studies about the efficacy of ESWT in some of the expert and exceptional indications as osteoarthritis, carpal tunnel syndrome, spasticity, myofascial pain syndrome, Dupuytren's disease, trigger finger etc. In conclusion, ESWT could be considered as a non-invasive treatment option in different health conditions. There is growing evidence about its effectiveness to alleviate symptoms in disorders, considered as standard indications by the Consensus statement of International Society for Medical Shock Wave Treatment, and also in some new applications.

Ultrasound-guided extracorporeal shock wave therapy for tendinopathies and myofascial pain syndrome

Nikolaos Barotsis

Department of Medicine, University of Patras, Greece
E-mail: nbarotsis@icloud.com

There is growing evidence supporting the use of Extracorporeal Shock Wave Therapy (ESWT) in the treatment of various musculoskeletal disorders, especially when the underlying mechanism is impaired healing. This lecture aims to address the usefulness of musculoskeletal ultrasonography (US) in treating tendinopathies and myofascial pain syndrome with ESWT. Two techniques are currently used for US-guided ESWT. For co-axial (inline) guidance, the ultrasound transducer is integrated into the shockwave (SW) generator. The concept to apply the SWs using real-time imaging seems very attractive. However, the co-axial devices present certain drawbacks, including difficulty in maneuverability, high-level noise, increased cost, and low-quality imaging capabilities. With a US transducer to mark the target before the application of ESWT, the indirect guidance seems to be more advantageous. ESWT is considered a safe treatment with minor side effects, provided that the therapist is sufficiently trained and has respected the contraindications and precautions for its use. However, physicians and therapists treating patients with tendinopathies may face several dilemmas: (1) Can a patient with tendon tears benefit from ESWT? (2) Are there any complications when treating tendinopathy associated with intra-tendinous tears? (3) Shall we apply ESWT on myofascial trigger points close to sensitive tissues? (4) What are the protocols to be followed?

To achieve the best possible therapeutic outcome, it is paramount to obtain an accurate diagnosis before applying ESWT. Musculoskeletal ultrasound presents several advantages in this regard. ESWT is an important therapeutic tool in treating patients with tendinopathy and tendon tears. The treatment protocol depends on the type of tear, its size, the secondary disorders and comorbidity. Accurate diagnosis and regular follow-up are the keys to effective therapy. Ultrasound imaging allows for: (1) The proper patient/limb positioning to optimally expose the target area; (2) A better understanding of pathology. Ultrasound imaging offers several diagnostic clues, allowing the therapist to optimise treatment parameters; (3) Proper timing: US imaging can effectively help to differentiate between the chronic and acute phase of a musculoskeletal disorder, which is essential in elaborating a treatment plan; (4) Whenever pathology requires focused treatment, the use of US will ideally localise the target tissue and lesion; (5) The localization and avoidance of sensitive structures for a safe and efficient SW application; (6) Follow-up of the patient, especially in case of complications. In conclusion, US guidance can help the therapist deliver an individualized SW treatment, minimize complications, and achieve the best possible outcomes in treating musculoskeletal disorders.

PUBLICATION

Disseminating scientific information through social media: A synergy with scientific journals

Mauro Zampolini

Department of Rehabilitation, USL Umbria 2, Italy
E-mail: mzampolini@gmail.com

Social media are increasingly widespread and play a key role in creating opinion. For example, in the pandemic period, it was seen that the spread of uncontrolled information within social networks created a complex situation characterized by the circulation of false news that negatively affected the management of the pandemic. It is, therefore, necessary to put in place a strategy to counteract fake news. This

should be contrasted with scientifically reliable news that is typically published in scientific journals. Therefore, scientifically correct news should also be included in the social networks frequented by ordinary people. Furthermore, disseminating articles in social networks can reach laypeople and health professionals interested in learning more about the topic posed while accessing this type of social media. If this is true, one can expect a positive impact in disseminating the various articles published, which is a positive influence of biometric indices. There are different types of social media, the most popular of which are social networks that are characterized by the target audience. The EJPRM has been on Facebook since 2016 with good results (1707 followers). Prevalence is in the 25-34 age group. Access is 42% from Italy, 16.5% from Egypt and in third place Portugal with 6.7%. Twitter has also been thriving since 2014 (901 followers). The publications in the two social networks were made without specific planning. As regards LinkedIn, however, a specific editorial plan has been made since May 2020 with the aim of: (i) increase the overall article readership and citations; (ii) improve the long-term performance of the journal, ideally contributing to improving the journal rankings (such as the Impact Factor); (iii) provide broader visibility in the scientific community to the authors, positively influencing their h-index; (iv) support physicians specializing in Physical and Rehabilitation Medicine (PRM) and other healthcare and allied health professionals. This strategy has resulted in a steady number of 4000 impressions after a very rapid rise at the beginning of the application of systematic publication. We do not yet have data on how this has influenced the bibliometric indices. From the literature data and the specific experience of the EJPRM, we can think that disseminating articles in social networks can play a role in reaching health professionals and the lay public. Furthermore, this approach would help counteract fake news and spread awareness of the importance of PRM. However, implementing this strategy in the best possible may require social media managers' work with the associated additional costs in managing the scientific journal.

Use of big data for medical research

Nitin Jain

Department of Physical Medicine and Rehabilitation, Orthopaedic Surgery, and Population and Data Sciences, UT Southwestern Medical Center, Dallas, USA
E-mail: nitin.jain@utsouthwestern.edu

The use of de-identified medical records and data from large networks/consortium has been increasing in the last decade. The use of such datasets are a major advantage as they offer a readily available patient-population for research and to ask meaningful research questions. However, there are also substantial challenges including accuracy of the data, securing the datasets, privacy concerns, and added complexities when using genetic information. This session will describe the advantages and challenges when using big data. It will also provide guidance on issues to consider when using such datasets. Specifically for rehabilitation medicine, it will address how potential collaborations can result in big data that can be used for rehabilitation research.

SPASTICITY

Relation between spasticity and muscle's structure and mechanical properties

Clara Selves, Marine Devis, Thierry Lejeune, Gaëtan Stoquart

Université Catholique de Louvain, Louvain-la-Neuve, Belgium
E-mail: thierry.lejeune@saintluc.uclouvain.be

Introduction: Approximately half of the people with stroke present with impaired gait and/or upper-limb function due to muscle hyper-resistance (HR). The neural components of HR can be velocity dependent (spasticity) or not (spastic dystonia, co-contractions). Concurrently, a modification of the muscle's structure occurs due to the impaired central nervous system command and results in modifications of muscle's mechanical properties, with shortening and loss of extensibility of muscles, a reduction of cross-sectional area and neurogenic atrophy, a decrease in fiber size, an increase of collagen proportion and of intramuscular lipid accumulation. This impacts muscle's stiffness (viscosity and elasticity), which constitutes the non-neural component of HR (sometimes referred to as spastic myopathy). Some of the treatments used for HR, such as botulinum toxin (BTX) injections, which are considered standard of care, may also impact muscle structure and its mechanical properties. The neural and non-neural components of HR and muscle structure can be assessed by different techniques. **Stiffness:** The assessment of HR is mostly based on the use of two clinical scales, the Modified Ashworth Scale and the Modified Tardieu Scale, that still constitute the gold-standard of spasticity evaluation. They allow a non-linear grading of the resistance of muscles to passive stretch at a supposedly controlled speed. Although these scales remain useful on a clinical setting since they require no material and very little time, their inability to distinguish between the different components of HR is now widely accepted. Some objective measurement tools have emerged in the past decade, including motor-driven devices imposing isokinetic extensions at controlled speeds, electromyography-equipped electrical goniometers and electromechanical oscillatory devices, amongst others, which measure resistance to movement and help differentiate between the different components of HR in an objective way. Recently developed echography sequences, such as shear wave elastography (SWE), are increasingly used to assess muscle stiffness. **Structure:** Magnetic resonance imagery is considered the reference tool for non-invasive muscle structure evaluation. Acquisitions using the Dixon technique allow the quantification of the fat fraction present in every image voxel and thus help quantify fat and collagen muscle content. Diffusion tensor-imaging (DTI) allows the study of the diffusion of water molecules in tissues along different directions. In muscles, DTI has proven capable to accurately determine fascicle length and orientation. Relationship between HR treatment, muscle structure and stiffness: Surgical and chemo-denervation have been shown to have consequences on muscle structure and stiffness, but these consequences remain poorly understood. Some authors have shown that measures of SWE are responsive to BTX injection, and that elastographic and clinical measurements are correlated. **Conclusion:** This presentation discusses the relation between HR, muscle structure and mechanical properties. It will also address how BTX injections impact these by reviewing the most recent evaluation tools and techniques.

Optimizing intrathecal baclofen therapy with FLEX flow rate

Klemen Grabljevec

University Rehabilitation Institute Ljubljana, Ljubljana, Slovenia
E-mail: klemen.grabljevec@gmail.com

Spasticity is a motor disorder characterized by tight or stiff muscles that may interfere with voluntary muscle movements and is a problem for many patients with multiple sclerosis (MS), spinal cord injury (SCI), cerebral palsy (CP), and acquired brain injury (ABI). Increased tone and spasm reduce mobility and independence, and interferes with

activities of daily living, continence and sleep patterns. Spasticity may also be associated with significant pain or discomfort (e.g., due to poor fit in braces, footwear, or wheelchairs), skin breakdown, contractures, sleep disorders and difficulty in transfer. Intrathecal baclofen (ITB) has become the standard of care for the treatment of severe spasticity of both spinal and cortical origin. Baclofen, a gamma-aminobutyric acid (GABA) agonist, works to inhibit the excitatory activity at the spinal reflexes. Intrathecal baclofen acts at the GABA receptors in the spinal canal, increasing its inhibitory effect and decreasing side effects of fatigue and sedation produced with oral antispasmodic agents. Pulsatile bolus doses (flex mode) have been proposed as an effective and safe treatment strategy to reverse the need for increasing ITB dosages in patients with the probable 'tolerance' to ITB. Interestingly, most clinicians reserve flex or bolus dosing for more severe cases or cases of primarily dystonia that were relatively unresponsive to simple continuous ITB therapy. This supports the notion that pulsatile bolus / Flex dosing of ITB may be more efficacious. The concentration of baclofen is only 0.5% at a distance of 5 cm in comparison with the catheter tip at a steady state with a continuous low dose infusion. This could be increased to almost 50% with a high-dose continuous infusion, increased even further if a single large bolus is administered. The large bolus can raise the concentration at 5 cm to within 75% of the catheter tip and was still 23% at 10 cm. At either dose of continuous infusion rate, the concentration at 10 cm is virtually undetectable. It is hypothesized that the source of energy to facilitate the greater drug distribution within the CSF is the kinetic energy imparted to the drug by the act of the injection. The drug infusion in a simple continuous infusion is almost imperceptible. The faster infusion and especially the bolus imparts a slight, but observable, forward motion to the injectate, and differences among the drug distributions may be in part the result of differences in kinetic energy associated with the different infusion rates.

EMG and US guided state of the art BoNtx injection

Serdar Koçer

Médecin-chef de Service, Centre de Rééducation, Hôpital du Jura Porrentruy, Porrentruy, Switzerland
E-mail: serdar.kocer@h-ju.ch

Spasticity, one of the components of upper motor neuron lesion is very frequent with important consequences on the functional level but also sometimes at the origin of pain, musculo-tendinous contractures, skin problems etc. Dystonia is a disabling abnormality of movement with involuntary contractions that can affect an extremity such as the cervical region, the face, the larynx etc. Currently the first line treatment for multi-focal spasticity and dystonia is botulinum toxin injection. The success of this treatment depends on the accuracy of the indication, the choice of the target muscles to be injected and also the reliability of the injection technique. The action of botulinum toxin is at the level of the neuromotor junctions, so theoretically the product should be injected close to these areas rich in motor plaques. In general, the injections are performed either only with the help of anatomical location, by EMG - electrical stimulation or under ultrasound guidance. Several studies have shown the necessity of using EMG or ultrasound guidance. But we do not have yet enough evidence on the clinical effectiveness of one of these techniques. The choice of a technique or the combination of two guidance and analysis techniques can also be discussed in some cases. The aim of this session is to discuss the place of each technique in the light of personal experience and current literature.

Surgical treatment of the upper and lower limb spasticity

Paolo Zerbinati

Unità Operativa di Neuro-ortopedia Casa di Cura Santa Maria, MultiMedica, Castellanza, Italia
E-mail: dr.paolo.zerbinati@gmail.com

Neuro-orthopedic surgery through tenotomy, tendon lengthening or tendon transfer, aims to resolve contractures or spastic deformities of the upper and lower limbs to improve the functionality of the affected limb or sometimes just to reduce the deformities. Neuro-orthopedics, thanks to the improvements of the pre-operative diagnostic study with gait analysis, has become an integral part of the rehabilitation treatment of the hemiplegic patient and a powerful means for the correction of spastic contractures. This study, carried out by physiatrists at centers specialized in spasticity, allows to identify the muscle groups responsible for limb deformities and the compensation created by the patient to overcome the deformities. The electrical activity of the muscles is recorded during walking by a series of surface electrodes. Information on walking speed and stride length is also collected. This information is used to decide the treatment that allows the best correction of the deformities. The study of the gait therefore provides the orthopedic surgeon with the necessary tools to understand where the patient's walking or posture can be corrected to reduce his deficits. The presentation analyzes the different surgical techniques for correcting deformities of the upper and lower limbs through the analysis of clinical cases before and after surgery.

SCIENTIFIC EDUCATION AND TRAINING OF PROFESSIONALS

How to move forward in professional societies

John L. Melvin

Department of Rehabilitation Medicine, Sidney Kimmel Medical School, Thomas Jefferson University, Philadelphia, USA
E-mail: john.melvin@jefferson.edu

Professor Melvin has held many leadership positions in professional organizations dedicated to the improvement, development, and expansion of rehabilitation services. These include being the President or Chairman of twelve major national and international organizations. Among these organizations are those emphasizing academics, physician practice, facility development, teaching, program accreditation, physician specialist certification, research, and the advancement of physical and rehabilitation medicine. Through this lecture, his aim is to help participants move forward in their professional societies. **Methods:** Sharing observations from Professor Melvin's experience. **Results:** Most important is to feel a deep commitment to the mission of the organization and to value one's contributions to its success. Successful involvement focuses on the advancement of the organization and not on personal agendas. Although this lecture addresses those who wish to move forward in professional societies, each person should determine how much of a commitment is appropriate and plan their participation accordingly. Participate thoroughly in the activities of the organization. Be prepared for each activity; for example, read thoroughly the organization's core governance documents and any materials prepared for meetings. Finish assignments on time and completely. Attend meetings and focus actively on their purpose throughout the meeting. Look for changes that could improve the organization's success. Follow-up

with proposals. Be prepared to author documents to implement the proposals and otherwise invest time in their adoption. Have effective interactions with those in the organization, including staff members, officers, board members, and general members. Let them know of your enthusiasm for the organization's success, your ideas that might further that success and your willingness to provide the time and effort to contribute to that success. Develop a servant leader approach; where you focus on helping others to provide successful contributions to the organization. Allow others to accomplish their tasks without micro-oversight while being available to help if needed. Be generous in recognizing the contributions of others. **Conclusions:** Commitment to an organization's mission, willingness to contribute to that mission, and involvement with others associated with the organization are key factors in moving forward in professional societies.

MUSCULOSKELETAL DISORDERS – PROSTETICS AND ORTHOTICS

Performing arts medicine as a field of PRM: A specialized approach to the performing artists

Ana Zão

International Center for Arts Medicine - Instituto CUF Porto, Serviço de Medicina Física e de Reabilitação, Unidade de Medicina da Música e Unidade de Dor, Hospital Senhora da Oliveira, Guimarães, Portugal
E-mail: anazao100@gmail.com

Performing Arts Medicine is a field of Medicine which has gained special attention in recent years. Literature has shown that 62%–93% of musicians will develop pain. The most common problems of performing artists are musculoskeletal and neurological disorders, and so Physical and Rehabilitation Medicine (PRM) doctors are a key component of the interdisciplinary and multiprofessional team. These disorders have a significant negative impact in artists' performance and quality of life and may contribute to premature ending of artistic career. Musicians and dancers are the subgroups most commonly studied among performing artists. According to recent studies, despite the high prevalence and incidence of playing-related pain, only about 10-20% of musicians reported to seek medical care and only few of them were evaluated by a medical doctor specialized in performing arts medicine. Most musicians are not aware about the need of an early and specialized medical evaluation, which seems to be an important prognostic factor for musician's recovery. Unfortunately, this area of specialization is not well diffused neither in medical nor artistic contexts. The evidence concerning some specificities of artist's approach is growing and highlights the need for further studies on performance-related disorders predictive factors in order to develop more effective preventive programs. It is crucial to implement holistic and individualized patient-centred rehabilitation programs in order to address not only pain and structural underlying problems, but also to increase the musicians' ability to participate in his multiple contexts, particularly in the artistic one. This holistic approach should focus not only in a clinical and functional evaluation but also in a perspective of performance evaluation and optimization, as well as improvement of musicians' performance, participation and quality of life. In this lecture we intend to address the specificities of Performing Arts Medicine as a PRM subspecialisation.

Rapid triage of complex regional pain syndrome Type 1 and 2 – PRM as ideal clinician

Paul Winston

Division of Physical Medicine and Rehabilitation, University of British Columbia, Victoria, Canada
E-mail: pauljwinston@gmail.com

Complex regional pain syndrome (CRPS) is defined as a group of regionally painful conditions disproportionate to any inciting event. It presents as a constellation of pain and edema with sensory, vasomotor, sudomotor, motor and trophic signs and symptoms. The prognosis for CRPS ranges from early recovery within one year, to progression to chronic pain and disability. Due in part to a heterogeneous patient presentation and a lack of a definitive diagnostic testing, CRPS continues to be difficult to diagnose and treat. Treatment of CRPS continues to be challenging for clinicians due to a lack of consensus and evidence-based therapies. Harden noted that Oral corticosteroids are the only anti-inflammatory drugs for which there is direct clinical-trial evidence in CRPS (level 1 evidence). Birklein et al. endorsed corticosteroids to reduce posttraumatic inflammation noted success with a high initial dose of 100 mg prednisolone per day with a 25% reduction every 4 days and concluded that steroids are a sensible treatment option particularly in the first 6–9 months of the disease. Birklein has underscored that blocking the SNS is no longer considered a first-line therapy. Along with spinal cord stimulators they are reserved for specialized centres. This presentation will outline the rapid triage of acute and subacute CRPS to treat with disease modifying corticosteroids, to bring functional restoration to the upper and lower extremity. As fractures, particularly upper extremity are the most common cause of CRPS, we will discuss the management in the outpatient setting without specialized centres. The tools include the Budapest and newer Valencia Criteria, simple FLIR, or thermographic imaging tools, ultrasound guided diagnostic nerve blocks, and electrodiagnosis, to improve the clinical diagnosis and to assess for underlying discrete nerve injury CRPS II. The use of serial photographs and videos are a necessity to manage the chronicity of the disorder to seek resolution of disability. This presentation will underscore how the PRM physician has the tools to make effective diagnosis and treatment decisions to reduce disability and improve function through rapid triage.

STROKE II

Furthering stem cell therapy in neurological diseases: State of the art

Xiaofeng Jia^{1,2}

¹Department of Neurosurgery, Orthopedics, Anatomy and Neurobiology, University of Maryland School of Medicine, Baltimore, Maryland, USA, ²Department of Biomedical Engineering, Anesthesiology and Critical Care Medicine, Johns Hopkins University School of Medicine, Baltimore, Maryland, USA
E-mail: xjia@som.umaryland.edu

Traumatic events, iatrogenic injuries, and neurodegenerative diseases can lead to axonal degeneration and neuron death in the central nervous system. The injured adult nervous system has a limited regenerative capacity due to an insufficient pool of precursor cells. Stem cells, possessing the capacity of self-renewal and multicellular differentiation, promise new therapeutic strategies for overcoming these impediments to neural regeneration. Stem cells have been used for regenerative and therapeutic purposes in a variety of diseases, such as ischemic stroke, brain injury after cardiac arrest, hypoxic ischemic encephalopathy (HIE), and traumatic brain injury (TBI). Multiple stem cell types have been investigated in ischemic

brain injury, with a strong literature base in the treatment of stroke but limited studies have investigated these therapeutic mechanisms in the setting of cardiac arrest. Preclinical studies have been promising in stroke, but have failed to translate results to clinical trials. A major difficulty encountered in stem cell-based therapy is maintaining cell viability, biological properties, and functionality before and after *in vivo* implantation. Several delivery modalities are available, each with limitations regarding invasiveness and safety outcomes. Intranasal delivery presents a potentially improved mechanism, and hypoxic conditioning offers a potential stem cell therapy optimization strategy for ischemic brain injury. The use of stem cells to treat ischemic brain injury in clinical trials is in its early phase; however, increasing preclinical evidence has confirmed safety and tolerability profile of stem cells and suggests that stem cells can contribute to the regeneration following injury. This section will discuss the strategies including delivery routes, regeneration efficacy, minimizing adverse effects, and *in vivo* potential optimization to overcome the obstacles, such as stem cell modification, pretreatment, and chemical or biomaterial assistance to enhance stem cell therapy and promote its clinical application, with a focus on studies addressing delivery optimization, stem cell type comparison, or translational aspects.

Post-stroke depression: Mechanism, biomarkers and tDCS treatment

Zhenxiang Han

Seventh People's Hospital of Shanghai University of TCM, Shanghai, China
E-mail: hanxiang798007@gmail.com

Post-stroke depression (PSD), the most prevalent psychiatric disorder after stroke, affects nearly one-third of the survivors during first 5 years after disease onset. In this presentation, we will discuss the pathophysiological mechanism that contribute to PSD. The pathophysiology of PSD is a multifactorial mechanism that involves neuroinflammation. A potential mechanism for post-stroke depression involves various neuroinflammatory response-induced dysfunctions of the neurotrophic systems. The yin-yang hypothesis, in which mature brain-derived neurotrophic factor (mBDNF) and the precursor of brain-derived neurotrophic factor (proBDNF) elicit opposite effects on cellular functions, provides a new perspective on the neurotrophin hypothesis of post-stroke depression. Therefore, this presentation will propose that regulating the balance between proBDNF and mBDNF in microglia is a potential novel therapy target for post-stroke depression, so the markers of neuroinflammation and BDNF may be beneficial in the diagnosis and treatment of PSD. Finally, in the treatment of PSD, tDCS or Traditional Chinese Medicine Decoction may improve symptoms through anti-inflammatory and the up-regulation of neurotrophins.

NEW TRENDS IN PRM INTERVENTIONS

Advanced theory and interventions for chronic pain in women

Areerat Suputtitada

Department of Rehabilitation Medicine, Faculty of Medicine, Chulalongkorn University and King Chulalongkorn Memorial Hospital, Bangkok, Thailand
E-mail: areerat.su@chula.ac.th

Pain appreciation is the combination of recognizing somatic discomfort in conjunction with an emotional response to that

discomfort, rather than simply the outcome of inappropriate sensory input creating an unpleasant sensation. Because of physiologic and hormonal changes throughout a woman's life cycle, managing pain can be difficult. The etiology as well as a woman's stage of life or reproductive events, such as pregnancy, lactation, and menopause, influence the treatment. Chronic pain affects a larger proportion of women than males around the world, but women are less likely to receive treatment. Fibromyalgia (FM), chronic pelvic pain (CPP), and prenatal and postpartum musculoskeletal disorders are among the pain conditions that are more common in women. Irritable bowel syndrome and FM are two prevalent illnesses reported in women with CPP. Sensitization has recently been identified as a possible pathophysiological mechanism underlying a range of chronic pain syndromes. It is becoming very evident that pain relief is influenced by neurophysiology, which modulates pain differently in women. There have also been reports of gender differences in pain sensitivity, pharmaceutical therapy, and nonpharmacological pain therapies. Gender disparities in pain and its treatment are becoming more apparent because of an interplay of genetic, anatomical, physiological, neurological, hormonal, psychological, and social elements that modify pain differently. Advanced concepts and rehabilitation interventions for pain in women will be delivered in this lecture. For example, sensitization and its symptoms and signs, targeting sensitization and focusing on rehabilitation treatment, practical points of innovative ultrasound guided injection, and the roles of noninvasive neuromodulation.

THE FELLOWSHIP AND CERTIFICATIONS PROVIDED BY THE EUROPEAN BOARD OF PRM

The history of the European Board of Physical and Rehabilitation Medicine: A short overview

Rolf Frischknecht

Executive Committee Member of the UEMS Section and Board of Physical and Rehabilitation Medicine
E-mail: rolf.frischknecht@chuv.hospvd.ch

The foundation of the European Board of Physical and Rehabilitation Medicine (EBPRM) 30 years ago was the culmination of forty years of effort to set up the new medical specialty of Physical and Rehabilitation Medicine / Physical Medicine and Rehabilitation (PRM) in Europe and to make the specialty competent for providing effective interventions to maintain, improve or restore functioning in people with disabilities. During its 30 years of existence the EBPRM has become the leading European organization in the field of education in PRM. The development of the modern medical specialty of PRM started after World War II. War casualties and an increased prevalence of chronic diseases due to medical progress and increased life expectancy led to a raising number of disabled people in the community. The society also changed its attitude towards persons with disabilities considering them no longer as outliers, but as citizens with the right for care, support and integration. To define and harmonize the requirements for this new specialty several professional and scientific bodies were set up: International Federation of Physical Medicine (1950), European Federation of PRM (1963), Section of "Physiotherapy" of the Union of European Medical Specialists (1963, formally re-established in 1974), European Academy of PRM (1969) etc. In 1968 the WHO Committee of Experts on Rehabilitation defined the content of the new medical discipline of PRM at WHO level and set the minimal training duration at 4 to 5 years. The committee also recommended that every faculty of medicine should have a chair of

PRM “the only way of encouraging young and interested doctors to opt for this specialty”. The EBPRM was founded in 1991 as the third specialty board created by a section of the Union of European Medical Specialists (UEMS). Simultaneously the Foundation Collège Européen de Médecine Physique et de Réadaptation was launched to support the EBPRM. The main task entrusted to the EBPRM was to harmonize pre-graduate, post-graduate and continuous medical education in PRM at the highest possible level all over Europe. Thus, curricula for the teaching of medical students and for the postgraduate training of PRM specialists were defined and a certification system for PRM specialists, PRM training centres, PRM trainers and Continuous Medical Education events set up. The European Board examinations started in 1993, it took place for the 30th time this year. In 1989 the first “White Book on PRM” was written by representatives of the European PRM organizations followed by a second (2006) and a third edition (2018). The European Training Requirements (ETR) for the Specialty of PRM (UEMS) replaced the former curriculum in 2018. This ETR is presently being revised again.

Outline of the certification activities provided by the PRM board

Piotr Tederko^{1,2}, Aydan Oral^{1,3}, Nikolaos Barotsis^{1,4}

¹European Board of Physical and Rehabilitation Medicine, ²Department of Rehabilitation, Faculty of Medicine, Medical University of Warsaw, Warsaw, Poland, ³Department of Physical Medicine and Rehabilitation, Istanbul University Faculty of Medicine, Istanbul University, Istanbul, Turkey, ⁴Department of Medicine, University of Patras, Patras, Greece
E-mail: tederko.pl@gmail.com

Background and Aims: We report certification activities of the European Board of Physical and Rehabilitation Medicine (EBPRM) over the last 30 years. **Methods:** Overview of statistical data of certification of Fellows, Trainers and Training Centres. **Results:** Since the foundation of the EBPRM, between the years of 1993 and 2022, 3317 Physical and Rehabilitation Medicine PRM specialists, 300 trainers and 140 training centres obtained Board certifications. Among Board Certified Fellows, certification by equivalence (53%) slightly prevails over certification by examination (47%). There are 2810 Fellows, 361 Senior Fellows, 31 Life Fellows, one Honorary Fellow and 114 PRM doctors with pending fellowship status. The certification of the EBPRM Fellowship is a seal of excellence in the specialty of PRM and proof that the training of its holder was carried out according to the European Standards for medical training in PRM. Certification of trainers and training centres assures infrastructure necessary to effectuate the education and training in PRM according to the European Training Requirements in a harmonized way. **Conclusion:** Certification of Fellows, Trainers and Training centres belongs to core activities of the EBPRM aiming at harmonization the training of PRM in European Countries.

The quality assessment of the European PRM Board Examination

Nikolaos Barotsis

European Board of Physical and Rehabilitation Medicine
E-mail: nbarotsis@icloud.com

The quality assessment is an essential procedure to assure the high quality of the European PRM Board Examination. The assessment procedure is divided into three standardised segments: A. Feedback of examinees and national managers - Immediately after the examination, the examinees are anonymously surveyed.

The survey includes questions on the examination’s organisational, administrative, and scientific aspects. Moreover, the examinees are requested to provide detailed information on potentially problematic questions. Additionally, the feedback of the national managers, who coordinate the examination on a national level, and invigilators is collected. The results of both surveys are presented to the Jury and taken into consideration in the discussion of the examination results. B. Post hoc analysis of the results - Parameters obtained in the primary statistical validity analysis of the results include the mean & median score, standard deviation, internal consistency coefficient, skewness, kurtosis, error ratio and standard error. These figures give an overview of the examination quality compared to previous years’ results. Additionally, the difficulty (facility index) and discriminative power of each question included in the examination are statistically measured. During options analysis, the response rate each option received is analysed to detect potential issues with the key or plausibility of distractors. The secondary clinical validity analysis is necessary to review the examination questions, which proved to be problematic during the primary statistical assessment of the examination. A panel of experts checks if the questions were scientifically sound, following the technical standards issued by the Council for European Specialists Medical Assessment (UEMS CESMA). The recommendations of the panel are presented to the Examination Jury. Problematic items might be excluded from grading, whereas problems with the key option are corrected and the questions re-graded. C. The strengths, weaknesses, opportunities, and threats (SWOT) analysis - The Examination Committee elaborates a SWOT analysis annually to ensure continuous quality improvement and strategic planning for future examinations.

The question making for the European Board of PRM Examination

Aydan Oral

Department of Physical Medicine and Rehabilitation, Istanbul Faculty of Medicine, Istanbul University, Istanbul, Turkey
E-mail: aydanoral@yahoo.com

Department of Physical Medicine and Rehabilitation, Istanbul Faculty of Medicine, Istanbul University, Istanbul, Turkey; Secretary General, UEMS PRM Section and Board Assessment via exams is crucial to measure the outcome of training and to assess whether the trainees achieved the desired level of knowledge and competencies. The European Board of Physical and Rehabilitation Medicine (EBPRM) examinations are organized annually as an online and computer-based examination employing a hundred multiple-choice questions (MCQs) including single and clinical case MCQs. MCQs are based on learning objectives presented in the Chapters of the core curriculum for PRM post-graduate education as defined in the “European Training Requirements for the Specialty of PRM” and the Examination Blueprint, according to which a well-balanced set of questions is created with specific percentages assigned to each Chapter of the curriculum. The question making for the EBPRM examination is based on a diligent work with a series of actions including the training of examiners on writing superior quality MCQs, collection of the MCQs from the examiners, discussions in workshops to evaluate the questions and finally re-evaluation of the MCQs by the EBPRM Examination Committee. In “question writing webinars,” EBPRM employs the standard principles of effective item writing to create well-constructed MCQs based on the UEMS- Council for European Specialist Medical Assessments (CESMA) Guideline for successfully writing MCQs. When making questions, it is also important to define the objectives of MCQs and their targets in terms of the role

MCQs can play in the learning process. The classification of learning objectives, known as Bloom's taxonomy, guides us in this regard. Six levels were identified within the cognitive domain for learning which includes remembering (recall) and understanding which are classified as lower order learning, and applying, analyzing, and evaluating and creating which are classified as higher order learning. EBPRM aims to assess comprehension and critical thinking, not just knowledge and recall by asking candidates to evaluate situations, explain cause and effect, make inferences, and predict results that involve higher order learning. In short, EBPRM examination MCQs are intended to assess the ability of the candidates to analyze clinical situations relevant to PRM and to take the PRM related expected decisions which include establishing a diagnosis, prognosis advice, decision on further investigations, decision-making on the best treatment, recognition of complications and their diagnosis and treatment, and choice of the required rehabilitation interventions. In conclusion, creating well-constructed MCQs is a significant task. The EBPRM makes every effort to enhance the quality of MCQs in examinations in line with the CESMA standards. EBPRM strives to provide all candidates with a positive exam experience to enable them to perform at their best.

EDUCATION AND TRAINING IN PRM

The European training requirements: A competency-based approach

Maria Gabriella Ceravolo

Department of Experimental and Clinical Medicine, Politecnica delle Marche University, Ancona, Italy
E-mail: m.g.ceravolo@staff.univpm.it

In 1994, the UEMS adopted its Charter on Post Graduate Training aiming at providing the recommendations at the European level for good medical training. With five chapters being common to all specialties, this Charter provided a sixth chapter, known as "Chapter 6", that each Specialist Section was to complete according to the specific needs of their discipline. In 2005, the European Commission established the mechanism of automatic mutual recognition of qualifications for medical doctors according to training requirements within all Member States, through the Directive 2005/36/EC. While professional activity is regulated by national law in EU Member States, the UEMS recommends that it has to comply with international treaties and UN declarations on Human Rights as well as the WMA International Code of Medical Ethics. Hence, the UEMS asked each Section representing a medical specialty to provide the basic Training Requirements for the Specialty. In 2018, the UEMS Section and Board of Physical and Rehabilitation Medicine (PRM) developed the first edition of the European Training Requirements for PRM. The document defined in clear terms the scope and competencies of PRM physicians and their responsibility in: a) practicing the "medicine of functioning" as a rehabilitative strategy to be applied together with the curative strategy for the best recovery of patients' participation, b) planning the rehabilitation process according to the rehabilitation cycle, and leading the activities of multi-professional teams in order to achieve optimal outcomes. In line with the recommendations of UEMS and the most recent indications by the Rehabilitation Competency Framework released by the World Health Organization Rehabilitation Programme, a competency-based learning is proposed in the ETR for PRM. More in detail, the Competencies required of the trainee are defined in terms of theoretical Knowledge, practical and clinical Skills and Professionalism, as approved by the UEMS Section in PRM. According to Epstein & Hundert, 2002, a Competency is

"The habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and the community being served. Competency-based education is an outcome-based approach, focusing on knowledge application opposite to the content-based education of the traditional approach, that privileges knowledge acquisition. In this context, the evaluation of learning is continuous during the training, emphasizes the formative aspects over the summative ones, and is based on the direct observation of what the trainee DOES, as a proxy of what he/she can be ENTRUSTED to do in future practice.

ROBOTICS

Robotic and advanced technologies: A tool for rehabilitation development

Alessandro Giustini^{1,2}

¹PM&R at Florence University, Florence, Italy, ²San Pancrazio Rehabilitation Hospital, Trento, Italy
E-mail: alessandro.giustini@ntc.it

In recent years we have had a positive trend in the application of robots and technologies in Rehabilitation: research, publications, innovations and clinical data are growing. Rehabilitation centers using these technologies are more and more. Training and competences of PRM professionals have been greatly enriched. Our multiprofessional cooperation has increased fully understanding special principles and objectives of Physical and Rehabilitative Medicine in this field. European Robotic School supported very strongly this positive evolution, overcoming many problems, clarifying difficulties and in the same time great perspectives for rehabilitation development. One of the most striking aspects that emerge from the analysis of the literature is the enormous diversity of available technologies, which can be applied to similar pathological conditions and disabilities. In the same time the faced pathological conditions are equally numerous. Furthermore, is very low the number of studies where the sample of impairment severity is well analyzed in relation with the selection for different kinds of treatments. And is surely low a common and shared working methodology. In addition, systematic reviews of the literature and meta-analyses are very often presented without distinguishing the used different robotic technologies. In recent 'Cicerone consensus conference' in Italy was underlined the weak situation for clinical evidences: the suggestion is to create as soon as possible a larger research perspective (international) to overcome these criticisms. But in the same time this so large and growing interest in robotic rehabilitation is really supported by the evident positive effect on clinical and subjective outcomes in favor of treated patients, and by growing rehabilitation specialist's positive experiences. If we will be able to solve the "evidence question" we can reach a very larger diffusion of new technologies: lower costs, common practices and standards, clarified and shared indications. So applying robotic and advanced technologies we probably could have a tool to overcome the main problem in the future: to offer everywhere effective rehabilitation treatments to the growing number of people experiencing disabilities.

SPORT

tDCS and sports performance

Géraldine Martens, Stephen Bornheim

Département des Sciences de la Motricité, Faculté de Médecine, Université de Liège, Liège, Belgium
E-mail: geraldine.martens@uliege.be

Physical performance and means to improve it have been studied for a long time. While there are numerous variables affecting one individual's aerobic capacity, central mechanisms are known to be strong restrictors. These include the output generated by the motor cortex but also the mental fatigue or the perceived exertion. One way to act on these cortically mediated processes is through transcranial direct current stimulation (tDCS), a non-invasive neuromodulation method using weak electrical currents to modify neural excitability. Previous studies showed that tDCS applied over the primary motor cortex can improve maximal performance in cycling as well as sometimes decrease ratings of perceived exertion. The current literature still suffers from important gaps including the functional assessment of performance and the control of physiological variables such as blood lactate levels. This session will present the results of several trials conducted on recreational and high-level athletes aiming at boosting performance with tDCS. We investigated the effects of single session of motor tDCS on isokinetic upper strength, and running performance. Preliminary findings of our randomized, double-blind, sham controlled trial on upper limb rotation strength showed no significant effect of a single session of motor tDCS on upper limb concentric strength, for internal or external rotation, in sedentary, amateur, or high-level athletes. There was no significant effect on eccentric contractions for amateur and high-level athletes, but significant effects were found for sedentary subjects in internal and external rotations. Preliminary findings of our other randomized double-blind sham controlled trial on running performance showed no significant effect of a single session of motor tDCS on time to exhaustion in 25 trained runners (time to exhaustion [primary outcome] 11.9 min active – 11.7 min sham; $p=0.82$). However, there could be an influence of the baseline athletic level on response to tDCS. There is a trend towards runners with lower initial maximal oxygen consumption (VO_{2max}) showing longer time to exhaustion following active tDCS ($p=0.07$), which would need to be confirmed when the final sample ($n=50$) will be reached. At the end of the session, some paths for future research (tDCS montages, target population, injured patients) will be presented. The contents of this session will provide further insight into tDCS mechanisms of action and potential ergogenic effects.

Prevention of Hamstring injuries

François Delvaux

Département des Sciences de la Motricité, Faculté de Médecine, Université de Liège, Liège, Belgium
E-mail: fdelvaux@uliege.be

Hamstring injury (HSI) is the most frequent injury in sports involving maximum running speed, such as soccer or athletics; it is also particularly problematic in rugby and dance. These challenging epidemiological data argue strongly for the development and implementation of primary and secondary prevention strategies given the particularly high recurrence rates. The main risk factors for HSI are age, past injury, poor load management, muscle strength imbalances, biceps femoris fascicle length, sprinting technique and poor lumbopelvic motor control. Five elements appear essential to optimize a strategy for the prevention of HSI: 1) progressive, high-intensity, high-stretch, high-speed strengthening of the hamstring muscles; 2) workload management (incorporating progressive weekly changes in training and competition load, optimal management of competition schedules, psychological load, and travel) ; 3) lumbopelvic motor control to stabilize the pelvis; 4) development of general fitness and habituation to maximal sprint exercises that generate higher contraction intensities than all strengthening exercises; 5) optimization of running technique. Finally, the use of advanced analytical methods involving the manipulation of multiple data (data science such as Machine learning, Agent-Based Modelling, Supervised Learning Algorithms) and innovative statistical methods is of growing interest and could contribute to substantially improve the prevention of HSI.

Prevention of tendinopathy

Jean-François Kaux

Department of Physical Medicine and Sport Traumatology, Sports University and University Hospital of Liège, Liège, Belgium
E-mail: jfkaux@ulg.ac.be

In the last twenty years, sports activities have become increasingly important in our modern society, and tendinopathy is a common overuse injury in the athletic and profession-ally active population. The etiology of tendon pathology, although still poorly understood, is multifactorial and involves both intrinsic and extrinsic risk factors, which could precipitate the occurrence of the pathology in predisposed individuals. There are significant interindividual variations in the development and evolution of tendinopathy, making them a contemporary challenge in clinical practice and justifying the need to recognize and correct any risk factor as much as possible. Given the complexity of the etiology of tendon pathology and the difficulty to establish their effective and long-term management, general risk factors must be searched and identified in any patient with chronic or recurrent tendinopathy. Through this review, we will focus on the various systemic risk factors highlighted in the context of chronic tendinopathy, before proposing to address the principles of precaution to deal with a patient subject to the pathology. Moreover, the prevention of tendinopathy must therefore take into account these different parameters to be controlled.