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THE IMPACT OF CLIMATE CHANGE ON INFECTIOUS DISEASES

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Since the beginning of the Industrial Revolution (late 18th century) and the subsequent burning of fossil fuels the climate has been changing at rates not documented in the Earth's natural history. Climate change poses new challenges for infectious disease control. According to a study published in the journal Nature Climate Change in 2022, more than half of infectious diseases affecting humans are exacerbated by climate change. As demonstrated in this review, 277 human infectious diseases can be exacerbated by the wide range of climate risks caused by continued GHG emissions, and include 58% of all infectious diseases known to have affected humanity in recorded history. Over 1,000 different pathways in which the series of climate hazards, through different types of transmission, led to disease outbreaks from a taxonomic diversity of pathogens. Outbreaks of infectious diseases are directly linked to global warming One of the most important ways in which a warmer planet affects infectious diseases is by allowing pathogens or the insects that carry them to move into habitats that were previously too cold for them (with the risk of spreading beyond the tropics and into temperate zones). Warming has also been associated with melting ice sheets and thawing permafrost exposing once frozen pathogens (zombie viruses). Rapid rates of urbanization in low- and middle-income countries have created new opportunities for the emergence of infectious diseases. The global anxiety caused by the emergence of COVID-19 has clearly revealed the significant human vulnerability to pathogenic diseases. Recent anthropogenic climatic, demographic and technological changes have changed the landscape of infectious disease risk over the past two decades. Hot beds of emerging, re-emerging and endemic pathogens spreading rapidly, aided by global connectivity. Habitat Shift - Areas Displaced by Climate Change reveals the magnitude of the threat to human health from climate change and the urgent need for aggressive action to mitigate GHG emissions.

Keywords: Climate Change, Infectious Diseases, Melting Ice

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CLIMATE CHANGE IMPACT ON SCI INDIVIDUALS

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The presentation focused on the impact of climate change on individuals with spinal cord injuries (SCI) and introduced the Climate and Health Special Interest Group of International Spinal Cord Society (ISCOS), how it was developed and inspired by Prof. Marcalee Alexander. Climate change poses significant challenges for individuals with SCI, exacerbating their vulnerabilities during extreme weather events and impacting their overall health. The need for integral disability considerations into climate adaptation emergency plans, including ensuring accessible locations, reliable power sources for medical equipment, and training healthcare providers on the specific needs of individuals with SCI during climate-related events was emphasized. Future steps were analyzed: ISCOS' Climate and Health Special Interest

Group to develop targeted strategies for addressing climate change impacts on individuals with spinal cord injuries, healthcare providers to receive training on the specific needs of individuals with spinal cord injuries during climate-related events, emergency response teams to ensure accessible evacuation routes and reliable power sources for medical equipment in disaster preparedness plans, public health officials to create accessible public health information and communication campaigns for people with disabilities, local community organizations to engage with and educate vulnerable populations about climate change mitigation and adaptation strategies, disability advocacy groups to collaborate with climate change organizations for inclusive policy-making and action plans, government officials to integrate disability considerations into climate adaptation and emergency response plans, research teams to study and document the specific impacts of climate change on individuals with spinal cord injuries, environmental planners to consider the needs of people with disabilities when developing climate change mitigation and adaptation strategies, healthcare facilities to develop contingency plans for maintaining services during climate-related disruptions, specifically for individuals with spinal cord injuries. The importance of mitigation strategies, such as public communication campaigns, patient-centered approaches, and advocacy at local, national, and global levels was also highlighted. The conclusion addressed the importance of adaptation strategies, including disaster preparedness and relocation of vulnerable populations.

Keywords: Climate, Health, Spinal Cord Injury, Adaptation, Mitigation

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THE ESTABLISHMENT OF THE "DAY FOR TOMORROW" AND THE PRESERVATION OF THE FUNCTIONALITY OF PEOPLE WITH DISABILITY.

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The WHO 2030 Rehabilitation Initiative draws attention to the increasing need for rehabilitation services worldwide, and stresses the importance of strengthening health systems to provide rehabilitation services. There is an international trend that public health insurance covers a shorter initial inpatient rehabilitation program. The need for lifelong rehabilitation services is not always recognised by stakeholders. Rehabilitation services at Community level are poorly or not organised at all in many countries. The needs of rehabilitation services in Europe are significant and growing in parallel with increasing elderly population. People with spinal cord injury (SCI) need the maximum degree of rehabilitation services and challenge health systems even though they are only 0.1% of people with disabilities. Previously, chronic traumatic SCI was considered a stable clinical condition. It is now seen in accordance to the bio-psycho-social model of International Classification of Functioning, Disability and Health (ICF) as a dynamic situation in which the needs, abilities and limitations of people with paraplegia-tetraplegia are constantly changing as the secondary health conditions, comorbidities, environmental and personal factors may change. Individuals who are injured during or before puberty enjoy a sustained function/maintenance phase of 20 years before experiencing functioning decline. Individuals who are 55 years or older at the onset of SCI have 5 to 7 years of relatively stable function before experiencing a decline in functioning. It is obvious that the success of the initial rehabilitation program post SCI will play an important role both in achieving the optimal functional status of the patient, but also in maintaining a sufficient degree of functioning over the years.

"The greatest health threat facing humanity is climate change" World Health Organization, October 2021. "Sustain Our Abilities (SOA) is a non-profit organization focused on the intersection of climate change, health & disability and it is dedicated to helping all people sustain quality of life in our changing world." The first Day for Tomorrow event was held by SOA in 2019 and since then it takes place every 22nd of October all around the world. "The Day for Tomorrow is more than a day – it is a concept: for people to connect with their communities, be prepared, build climate resilience, and transform our built environment to be more sustainable, safe, and healthy for people with and without disabilities!"

The climate crisis is putting human rights and social justice in crisis. Low-income countries are disproportionately

affected and, in all countries regardless of income, vulnerable people. Land becomes uninhabitable or uncultivable and many people will become environmental refugees. The 2023 Lancet Countdown report on health and climate change stresses the urgent need for health-centric responses in a world facing irreversible damage. Climate change directly and disproportionately threatens the right to healthcare services of persons with disability. The global mortality rate of persons with disability in natural disasters is up to four times higher than persons without disability. Maintaining functionality over the years requires continuous effort both individually and through health systems and the community. Rehabilitation services are an important component of health services and are a key strategy for achieving "Sustainable Development Goal 3": ensuring healthy lives and promoting well-being for all at all ages.

Keywords: Spinal Cord Injury, Rehabilitation Services, International Classification of Functioning, Disability and Health, Climate Change

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HYPERKYPHOSIS

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The presentation provides a comprehensive analysis of hyperkyphosis, characterized by an excessive anterior curvature of the thoracic spine, diagnosed when the curvature surpasses 50 degrees. Hyperkyphosis results from a biomechanical imbalance in which the anterior vertebral bodies and intervertebral discs bear compressive forces, while the posterior muscles and ligaments undergo tension to preserve equilibrium. Primary factors encompass degenerative disc disease, characterized by the loss of hydration and structural integrity of intervertebral discs with aging, resulting in heightened curvature, and osteoporosis, which compromises spinal strength, leading to wedging, especially in the mid-thoracic area. Women, particularly those who are postmenopausal, exhibit increased vulnerability due to hormonal fluctuations, diminished physical activity, and muscular atrophy.

Diagnostic techniques encompass radiographic evaluations, including Cobb angle measures, the occiput-to-wall distance test, which evaluates postural deviation, the use of the Debrunner kyphometer, and the Spinal mouse, a computer-assisted medical device for assessing spinal column shape and mobility.

Hyperkyphosis presents in various forms: postural kyphosis, associated with inadequate posture and extended thoracic flexion; Scheuermann's kyphosis, a hereditary condition marked by vertebral wedging and abnormal endplates, resulting in a stiff, angular curvature; and kyphosis resulting from compression fractures due to osteoporotic vertebral collapse. Clinically, hyperkyphosis leads to musculoskeletal alterations including forward head posture, shoulder protraction, and diminished lumbar lordosis, resulting in joint dysfunction and persistent pain. It diminishes physical function, heightening postural wobble, decreasing gait velocity, and augmenting fall risk, especially in elderly individuals. Severe cases may impair pulmonary function due to thoracic stiffness, exacerbating physical restrictions.

Elevated kyphotic angles are associated with a heightened risk of spinal fractures, with research demonstrating an 8% increase in fracture incidence for each 10-degree increment. Hyperkyphosis is correlated with increased death rates, particularly in persons with concomitant spinal fractures. Diagnostic imaging, such as X-rays, CT scans, and MRIs, detects structural anomalies and compression fractures. Management techniques encompass physical therapy, bracing, posture correction, and surgical interventions for severe instances. The presentation emphasizes that hyperkyphosis is a complex illness with considerable biomechanical, structural, and functional consequences, requiring early identification and thorough treatment to alleviate its influence on quality of life.

Keywords: Hyperkyphosis, Spine, Rehabilitation, Pain, Posture

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TREATMENT OF JUVENILE AND FLEXIBLE HYPERKYPHOSIS

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Hyperkyphosis is an excessive forward curvature of the thoracic spine and is one of the most common postural disorders. During adolescence, structural curves should be differentiated from postural ones. A rigid hyperkyphotic curve requires lateral radiographs to rule out Scheuermann disease. Postural and flexible increase in the sagittal plane is the most common kyphotic pattern and is often overlooked. Postural control is dependent on inputs from the somatosensory, visual and vestibular systems. Importantly, body position is representative of physical and mental health. Research has shown that the motoric system including posture can strongly affect emotional processes. Obesity and poor lifestyle habits play a significant role in developing hyperkyphosis. Management of postural and Scheuermann's kyphosis is usually conservative. However, a comprehensive approach is needed, including clinical evaluation and follow-up, exercise and physical therapy, postural re-education and lifestyle modification. Some cases will need orthopaedic treatment, usually when Cobb angle increases to 60 to 80 degrees and patients are minimally symptomatic. Successful bracing depends on patients 'compliance and curve flexibility and should be complemented with exercise.

Surgical treatment is considered when kyphosis is greater than 75 degrees, with an unacceptable deformity, with severe associated pain, or in case of neurologic deficits.

Postural hyperkyphosis should be identified as a public health problem, emphasizing the need for prevention, diagnosis, and treatment.

Keywords: Hyperkyphosis, Dorsal, Juvenile, Flexible, Posture

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EFFECTS OF SPA REHABILITATIVE INTERVENTIONS

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According to a 2019 World Health Organization report, at least one in three people will experience a disability during their lifetime. Health resort medicine is emerging as an innovative proposal for rehabilitation and healthy aging by integrating medical care, traditional therapies, rehabilitation, and wellness within a therapeutic environment.

At the University of Padova, we are proposing a new model, which exploits the unique properties of thermal mineral-rich waters and the synergies of the thermal environment, combining balneotherapy and therapeutic exercise. The benefits of spa-based rehabilitation are particularly evident in the treatment of musculoskeletal, neurological, and cardiopulmonary conditions, as well as for improving the overall well-being of aging individuals. Spa-based rehabilitation is especially effective due to the therapeutic properties of water, which enhance the effectiveness of rehabilitative exercises. These properties include buoyancy, which reduces the load on joints and muscles, making exercises less stressful for patients with mobility limitations. The viscosity of water provides natural resistance, strengthening muscles and improving endurance. Hydrostatic pressure helps improve circulation and reduce edema, while the thermal effect of water promotes muscle relaxation and alleviates pain. In addition, combining water-based rehabilitation with traditional and complementary therapies in the spa setting creates a comprehensive approach to health. The spa-based model is also particularly effective for managing the comorbidities that often accompany chronic diseases, such as obesity, pain, and fatigue. It also provides an ideal setting for healthy aging strategies, allowing individuals to maintain their quality of life and independence.

This environment supports both physical recovery and mental well-being, helping individuals manage psychological challenges, with mood improvements linked to the modulation of ACTH and cortisol.

In conclusion, the integration of spa-based rehabilitation represents a promising approach to promoting health, functional recovery, and well-being, particularly for individuals with chronic conditions and those seeking to enhance healthy aging.

Keywords: Rehabilitation, Health Resort Medicine, Balneotherapy, Longevity, Healthy Aging

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NUTRITION SUPPORT IN OPTIMISING OUTCOMES IN PHYSICAL MEDICINE AND REHABILITATION (WITH SPECIAL FOCUS ON PEOPLE WITH SPINAL CORD INJURY)

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Rehabilitation medicine is concerned with the prevention, diagnosis, treatment and rehabilitation management of people with disabling conditions. This lecture will be focused on people with spinal cord injury (SCI). Sir Ludwig Guttmann founded the first SCI centre at Stoke Mandeville in 1944. He emphasised the needs of a person with SCI (PWSCI) not just treating the direct injury but also all organ systems affected, by providing training and equipment, the psycho- / socio- logical adjustments, the vocational pursuits and to provide long term specialised follow up care. PWSCI are often at risk of malnutrition (inlcuding both over- and under- nutrition) and it is probable that this causes adverse clinical outcomes such as increased hospital stay, prolonged operative times, higher total complications and increased mortality afer SCI centre admission. The true prevalence of malnutrition in SCI is not well studied despite national and international reports highlighting the importance of good nutrition and its clinical and financial implications. The use of a SCI specific nutrition screening tool, such as Spinal Nutrition Screening Tool is recommended as an important first step to identify those who require nutritional intervention. After SCI, people may still be acutely recovering from the trauma or are stable and undergoing rehabilitation. The nutritional needs are quite different. Due to enforced inactivity and change in body composition, energy expenditure in PWSCI underwent stable rehabilitation would be lower than we predict in able-bodied control, particularly in people with high cervical SCI and / or mechanical ventilation, ultimately leading to obesity and cardio-metabolic disease risk. On the other hand, PWSCI will require additional protein (up to 200%) for pressure ulcer healing and/or pre- and post- operatively. Depending on the site of pressure ulcers, increased provision of enteral nutrition, could mean an increase faecal output, leading to increased risk of faecal contamination. Enteral tube (ET) feeding is also sometimes insufficient or unavailable, such as with delayed ET placement or when ET feeding alone is not sufficient to meet the high requirements and when supplementary PN is therefore indicated. Due to lack of standard in dietetic staffing in SCI centres, malnutrition will continue to be under-recognised and under-treated. PWSCI are also at risk of vitamin D and sub-optimal bone mineral density and special diet such as dietary fibre manipulation, Low FODMAPs diet and probiotics may play a role in neurogenic bowel management. To address the complex nutritional needs of this special population group, we recommend to (i) establish a staffing level for dietitians; (ii) implement a validated nutrition screening tool to identify malnutrition; (iii) implement evidence-based interventions to prevent / treat cardiometabolic complications after SCI and (4) develop and implement a standardised dataset to monitor nutrition management and outcome in PWSCI. Additional organisational cost will be incurred initially, but appropriate nutrition can potentially decrease long-term healthcare costs as patient's outcome and quality of life is improved.

Keywords: Spinal Cord Injury, Malnutrition, Nutrition Related Complications, Nutrition Support

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RISK FACTORS, CLINICAL CORRELATIONS, AND OUTCOMES OF ULCER DEVELOPMENT IN A MIXED ICU: A RETROSPECTIVE ANALYSIS TO GUIDE PREVENTIVE STRATEGIES

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This study investigates the evolution of pressure ulcers, associated risk factors, and patient outcomes in a 10-bed mixed Intensive Care Unit (ICU). Through a retrospective analysis of patient data collected over a 12-month period, the research aims to inform future preventive strategies and enhance patient care. A total of 83 patients were included, with a median age of 71.5 years ±15.1 (mean 68.05, range 20–93) and a median length of stay (LOS) of 17 days±14.4 (mean 21.44, range 3–74). The analysis revealed that 9.6% of patients developed pressure ulcers during their ICU stay. Clinical assessments revealed a mean APACHE score of 19.2±7.7 for patients without ulcers compared to 23.3±5.8 for those with ulcers, alongside SOFA scores of 8.8±3.0 and 10.5±2.3, respectively. The mean Cubin-Jacksson score is 22.5±3.5 for patients who developed ulcers versus 24.5±3.6 for patients who did not (p<0,05), reflecting the high risk of pressure ulcers in ICU patients. Correlation analysis highlighted significant relationships between various risk factors, clinical scores, and the incidence of ulcers. The study concludes that pressure ulcer development is a critical issue in mixed ICUs, especially for patients with extended hospital stays and pre-existing health conditions. It underscores the necessity for targeted preventive measures and the early identification of high-risk individuals.
Keywords: Pressure Ulcers, Intensive Care Unit, Risk Factors, Patient Outcomes, Preventive Strategies

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STAGING OF PRESSURE ULCERS AND DRESSINGS

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The presentation provides a comprehensive review of the prevention, management, and treatment of pressure ulcers, with an emphasis on best nursing practices and the critical role of various dressing materials in facilitating wound healing. The prevention of pressure ulcers is prioritized through patient positioning, appropriate use of pillows and supports, and ensuring adequate nutrition. It is essential to avoid medications that impede the healing process and to maintain sufficient tissue oxygenation, which are key factors in optimizing patient outcomes. The selection of wound dressings, including film, hydrocolloid, alginate, polymer, and hydrogel dressings, is determined by the ulcer's stage, exudate volume, and wound characteristics. The presentation outlines the properties of these dressings, focusing on their absorptive capacities, infection prevention capabilities, and their role in maintaining an optimal healing environment. The presentation emphasizes the importance of aseptic techniques, or alternatively, clean techniques, to prevent wound contamination. It advocates for the use of saline solution or other appropriate cleansers for wound care, as these methods avoid further tissue damage while facilitating healing. The use of topical antibiotics and antiseptics is discouraged unless clinical evidence of infection is present. Additionally, the presentation highlights the importance of timely and effective debridement, including the removal of necrotic tissue, which is integral to successful treatment. However, treatment effectiveness extends beyond medical interventions and necessitates the continuous education of healthcare professionals and patient involvement. The education of patients and their families is crucial in promoting recovery and preventing recurrence of pressure ulcers. Comprehensive staff training ensures improved clinical management, reduces complications, and enhances the overall quality of care delivered.
Keywords: Pressure Ulcers, Prevention, Wound Care, Dressing Selection, Nursing Interventions

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PRESSURE INJURIES: WHAT SHOULD THE REHABILITATION TEAM BE AWARE OF?

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Pressure ulcers, also known as pressure sores, are a serious and life-threatening complication that affects nearly 80% of spinal cord injury (SCI) patients at least once. These injuries result from prolonged pressure on the skin and underlying tissue, leading to tissue damage and necrosis. The prevention and treatment of pressure ulcers is crucial to improve the quality of life of those affected and avoid serious health consequences.

The first observations and definitions of pressure ulcers date back to Brown-Sequard in 1853 and Paget in 1873. Brown-Sequard found that guinea pigs with and without spinal cord injuries developed ulcers after the application of pressure and that the same healing potential was observed. Paget defined pressure ulcers as "the death of a part caused by pressure". Further historical contributions were made by Charcot (~1880), who postulated the existence of a neurotrophic factor leading to the destruction of tissue in paralysed limbs. Davis JS and Groth KE also contributed to research on pressure ulcers in the 1930s and 1940s. Guttmann L addressed the problem and treatment of pressure ulcers in paraplegics in the 1950s.

The distribution of pressure plays a decisive role in the prevention of pressure ulcers. Pressure peaks occur at the bony interfaces and not at the skin surface6. Pressure relief measures include regular changes of position, the use of suitable wheelchairs and pressure-relieving materials such as foam, air cushions or gel. Other preventative measures include maintaining dry and clean skin, bladder and bowel control and early and consistent treatment of infections. For bedridden patients, it is important to change position every 3 to 4 hours and protect vulnerable skin areas with extra soft pads.

Seat pressure measurements are an important tool for assessing pressure in patients. These measurements show significant differences in the pressure ranges and their effects on the prevention of pressure ulcers. In active patients, the maximum pressure ranges and the dispersion index remain almost unchanged, while they increase in inactive patients. These results emphasise the importance of regular pressure relief measures and the use of suitable aids.

The treatment of pressure ulcers includes both conservative and surgical methods. Conservative treatment methods include debridement, disinfection and granulation tissue protection. Surgical treatments include wound conditioning, radical excision and selection of appropriate flaps. Postoperative care is also very important and includes the administration of antibiotics, bed rest and mobilisation.

Pressure ulcers are a common and serious complication in patients with spinal cord injuries. Prevention and treatment of these injuries requires a comprehensive understanding of the underlying mechanisms and careful implementation of preventive and therapeutic measures. Historical contributions have significantly increased our knowledge of pressure ulcers, and modern techniques for pressure measurement and treatment have improved the possibilities for prevention and healing. Pressure ulcers can be effectively prevented and treated through regular pressure relief, appropriate devices, skilled surgical care and careful post-operative care.

Keywords: Pressure ulcers, Spinal Cord Injury, Neurotrophic Factors, Conservative Treatment, Surgical Treatment

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SPINAL CORD INJURIES: CONSERVATIVE AND OPERATIVE TREATMENT

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The treatment of Spinal Cord Injury (SCI) has dramatically changed over the last years because of new evidence provided by preclinical and clinical research. Factors such as hemodynamic management in the early stages of SCI, pharmacological treatment, type and time of surgery are better optimized in order to enhance motor recovery and prevent secondary complications.

Clinical practice guidelines suggest that early surgery within 24 hours of injury, when feasible results in better outcomes. Ultra early surgery (less than 12 hours) is under investigation considering the balance between potential benefits, cost -effectiveness and feasibility.

Regarding the hemodynamic management of acute SCI, reduced mean arterial pressure (MAP) affects the spinal cord decreasing spinal perfusion and worsening secondary injury. According to several authors the effect of augmenting MAP on neurological recovery is uncertain since the treatment with vasopressors is associated with increased rates of myocardial injuries, arrhythmias and other adverse effects. It might be considered reasonable

to monitor and keep aggressively a MAP between 75 to 95 mmHg in a healthy young patient and to avoid vasopressors for a frail elderly patient with preexisting cardiac problems.
Regarding pharmacological treatment, several studies have been conducted to validate any potential neuroprotective role. There is insufficient evidence supporting the use of methylprednisolone or any other drug in the treatment of spinal cord injury.
Future studies will focus on guidelines, global standards and further establishment of connections between clinical and basic science teams to promote innovation.
Keywords: Spinal Cord Injuries, Surgery, Management, Guidelines

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THE USE OF THE INTERNATIONAL CLASSIFICATION OF FUNCTIONING, DISABILITY & HEALTH (ICF) FRAMEWORK IN THE CLINICAL EVALUATION OF THERAPEUTIC INTERVENTIONS FOR THE TREATMENT OF SPASTICITY

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Spasticity is defined as 'a disorder of sensory-motor control resulting from an upper motor neuron lesion, presenting as intermittent or sustained involuntary activation of muscles'. The management of spasticity is complex and requires the interdisciplinary Rehabilitation team working together with the patient and family/ carer. Given the wide diversity of harmful consequences of spasticity, the goals for treatment may be various, regarding not only the reduction of unwanted muscle overactivity, but the change at functional level as well. The World Health Organization's International Classification of Functioning, Disability and Health (ICF) is a useful framework to describe and evaluate the impact of therapeutic interventions for spasticity on (i) the body functions, (b) the capability to perform activities and (c) participation in society (WHO 2001). According to patient-centered approach of ICF model, it is essential before starting treatment to clearly recognize and define individualized priority goals of each patient that should be SMART (specific, measurable, achievable, realistic, and timed) and then use standardised tools to assess to what extent those goals are achieved. Goal Attainment Scale-(GAS) and its modified version GAS- light are sensitive methods of evaluating outcomes by scoring the goals achievement in the course of intervention. In order to have a holistic view of the effectiveness of spasticity's management, it is highly recommended that those scales should be combined with other reliable and standardised measures that capture the progress in active/ passive function and benefit on quality-of-life issues. All data must be recorded both at baseline and at follow-up appointments.
Keywords: Spasticity Management, ICF Model, Goal Attainment Scale

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SPASTICITY OF CEREBRAL AND SPINAL ORIGIN: THE USE OF BOTULINUM TOXIN

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Spasticity is a sensorimotor control disorder resulting from an upper motor neuron (UMN) lesion, presenting as intermittent or sustained involuntary muscle activation. It is a common complication following various types of UMN disorders of either spinal or cerebral origin. Spasticity can cause progressive musculoskeletal problems if left untreated. The patient should be properly assessed before treatment is planned. Each patient is unique and treatment goals should be individualized. Treatment goals should be clearly identified and agreed with the team and the patient. In addition to relieving spastic muscle tone, improving quality of life, improving function and reducing secondary complications due to spasticity are also important. Effective treatment requires a multimodal and a multidisciplinary approach. Before considering more invasive measures, it is appropriate to start with more conservative treatment options. After evaluating and eliminating potential nociceptive sources, spasticity management options can be divided into 3 main groups;

non-pharmacologic measures, pharmacologic treatments; both oral medications and local treatments and surgical interventions. Local pharmacological treatments are used primarily in the management of spasticity affecting certain muscle groups and they include phenol, alcohol and botulinum toxin-A (BoNT-A) injections. Use of BoNT-A to relieve focal muscle spasticity of various aetiologies (both cerebral and spinal) found effective. Its ease of administration, good side-effect profile and beneficial effects are the advantages of BoNT-A. Knowledge of the functional anatomy and action of muscles, and using proper injection technique, are the most important prerequisites for effective and safe toxin injection in focal spasticity.

Botulinum toxin was found to be effective in the management of focal spasticity after stroke as part of a comprehensive, multimodal treatment programme. Although the efficacy of BoNT-A in reducing post-stroke spasticity is supported by high quality evidence, there is ongoing debate about its role in functional recovery. In spinal cord injury (SCI), the distribution of spasticity tends to be more diffuse and focal treatments may be of less benefit than in other aetiologies of spasticity. BoNT-A injection may be useful in the treatment of spasticity secondary to SCI. If the number of spastic muscles affecting the patient's ability to perform activities of daily living, walking or transfers, is limited, we can use the BoNT-A. Although the spasticity may be generalised, BoNT-A can be used to achieve specific partial goals, such as relaxing the muscles involved in an abnormal posture that causes a pressure ulcer, or relaxing the hip adductors to allow urinary catheterisation. In conclusion, BoNT-A injections have an important place in the treatment of spasticity among all therapeutic options. Patient assessment, goal setting, identification of the muscles to be injected and use of an injection technique are essential for BoNT-A injections. However, BoNT-A treatment should be considered as an adjunct to a neurorehabilitation programme. A combination of treatments is required to achieve the most successful outcome for each individual.

Keywords: Spasticity, Botulinum toxin-A injections, Spinal cord injury, Post stroke spasticity

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MANAGEMENT OF SPASTICITY WITH BACLOFEN PUMP

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Generalized spasticity is frequently observed in children and adults with brain or spinal cord impairment, leading to impaired gross motor function (ambulation/transfer/seating), daily life activities and daily rest or sleep. It regularly leads to pain, discomfort and is a potential source of secondary complications, such as pressure ulcers, malnutrition and muscle contractures. Further, it interferes with rehabilitation interventions and impedes the patients' progress.

Pharmacotherapy for spasticity has been confined to medications that either limit peripheral cholinergic activity at the neuromuscular junction (botulinum toxin), inhibit the release of calcium from the sarcoplasmic reticulum (dantrolene sodium) or modulate central nervous system activity (baclofen, diazepam). Among the latter, baclofen as a muscle relaxant is a first line of treatment for spasticity. Due to its structural similarity to the neurotransmitter GABA, it acts as a potent agonist via GABA-B receptors at the posterior horns of spinal cord level to inhibit the release of excitatory neurotransmitters by inhibiting Ca influx into presynaptic terminals.

When considering pharmacological measures many factors influence the choice of treatment of disabling spasticity; often spasticity distribution is highlighted as one of the most important features. Patients considered for ITB tend to have predominantly lower limb spasticity however, ITB is known to have some impact in the upper limbs and trunk (often considered to be approximately one-third of the effect in lower limbs), particularly at higher doses and perhaps depending on the placement of the tip of the catheter. Severe generalized spasticity is rarely successfully controlled by oral baclofen or other antispastic drugs only. Intrathecal baclofen (ITB) delivery via implantable pump bypasses several limitations of oral baclofen. Patients with generalized disabling spasticity, refractory to oral drugs, such as those with spinal cord diseases and injuries, multiple sclerosis, traumatic and hypoxic brain injury, stroke, cerebral palsy and hereditary spastic paraparesis, are the best candidates for ITB therapy. Patients are selected through rigorous clinical criteria and a preimplant trial with ITB. After the surgical implantation of ITB system, regular pump reservoir refill service is needed. Due to battery depletion, the pump must be surgically replaced approximately every 7 years. Complications regarding treatment with intrathecal baclofen represents an overdose or withdrawal of the drug and peri/post operative infections. Mistakes in programming or use of wrong solution concentration are major factors for overdose or withdrawal of the drug. However, procedure- and device-related complications

influence ITB system utility, with complication rates ranging from 0 to 2.24 per implant. Catheter malfunctions are most frequent, with a significantly higher incidence in a follow-up period longer than 18 months. The silicone catheter type, used until 2013, was found to be a significant risk factor for complications. Further, the impact of a daily baclofen dose on catheter complications is still discussed in the literature, since reports are contradictory.

Keywords: Spasticity, Spastic Movement Disorder, Baclofen Pump, Intrathecal Baclofen

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NEUROANATOMY AND NEUROPATHOLOGY OF THE LOWER URINARY TRACT

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The lower urinary tract (LUT), that consists of the bladder, the urethra and the prostate in men, is responsible for the storage of urine at low intravesical pressure, without leakage and periodic voluntary and complete emptying of bladder. The switch on/ off like pattern of LUT activity is controlled by peripheral autonomic and somatic nerves, which are regulated by centers in: i) the brain (medial prefrontal cortex), ii) the pontine [the pontine micturition center (PMC)/ Barrington nucleus and the pontine storage center (PSC)] and iii) the sacral spinal cord (S_2-S_4). During the storage phase of the urine in bladder, the urothelium is stretched, and sensory input is transmitted through the pelvic, hypogastric and pudendal nerves to the periaqueductal gray region in the midbrain. Then, via thalamus, insular cortex and anterior cingulate gyrus, activated prefrontal cortex edits the information of bladder filling and conscious (voiding or continuing storage) decisions are made through regulating micturition reflexes. Sympathetic (T_{10}-L_2) and somatic (S_2-S_4) nervous system are activated. Sympathetic efferent nerves (within the hypogastric nerve) modulate contractions of the urethral smooth muscle and bladder outlet and inhibit parasympathetic nervous system, causing relaxation of detrusor muscle. Somatic efferent nerves (within the pudendal nerve) are responsible for the modulation of striated (voluntary) contraction of the external urethral sphincter and the pelvic floor muscles in general. Once a urine volume threshold is reached and time/ place are appropriate to proceed to voiding, the PMC takes control and parasympathetic (S_2-S_4) is activated, whereas sympathetic and somatic nervous systems are inhibited. Parasympathetic efferent nerves (within the pelvic nerve) cause contraction of the detrusor muscle and relaxation of bladder outlet. Lesions in the involved peripheral or central nervous pathways due to neurologic diseases would disrupt coordination between bladder storage and emptying, causing LUT dysfunction.

Keywords: Lower Urinary Tract, Neural Control, Micturition Cycle

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EVALUATION OF NEUROGENIC BLADDER

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Lower urinary tract dysfunction (LUT) is a common sequel of neurological disease resulting in symptoms that significantly impacts quality of life and can lead to urological complications. The site of the neurological lesion and its nature influence the pattern of dysfunction. Early evaluation of neurogenic bladder serves to minimize renal damage A thorough history focusing on urological and neurological history and symptoms, is always the first step in evaluating a neurogenic bladder. Physical examination, combined with assessment of patient's overall health, mobility, cognitive ability, hand function (strength, coordination, and control), and social support network should also be performed. Bladder diaries provide a real-time objective patient-reported measure of LUT symptoms, while the pad test is a noninvasive, inexpensive tool to determine and quantify urinary

incontinence. Questionnaires focused on bladder-related QOL or symptoms are crucial for patient-centered care. The initial assessment should also include urinalysis, renal function tests (Crea/GFR), Renal and Bladder Ultrasound, Post Void Residual (PVR) measurement and Abdominal X-ray. Urodynamic investigation (UDS) (including Uroflowmetry and PVR, Filling cystometry, Pressure flow study and Electromyography) is crucial for defining the underlying pathophysiology, evaluating the pattern of LUT dysfunction and creating a framework for goal directed management and therefore considered a gold standard examination. However there are differences among the recommendations concerning the initial assessment. EAU (European Association of Urology) strongly suggests an urodynamic examination for all neuro-urological patients while AUA(American Urological Association) and NICE (National Institute of Clinical Excellence) recommend UDS for high and moderate risk patients after an initial stratification. Moreover, depending on the clinical indication and patients' characteristics more advanced tests should be performed (cysteoscopy, CT). In summary, the evaluation of LUTS is challenging but crucial to ensure quality of life for neurological patients.

Keywords: Diagnosis, Neurogenic Bladder, Lower Urinary Tract Dysfunction

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NEUROGENIC LOWER URINARY TRACT DYSFUNCTION (NLUTD) MANAGEMENT

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The treatment strategy for nLUTD is based on the individual pathophysiology of the dysfunction as it is documented by urodynamics. Understanding each patient's needs and dexterities is essential for offering realistic management options. The management of nLUTD contains two main goals: protection of the upper urinary tract and urinary continence.

Assisted bladder emptying by bladder expression or triggered voiding is not recommended as the LUT is exposed to a high-pressure condition putting the UUT in danger. Antimuscarinics are the first-line treatment for Neurogenic Detrusor Overactivity (NDO). Their action, in the filling phase, is not only limited to the inhibition of the detrusor contraction but also mediated to the inhibition of afferent stimuli (the sensory part), resulting in the inhibition or delay of the release of the reflexes of the detrusor contraction. Antimuscarinics increase bladder capacity, improve compliance and reduce the amplitude of detrusor contractions resulting in decreased intravesical pressure. A higher dose or drug combination may be needed for better clinical outcomes, increasing, on the other hand, the complication rate and severity. Beta 3 agonists, although they show promising signs of improving the symptoms of NLUTD, they did not have a proven urodynamic effect on capacity and detrusor pressure.

If conservative or minimally invasive treatment fails, surgical intervention, mainly by bladder augmentation, is an available and very efficient management option. Intermittent catheterization using an aseptic technique, is the standard option for bladder emptying when spontaneous voiding is impossible or unsafe for the UUT. Intradetrusor botulinum toxin injection is an effective minimally invasive treatment option for NDO. In some cases, the patient's comorbidities force less favorable solutions, such as continuous bladder drainage through indwelling catheters (suprapubic route is preferable) or incontinent stomas.

Keywords: Neurogenic Bladder, Urinary Dysfunction, Intermittent Catheterization, Incontinence

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USING ADVANCED TECHNOLOGY IN REHABILITATION

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The burst of technology the last decades and the need of developing new technics and methods in rehabilitation, led most of the rehabilitation centers in employing new therapeutic programs by using robotics, exoskeletons,

virtual reality devices, artificial intelligence, augmented reality and assistive technology. On the other hand, according the World Health Organization (WHO), globally more than 2.5 billion people use at least one assistive technology product, in order to enhance their selfcare and everyday living.

For example, individual physical or mental exercise is made easier and safer by the integration of AI, VR, AR and wearables. They provide patients with immersive environments that simulate real-world challenges, helping them regain motor skills and cognitive functions in a controlled yet dynamic setting. Robotics and exoskeletons enable individuals with physical disabilities to regain mobility, providing support during rehabilitation exercises and making progress more measurable. AI-powered systems also help in tailoring rehabilitation plans to individual needs, analyzing data from patient performance to adjust treatment protocols in real-time. Smart home technologies enable independence and enhance the patients' quality of life.

These technological innovations not only improve outcomes but also foster greater patient motivation and participation and encourage patients to stay engaged.

As we are moving towards a post-technology era, all these technological innovations trend not only to become mainstream but are also considered to be a must through protocols in scheduling rehabilitation programs in which they are normally adjusted.

ROBOTIC REHABILITATION: FROM THEORY TO PRACTICE

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People with weakness following stroke or Traumatic Brain Injury (TBI) benefit from repetitive, functional tasks as the principal rehabilitation approach to promote positive neuroplasticity. Robotic rehabilitation provides this intensive, repetitive, task-specific therapy, minimizing therapist effort and increasing patient safety. Furthermore, electronic and robotic devices, when combined with conventional physiotherapy, can be particularly beneficial during the first three months post-stroke, and for individuals unable to walk. In alignment with this evidence, the National Rehabilitation Center of Greece (EKA) employs advanced robotic rehabilitation systems and robotic suspension systems to deliver intensive neurorehabilitation from the early stages of treatment. Additionally, EKA develops combination therapies such as robotic therapy integrated with functional electrical stimulation (FES) or Virtual Reality Systems to enhance the efficacy of therapeutic protocols and improve patient adherence to therapy. Innovation is a cornerstone of EKA's approach. To further this mission, EKA has joint the INTEREHA Working Group under the European Platform for Rehabilitation (EPR). This collaboration facilitates the exchange of good practices in robotics, promotes innovation and enables the development of joint projects with other tech-based European rehabilitation centers.

Keywords: Robotic Rehabilitation, Task-Specific Training, Intensive Neurorehabilitation, Intereha Working Group, European Platform for Rehabilitation

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OSTEOSARCOPENIA IN THE ELDERLY

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The presentation on osteosarcopenia delineates the syndrome's intersection of osteoporosis and sarcopenia, emphasizing its frequency and effects on elderly people by elevating hazards such as falls and fractures. It highlights the diagnostic intricacy stemming from disparate definitions among different medical organizations, which impacts epidemiological monitoring and precise clinical identification of at-risk populations.

The discourse highlights the two aspects of bone-muscle interactions—mechanical, shaped by physical loads, and biochemical, governed by myokines and osteokines that oversee the health of both tissues. The intricate interaction underlies the syndrome's pathophysiology, which is further compounded by factors such as lipotoxicity resulting from fat buildup in tissues, impairing cellular function and worsening illness.

The diagnostic approach indicates that DXA scans are the definitive standard for assessing bone density and muscle mass, complemented by biochemical markers like vitamin D and parathyroid hormone levels to enhance patient evaluations.

The therapeutic approach promotes a comprehensive strategy that includes lifestyle modifications, nutritional improvements, and specific pharmacotherapy using drugs such as denosumab, which has distinct effects on bone and muscle health relative to conventional osteoporosis treatments.

Finally, the presentation introduces a holistic management framework termed "Osteosarcopenia School," which

amalgamates patient education, physical rehabilitation, and community assistance to enhance outcomes. This proactive paradigm aims to empower patients by enhancing their understanding and engagement in treatment procedures, with the objective of reducing the syndrome's prevalence and alleviating its impact through informed community and healthcare interventions.

Keywords: Osteosarcopenia, Bone, Muscle, Rehabilitation, Osteosarcopenia School

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OSTEOSARCOPENIA: THE IMPORTANCE OF NUTRITION

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Osteosarcopenia is a geriatric syndrome defined by the concominant loss of bone mineral density and muscle mass and/ or muscle function, which significantly lowers quality of life and increases mortality. The concominant presence of obesity magnifies the health consequences in osteosarcopenic obesity. The purpose of this review is to present the role of nutritional intervention in the management of osteosarcopenia. Many scientific data exist as to the favourable role of adequate protein intake with special focus on BCAA (especially leykine), vitamin D and calcium. Fewer yet promising data regarding the role of vitamin B12, folic acid and creatine point out a possible role of these nutrients in medical nutrition therapy of this syndrome. Optimal results appear in patients who receive supplements combining more than one nutrients with resistance exercise, which also appears to be an effective and safe approach. Additional randomized controlled studies and meta-analysis are necessary to fully elucidate the role of nutrients on the management of osteosarcopenia.

Keywords: Osteosarcopenia, Protein, Vitamin D, Calcium

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THE ROLE OF EXERCISE IN THE PREVENTION AND TREATMENT OF OSTEOSARCOPENIA

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Osteosarcopenia, describes the co-existence of osteoporosis and sarcopenia. Given the severe consequences of osteosarcopenia on general health status and quality of life in older adults, early prevention and rehabilitation interventions are required. Exercise has been recommended as a nonpharmacological therapeutic approach for osteosarcopenia. Prescribing exercise is needed to maintain or improve bone mineral density, maintain muscle strength and muscle quality, reduce adiposity, and improve balance. Recent studies have shown that a complete exercise programme including aerobic, strength, and balance exercises can have a positive effect on osteosarcopenia individuals. It is recommended that practitioners consider the individuals' chronic conditions and limitations, so that exercise could be altered according to the level of fitness and strength. Given that osteosarcopenia is a newly established syndrome, exercise interventions require further work is needed to advance knowledge on the synergistic effects of exercise training, in osteosarcopenic patients.

Keywords: Osteosarcopenia, Exercise, Resistance Exercise

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ASSESSING THE LEVEL OF FUNCTIONAL STATE AND FRAILTY OF THE OLDER PEOPLE: A MAJOR CHALLENGE OF MODERN MEDICAL PRACTICE

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In a worldwide aging population, knowledge of the functional ability (independency with activities of daily living) of the older people is important information as it is related with their quality of life and sense of wellbeing, caregiver needs and prognosis of their life expectancy. Frailty consists a clinical geriatric syndrome characterized by fatigue, unintentional body weight loss, muscle weakness, reduced physical activity and slow gait speed and is also related to functional disability, delirium, falls, need for long term care and death. Both functional ability and frailty assessment are critical because they are related to the costs of living and care (use of medical and social care services) at the community level, as well as at the hospital level and long-term care facilities. Frailty is considered to be the result of the accelerated decline of the Intrinsic Capacity (IC) through one's lifetime course that means a decline in physical, mental and psychological reservoirs. Based on the degree of frailty and functional ability of an older person, primary health care teams can design targeted interventions (such as diet and exercise) and individualize the management of one's chronic diseases such as screening for cancer, blood pressure and glycemic control. In October 2017, the World Health Organization (WHO) published Integrated care for older people (ICOPE): Guidelines on community-level interventions to manage declines in IC. Through these guidelines WHO suggests a life-course approach in order to increase our understanding of how frailty and its risk factors develop in earlier life stages and contribute to the development of public health strategies for frailty prevention. The lecture presents some of the most well-known scales for assessing functional ability and prediction of life expectancy, suggests some of the most famous tools for measuring frailty and introduces the WHO ICOPE screening tool.

Keywords: Functional Ability, Frailty, Intrinsic Capacity

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