Neuropathic pain in spinal cord injury

Associate Professor Nanna Finnerup

Danish Pain Research Center, Department of Clinical Medicine, Aarhus University, Aarhus, Denmark

Plenary 1: Guttmann Lecture: Neuropathic pain in spinal cord injury. Nanna Finnerup, Festsaal (Plenary), September 14, 2016, 8:10 AM - 8:55 AM

Individuals with spinal cord injury (SCI) often suffer from chronic pain. About 50% develop chronic neuropathic pain due to the lesion of the somatosensory pathways in the spinal cord or nerve roots. Neuropathic pain tends to persist despite treatments attempts and may have a major impact on the quality of life. This talk will discuss the prevalence, impact, and classification of SCI neuropathic pain and how subclassification of neuropathic pain based on different clinical phenotypes may offer an approach for a mechanism-based classification. The talk will briefly touch upon recent advances in the understanding of the underlying mechanisms and risk factors and discuss the evidence-based treatment for spinal cord injury pain.
A randomized controlled trial of auto-titrating continuous positive airway pressure treatment for obstructive sleep apnoea after acute quadriplegia (COSAQ).

Dr David Berlowitz1,2

1Institute for Breathing and Sleep, Austin Health, Melbourne, Australia, 2The COSAQ collaborative, Melbourne, Australia

Topical Papers 1, Forum (Parallel 3), September 14, 2016, 9:00 AM - 10:30 AM

Quadriplegia is a severe, catastrophic injury that acutely causes obstructive sleep apnoea alongside lifelong physical disability. Treatment with nasal continuous positive airway pressure (CPAP) is particularly challenging in this group. We hypothesised that 3 months of auto-titrating CPAP would improve neuropsychological function, sleepiness, quality of life, anxiety and depression more than usual care in acute quadriplegia.

Methods. 11 spinal cord injury centres across Australia, New Zealand, Canada and the UK screened 1628 people (July 2009-October 2015) who sustained a new, traumatic quadriplegia. 337 people met the inclusion criteria and underwent full, portable polysomnography. 265 had an apnoea hypopnoea index greater than 10, were classified as “OSA positive” and proceeded to a 3 night CPAP trial. 160 tolerated at least 4 hours of CPAP during run-in and were randomized.

Results. 149 participants (134 men, age 46+34, 81+57 days post-injury) completed the trial. Linear modelling revealed no differences in improvement in attention and information processing, as measured by the Paced Auditory Serial Addition Task, on intention-to-treat (p=.59; mean difference 2.6, 95% CI, -6.9 to 12.1) or per protocol for adherence (primary outcome) analyses. Intention-to-treat analyses revealed that CPAP significantly improved the secondary outcome of sleepiness (p=0.01, 1.17, 2.1 to 0.25).

Discussion: CPAP significantly improved sleepiness after acute quadriplegia but did not improve neurocognition beyond that seen with post-injury, spontaneous recovery.

Trial registration: Australian New Zealand Clinical Trial Registry ACTRN12605000799651
Early intensive hand rehabilitation is not more effective than usual care after SCI: “Hands On” - A Randomised Trial

Professor Mary Galea¹, Professor Lisa Harvey², Professor Sarah Dunlop³, Professor Leonid Churilov⁴

¹The University Of Melbourne, Parkville, Australia, ²The University of Sydney, Sydney, Australia, ³The University of Western Australia, Perth, Australia, ⁴Florey Institutes of Neurosciences and Mental Health, Parkville, Australia

Introduction: Loss of hand function is more debilitating than any other consequence of spinal cord injury. Intensive task-specific training with functional electrical stimulation (FES) has shown promising results but has not been examined within a high quality clinical trial. Here we examined efficacy of an intensive hand-training program in people with recently acquired tetraplegia.

Methods: Seventy people with recent tetraplegia (C2 to T1, AIS A-D) were recruited from 7 spinal units in Australia and New Zealand. Participants were randomly assigned to a control (n=33) or experimental intervention (n=37). Both received usual care and 15 minutes of one-to-one hand therapy three times per week without FES. Experimental participants received intensive training for one hand involving training with an instrumented exercise workstation in conjunction with FES for 1 hour/day, 5 days/week for 8 weeks. The primary outcome was the modified ARAT (m-ARAT) score at 8 weeks.

Results: Sixty-six participants completed the 8-week assessment and were included in the primary analysis. The mean (SD) m-ARAT score for experimental (n=35) and control participants (n=31) at 8 weeks was 36.5 (16.0) and 33.2 (17.5), respectively, with an adjusted mean between-group difference of 0.9 points (95% CI: -4.1 to 5.9, p=0.721).

Conclusion: Intensive hand training with FES does not improve hand function more than usual care plus one-to-one therapy in people with recently acquired tetraplegia.
FES activation by a sniff controller for effective synchronized cough in people with upper thoracic or cervical SCI

Professor Amiram Catz\textsuperscript{1,2}, Dr. Lior Haviv\textsuperscript{3}, Dr. Hagit Friedman\textsuperscript{4}, Mr. Uri Bierman\textsuperscript{1}, Dr. Itzhak Glass\textsuperscript{1}, Dr. Anton Plotkin\textsuperscript{1}, BSc. Aharon Weissbrod\textsuperscript{3}, Dr. Sagit Shushan\textsuperscript{3}, Dr. Vadim Bluvshtein\textsuperscript{1,2}, Dr. Elena Aidinoff\textsuperscript{1,2}, Professor Noam Sobel\textsuperscript{3}

\textsuperscript{1}Loewenstein Rehabilitation Hospital, Raanana, Israel, \textsuperscript{2}Tel-Aviv University, The Sackler faculty of Medicine, Tel-Aviv, Israel, \textsuperscript{3}Department of Neurobiology, Weizmann Institute of Science, Rehovot, Israel, \textsuperscript{4}Department of Nursing, Faculty of Health Sciences and Social Welfare, University of Haifa, Haifa, Israel

Topical Papers 1, Forum (Parallel 3), September 14, 2016, 9:00 AM - 10:30 AM

Introduction: Coughing may be impaired in individuals with upper thoracic or cervical spinal cord injury (SCI). Those with paralyzed hands often depend on a caregiver for coughing. Coughing can be assisted, in these persons, by functional electric stimulation (FES) applied to abdominal muscles, but the efficacy of FES depends on temporal synchronization with their cough. To achieve effective cough timing for these patients, we used a sniff controller to trigger FES. The present study sought to optimize the activation timing of the sniff-controlled FES, and to test efficacy of the resulting coughing.

Methods: We used computerized analysis of the nasal airflow trace and endoscopic video films of the glottis of 16 able-bodied subjects to optimize the triggering timing of the sniff controller. We tested the efficacy of coughing induced without assistance, with manual assistance of a caregiver, with caregiver activated FES, with button self-activated FES, and with sniff-controlled self-activated FES, by measuring peak expiratory flow (PEF) in 14 patients (2 females, ages 21-57) with C6-T4 SCI (11 AIS grade A, 2 grade B, 1 grade C).

Results: The optimal time-point for FES triggering was found to be 50 milliseconds after vocal-cord closure. PEF was 5.42±1.55 L/s without assistance. All assisted methods provided equally effective improvement, increasing PEF on average by 25 ± 27\% (F[4,52]=7.99, p=0.00004). There was no difference between methods of assistance (F[3,39]=0.41, p=0.75).

Conclusions: Sniff-controlled FES improved cough, and was the only method among those tested that allowed efficient coughing, independent of caregiver, in persons with paralyzed hands.
Prevalence of antibiotic associated diarrhoea in spinal cord injuries centres: a multicentre study.

Dr Samford Wong, Dr Pierra Santullo, Mr. Naveen Kumar, Mr Joy Chowdhury, Dr Ineta Zobina, Mr S Kolli, Dr Angel García-Forcada, Dr Fatima Paz, Dr Marta Recio, Dr Carlotte Kiekens, Dr Nathalie Draulans, Dr Jean O'Drisco, Dt Ali Jamous, Mr Mofid Saif

National Spinal Injury Centre, Aylesbury, United Kingdom, School of Health Sciences, City University London, London, United Kingdom, Institute of Liver and Digestive Health, University College London, London, United Kingdom, Midland Centre for Spinal Injuries, The Robert Jones and Agnes Hunt Orthopaedic Hospital, Oswestry, United Kingdom, Welsh Spinal Cord Injuries Rehabilitation Centre, Rookwood Hospital, Wales, United Kingdom, Hospital Nacional de Parapléjicos, Toledo, Spain, University Hospitals Leuven, Belgium, Department of Microbiology, Stoke Mandeville Hospital, Aylesbury, United Kingdom, Royal Buckinghamshire Hospital, Aylesbury, United Kingdom

Introduction: Little is known about the use of antibiotics and the extent of antibiotic associated diarrhoea (AAD) in spinal cord injuries (SCI) patients. The study aim was to (1) record the use of antibiotics; (2) establish the prevalence of AAD and; (3) assess if any seasonal variation on antibiotic use and incidence of AAD.

Methods: A retrospective study was conducted in five European SCI centres during October 2014 to June 2015. We define AAD as 2 or more watery stools type 5, 6 or 7 (Bristol stool scale) over 24 hours.

Results: One-thousand-two-hundred-and-forty-four adults (median age: 53 years, 29.7% female) with SCI (52.1% tetraplegia; 41.9% complete SCI) were included. Of 231 (18.6%) patients on antibiotics, the top three indications for antibiotics were urinary-tract infections, pressure ulcers / wound infection and osteomyelitis. Thirty-two of 231 (13.8%) developed AAD.

No statistical difference was observed on number of antibiotics, severity of SCI, use of proton-pump-inhibitor and H2-blocker and use of laxatives in both groups. AAD was more common in the summer season when compared to spring, autumn and winter. (25%, 3.7%, 6.9%, 17.6%, p=0.04). AAD was associated with older adults (p<0.01); tetraplegia (p<0.01); hypoalbuminaemia (p=0.02) and elevated body-mass-index (p=0.02). Urinary-tract-infection was more common during autumn season. (p<0.01)

Conclusion: This multi-centre study found AAD is common in SCI patients and maybe a risk factor for poorer outcome and increased hospital cost. Further study testing whether probiotic can reduce incidence of AAD is warranted, especially during summer season.
Carbohydrate Signaling Pathways after Exercise in Persons with Chronic Spinal Cord Injury

Dr Ashraf Gorgey1,2, Dr Zachary Graham3, Dr William Bauman3, Dr Christopher Cardozo3, Dr. David Gater4
1Hunter Holmes McGuire VA Medical Center, Richmond, United States, 2Virginia Commonwealth University, Richmond, USA, 3National Center for the Medical Consequences of Spinal Cord Injury; James J. Peters VA Medical Center, Bronx, USA, 4Department of Physical Medicine and Rehabilitation, Penn State Milton S. Hershey Medical Center, Hershey, USA

Introduction: The study determined the effects of two forms of exercise training on signaling pathways (GLUT-4, AMPK and PGC-1) of the triceps and Vastus lateralis (VL) muscles in men with chronic motor-complete SCI.

Methods: Nine men with chronic motor-complete SCI participated in two exercise interventions [functional electrical stimulation cycling (FES; n=4) and arm cycling ergometer (ACE; n=5)] 5 days/week for 16 weeks. Whole body soft tissue composition was measured by dual energy x-ray absorptiometry. An intravenous glucose tolerance test was performed in each participant after a 10-12 hour overnight fast to measure glucose effectiveness and insulin sensitivity. Muscle biopsies of the right VL and triceps muscles were collected one week prior to and post the exercise training intervention.

Results: Training interventions failed to result in significant changes in soft tissue body composition or carbohydrate metabolism. GLUT-4 protein expression [increased by 381% in the VL (P =0.14) after FES training and increased 61% in the triceps (P =0.08) after ACE training]. PGC-1α protein expression increased 230% in the VL (P =0.068) after FES training and 379% in the triceps (P =0.14) after ACE training. AMPK protein expression increased 347% (P =0.14) in the VL after FES training and 347% in the triceps after ACE training (P =0.14).

Conclusion:
FES-LEC training resulted in similar protein expressions in the VL muscle compared to the triceps by effectively influencing three distinct carbohydrate signaling pathways. The findings highlight that vital signaling pathways for carbohydrate metabolism are still intact in the paralyzed muscles years after SCI.
The role of peer support in the rehabilitation process and beyond: a comparison of different approaches to peer support

Mrs Claire Guy¹, Miss Lucy Robinson¹
¹NSIC, Stoke Mandeville Hospital, Aylesbury, United Kingdom

Workshop 1: The role of peer support in the rehabilitation process and beyond: a comparison of different approaches to peer support. Lucy Robinson, Festsaal (Plenary), September 14, 2016, 9:00 AM - 10:30 AM

Following the very successful workshop in Maastricht 2014 with Manfred-Sauer-Foundation, Germany, Dwarslaesie Organisatie Nederland and Back Up, United Kingdom entitled Improving quality of life for people with spinal cord injury and their families: a comparison of different approaches to peer mentoring. The three organisations continued to stay in touch and met up at Manfred-Sauer-Foundation, Germany and then a new mentoring programme has since been set up at Dwarslaesie Organisatie following Back Up’s model of mentoring.

This workshop will summarise and compare four peer support case studies from four international organisations who provide peer support for people with spinal cord injury (SCI). Peer support is widely recognised as an important part of rehabilitation for people with SCI. This session will compare the different approaches to peer support and explore how collaboration can inspire improvements in service delivery and outcomes for people with SCI.

Each of these four presentations (15 minutes each) will bear particular reference to how these organisations provide peer support; how they tailor support to the needs of persons with SCI; finally, how these organisations evaluate the impact of these services provided.

A 30 minute structured panel discussion will follow about the ideas presented and the power of collaboration following the last workshop in Maastricht 2014.

The audience will be encouraged to ask questions and engage in the issues discussed. The ideas and discussions elicited during the workshop will inform and inspire the future projects and activities.

Format:

Presentation: Patient support at NSIC, Stoke Mandeville, UK.
Presenter: Lucy Robinson, NSIC

Presentation: Including high level injuries (C1-4) in Peer led activities
Presenter: Will Clark

Presentation: Information-management in the rehabilitation process of SCI
Presenter: Philipp Nieke, Verband der Querschnittgelähmten Österreichs.

Presentation: Peer mentor RCT and integration into SCI rehabilitation culture, Shepherd Center, USA
Presenter: Julie Gassaway, Shepherd Center, USA

Panel members: Jos Dekkers, Dwarslaesie Organisatie Nederland
Lucy Robinson, NSIC
Philipp Nieke, Verband der Querschnittgelähmten Österreichs
Robert Wynn, Spinal Cord Injury Association of Australia
EMSCI network: update and future directions

Prof. Armin Curt¹, Dr. Rüdiger Rupp², Prof. John Steeves³, Dr. Giorgio Scivoletto⁴, Dr. Doris Maier⁵, Prof. Norbert Weidner²

¹University Hospital Balgrist, Zurich, Switzerland, ²UniversitätsKlinikum Heidelberg, Heidelberg, Germany, ³University of British Columbia and Vancouver, Vancouver, Canada, ⁴Fondazione Santa Lucia, Rome, Italy, ⁵Berufsgenossenschaftliche Unfallklinik Murnau, Murnau, Germany

Workshop 2: EMSCI network: update and future directions. Armin Curt, Geheime Ratstube (Parallel 1), September 14, 2016, 9:00 AM - 10:30 AM

The European Multicentre Study in Spinal Cord Injury (EMSCI.org) was founded in 2001 with the overall aim of understanding recovery profiles in patients suffering from acute spinal cord injury. Improved understanding of recovery profiles was made possible through prospective collection of neurological and functional outcomes data over 1 year post-injury from over 3000 patients. This data has been highly informative for the development of novel trial designs, evaluating new outcome measures (GRASSP, Spinal Cord Ability Ruler) and protocol development in several clinical and interventional studies. The critical discussion ahead of us needs to shift from outcome assessments to translation of interventions to augment the natural recovery of function after spinal cord injury.

Learning objectives:
Invited EMSCI speakers will focus on:
• insights in the developments of EMSCI tools
• discussion of novel research findings and novel clinical trials
• strategies to standardize rehabilitation interventions

The overall emphasis of the workshop is to 1) provide clinicians and researchers in SCI information about recent perspectives of the EMSCI network and, 2) facilitate interactions with the EMSCI network to stimulate clinical and research interactions on a broader international level.
Prevention Committee Workshop on “Work related spinal injuries: The changing and challenging profile”

Dr Bonsan Bonne Lee², Dr Douglas J Brown³, Mr Eric Weerts⁴, Dr H Herndon Murray⁶, Dr Harvinder Chhabra⁴, Dr Fin Biering-Sørensen⁵, Mr Julian Chamberlayne⁷, Dr Michael Fitzharris⁸, Dr Shiv Lal Yadav⁹, Dr Sergio Aito¹⁰, Dr Yannis Dionyssiotis¹¹, Dr William H. Donovan¹²

¹ Indian Spinal Injuries Centre, New Delhi, India, ² Prince of Wales Hospital, Sydney, Australia, ³ The Spinal Research Institute, Sydney, Australia, ⁴ Handicap International, Gewijde, Boomstraat, B-1050, Belgium, ⁵ University of Copenhagen, Denmark, ⁶ Shepherd Center, Atlanta, USA, ⁷ STEWARTS LAW LLP, England, ⁸ Monash Injury Research Institute, Melbourne, Australia, ⁹ All India Institute of Medical Sciences, New Delhi, India, ¹⁰ Careggi University Hospital, Florence, Italy, ¹¹ European Interbalkan Medical Center, Athens, Greece, ¹² Past President ASIA & ISCoS, USA

Workshop 3: Prevention Committee Workshop on “Work related spinal injuries: The changing and challenging profile”. Harvinder Chhabra, Rittersaal (Parallel 2), September 14, 2016, 9:00 AM - 10:30 AM

Work related injuries account for 12–18% of the causes of TSCI. Nevertheless, not much has been documented regarding its epidemiology and prevention. Interesting epidemiological aspects of these injuries include high incidence in males (some studies suggest up to 95%) and majority representation from age group of 25-34 years, with fall reported as the major cause. Since there is no cure for SCI, it is important that primary prevention should receive greater emphasis. The scarcity of data regarding work related SCI in the literature reflects the low level of interest in primary prevention versus rehabilitation.

Factors predisposing to SCI differ amongst various industries. Hence, prevention strategies should be industry specific. The workshop will help audience identify prevention strategies specific to various industries including construction, mining, service delivery and agriculture. Prevention of work related injuries is expected to be a challenge in emerging and developed countries. A panel discussion on the topic shall be held as part of the workshop. The discussion during the panel discussion would identify the differences in approach amongst developed and emerging countries and could identify strategies used in developed countries which could be replicated in emerging countries. The audience will be encouraged to participate in panel discussion.

Topic and Speakers:
0900-0906 Introduction and Epidemiology: Work related injuries. Dr H S Chhabra
0906-0912 Prevention Strategies against accidents in construction industry: a developed country scenario. Dr Yannis Dionyssiotis
0912-0918 Prevention Strategies against accidents in construction industry: a emerging country scenario. Mr. Eric Weerts
0918-0924 Prevention Strategies against accidents in mining industry. Dr Bonne Lee
0924-0930 Prevention Strategies against accidents in work related to lifting and carrying heavy objects eg warehouse. Dr Yannis Dionyssiotis
0930-0936 Prevention Strategies against accidents in agriculture industry. Dr Michael Fitzharris
0936-0942 Prevention Strategies against accidents in emerging countries: Special scenarios eg fall from electricity poles. Dr S L Yadav
0942-0954 The legal profession and the medical profession working together to improve work related safety
0942-0948 Medical viewpoint. Dr Herndon Murray
0948-0954 Legal viewpoint. Mr. Julian Chamberlayne
0954-1000 Discussion
1000-1030 Panel Discussion: The changing and challenging profile of Work related spinal injuries: Developed and emerging countries scenario  Moderator: Dr H S Chhabra
Panelists :All speakers
Measuring Physical Functioning with the SCI-FI: Cutting Edge Research findings for clinical and multicultural applications.

Professor David S Tulsky1,2, Dr. Amanda Botticello3,7, Professor Allen Heinemann3,4, Dr. Sherri LaVela5, Dr. Mary Slavin6

1University Of Delaware, Newark, United States, 2Kessler Foundation, West Orange, USA, 3Feinberg School of Medicine, Northwestern University, Chicago, USA, 4Rehabilitation Institute of Chicago, Chicago, USA, 5Edward Hines Jr. VA Hospital, Hines, USA, 6Boston University, Boston, USA, 7Rutgers New Jersey Medical School, Newark, USA

Workshop 4: Measuring Physical Functioning with the SCI-FI: Cutting Edge Research findings for clinical and multicultural applications. David Tulsky, Prinz Eugen Saal (Parallel 4), September 14, 2016, 9:00 AM - 10:30 AM

SCI-FI contains patient-reported instruments measuring mobility (basic mobility, wheelchair, and ambulation) and self-care (self-care and fine motor functioning). Since the initial publications of the SCI-FI (2012) and assistive-technology instruments (SCI-FI/AT; 2016), investigators of several studies have validated and utilized the instruments in research and clinical practice. This workshop will include four presentations describing the research and the potential of the SCI-FI to track patients’ improvement over time, the use of SCI-FI to measure physical-functioning in diverse populations (e.g., military cohort, Spanish-speaking individuals), and the effects of the built environment on physical-functioning.

Presentations:

1. Tulsky, Charlifue, Heinemann, Kalpakjian, Tate, Fyffe, & Tulsky - Trajectories of improvement of physical-functioning following SCI – 17”.
2. Botticello, Charlifue, Heinemann, Kalpakjian, Rohrbach, & Tulsky – Effects of Built Environment on physical-functioning – 17”
3. Heinemann, Hill, Etingen, & LaVela - Self-Efficacy in Individuals with SCI/D with high versus low perceptions of mobility and fine-motor function – 17”
4. Slavin, Comins, Ycute-Castro - Adapting the SCI-FI scales to Spanish language and culture – 17”
5. Discussion with Audience – 20”

David Tulsky will describe the trajectories of change of physical-functioning. Individuals were assessed within 4 months of injury and retested 2 weeks, 3, 6, 12, and 24 months post baseline interview. Amanda Botticello will report findings of built environment influences on physical-functioning by linking geodata with SCI-FI. Allen Heinemann will present on data from a Veteran sample which shows that individuals with SCI who have high basic mobility and perceptions of self-care (versus low) reported higher perceptions of self-efficacy. Finally, Mary Slavin will report efforts to use a dual translation panel methodology and multi-step process to develop SCI-FI products for use in Spanish-speaking countries. There will be a 20" discussion following presentations.

Learning Objectives:

1. To explain how SCI-FI can track patients’ improvement in physical functioning over time.
2. To learn new ways to measure the environment to understand the contextual influences on health and functioning for persons with disabilities.
3. To describe relationships between patient-reported mobility and self-care with self-efficacy.
4. To describe the impact of conceptual, semantic and cultural differences when translating measures.
Lesional biomarker and reaction biomarkers in acute traumatic spinal cord injury

Dr Stefan Mircea Iencean¹, Dr Andrei Stefan Iencean²

¹GrT Popa University of Medicine and Pharmacy Iasi, Iasi, Romania, ²Neurosurgery Department, “Prof N Oblu” Emergency Clinical Hospital, Iasi, Romania

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Traumatic cervical spinal cord injury is one of the most devastating traumas for an individual because it leads to tetraplegia. The phosphorylated form of the high-molecular-weight neurofilament subunit NF-H (pNF-H) in cerebro-spinal fluid (CSF) is a specific biomarker for spinal cord lesion. The current study included 5 subjects with acute traumatic cervical spinal cord injury; the patients were classified according to the ASIA scale and all patients underwent surgery during the first 24 hours post injury (decompression, stabilization). We measured daily the heavy phosphorylated neurofilament subunit (pNF-H) concentration by sandwich ELISA test in CSF in all patients and we compared the values of pNF-H with the patients’ clinical evolution.

The evolution of daily values of the levels of CSF pNF-H showed three patterns of this biomarker in the cervical spinal cord compression. The mechanical injuries directly cause axonal destruction in fiber tracts, destruction of the neurons and of the glial cells, and their destruction releases substances whose presence, quantity and dynamics can be lesional biomarkers, such as pNF-H. The reactions of partially injured cells start simultaneously and the substances that are produced and their quantity may be reaction biomarkers. The lesional biomarkers appear immediately post-injury and after several hours there are both lesional biomarkers and reaction biomarkers.

This study shows pNF-H is a predictive lesional biomarker in spinal cord injury because its values pattern can show the reduction or stoppage of the secondary lesion with a favorable result.
Medical complications in Acute Spinal Cord Injured undergoing Rehabilitation at Yorkshire Regional Spinal Injuries Centre

Dr Siddeshwar Patil¹², Mr Wajid Raza¹, Mr Firas Jamil¹
¹Yorkshire Regional Spinal Injuries Centre, Wakefield, United Kingdom, ²University of Leeds, Leeds, United Kingdom

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

INTRODUCTION:
As healthcare professionals caring for individuals with spinal cord injury (SCI) know too well that medical complications can occur and will interfere with treatment programs and therapy. As a result can impact outcomes, length of stay and early transfer of SCI patient.

We aimed to review morbidity load/secondary medical complications in acute SCI patients undergoing rehabilitation.

METHODS

RESULTS
110 acute SCI admissions. Nearly 34% (n=37) had symptomatic UTI requiring antibiotic therapy. Majority of these were Escherichia Coli species and minimal few grew Proteus and Klebsiella.

10%(n=11) diagnosed with pressure sores, 7 of these admitted with and 2 developed category I and 2 developed Category II and III.

2.7% (n=3) were diagnosed with C.Diff, one developed within 24 hours; 2 were known carriers. 8% (n=8) were diagnosed with LRTI including pneumonia. 5 patients with dysreflexia.

One each of DVT, TIA, PE, Respiratory deterioration, Gi haemorrhage and Heterotopic ossification were documented.

CONCLUSION
The incidence of DVT/PE is minimal; could be due to awareness and prophylaxis. UTI is commonest; no renal complications documented; could be due to no radiological investigation being organised.

These findings indicate and we can speculate that as a result of impetus on early transfer to SCI centre, the rate of complications normally occurring in acute care setting may increasingly be encountered whilst on the SCI centres.

Education, anticipation, close monitoring and early intervention can minimise limitations to recovery or functional outcome.
MRI characteristics of occult flexion-distraction injury of the cervical spine

MD Takeshi Maeda¹, MD Eiji Mori¹, MD Itaru Yugue¹, MD Osamu Kawano¹, MD Tsuneaki Takao¹, MD Hiroaki Sakai¹, MD Muneaki Masuda¹, MD Keiichiro Shiba¹
¹Spinal Injuries Center, Iizuka, Japan

Introduction
Early detection of occult flexion-distraction (FD) injury of the subaxial cervical spine is quite important to prevent persisting segmental instability. We conducted MRI analysis in patients with spontaneously reduced FD injury (FD group), and compared their findings with those of patients sustaining hyperextension SCI without fracture or dislocation (EX group).

Materials and Methods
There were 13 patients in FD group, and 37 age/sex matched patients in EX group. FD injury was confirmed by flexion-extension or delayed upright lateral radiographs in FD group. Otherwise, initial radiographs were similar to each other. All FD group patients were treated surgically, while all EX group patients were successfully treated conservatively, leaving no persisting instability.

Results
Disruption of ligamentum flavum was recognized in 5 of 13 patients in FD group, while no patients in EX group had this finding. The most characteristic findings in FD group were disc herniation (75%) and bone bruise of the vertebral body (83%), which were shown in 11%, and 10% of EX group patients respectively (p<0.0001). Conversely, 70% of EX group patients had prevertebral T2 high intensity area, while only 33% of FD group patients had this finding (p<0.05). Anterior longitudinal ligament (ALL) disruption was detected in 46% of patients in EX group, while only 1 of 13 patients in FD group had this finding (p<0.05).

Conclusions
Disruption of ligamentum flavum, disc herniation and vertebral bone bruise are key findings of MRI suggesting occult FD injury. ALL disruption with prevertebral hyperintensity lesion was highly indicative of cervical hyperextension injury.
Relevance of Adrenal Insufficiency and Large-Dose Glucocorticoid in Spinal Cord Injury

Dr Kyu Ho Lee¹, Dr Hyun Tak Song², Dr Kang Hee Cho¹, Dr Min soo Jeon¹, Dr Kyo Jun Youn¹, Mrs Mi Ok Youn, Dr Hyun Kyu Jeon¹

¹Chungnam National University, Daejeon, South Korea

Objective: To investigate the incidence of adrenal insufficiency (AI) in patients with spinal cord injury (SCI) treated with large dose glucocorticoids and relevance of adrenal insufficiency and large dose glucocorticoids in SCI.

Methods: The medical records of 228 patients who were admitted to the rehabilitation center after SCI from January 2014 to January 2016 were reviewed retrospectively. Twenty nine of 228 patients had persistent symptoms suspicious for adrenal insufficiency despite continuous care for more than 4 weeks. So adreno-corticotropic hormone (ACTH) stimulation tests were conducted in 29 patients.

Results: Twelve of 29 patients (41.4%) with SCI and 10 of 15 patients (66.7 %.) with SCI treated with large dose glucocorticoid after injuries were diagnosed to adrenal insufficiency. The average basal cortisol was 6.77μg/dL in group treated with large dose glucocorticoid versus 11.25μg/dL in non-glucocorticoid group (P<0.05). The presence of AI was positively correlated with large-dose glucocorticoids use (P = 0.008; Fisher’s exact test).

Conclusion: Among patients with SCI who manifested similar symptoms of adrenal insufficiency, high incidence of adrenal insufficiency was found especially in patient treated with large-dose glucocorticoid. This is first study investigating incidence of adrenal insufficiency in patient treated with large-dose glucocorticoid after SCI. If a patient in acute management of SCI has similar symptoms of adrenal insufficiency, clinicians should consider possibility of adrenal insufficiency especially when a patient had history of large dose glucocorticoid use. And early recognition and treatment of the underlying AI should be done.
Spared tissue bridges are predictive of outcome after acute traumatic cervical spinal cord injury

Eveline Huber1, Patrice Lachappelle1, PD Dr. med. Reto Sutter1, Prof. Dr. med. Armin Curt1, PD Dr. med. Patrick Freund1,2,3,4
1Spinal Cord Injury Center, University Hospital Balgrist, Zurich, Switzerland, 2Wellcome Trust Centre for Neuroimaging, UCL Institute of Neurology, London, United Kingdom, 3Department of Brain Repair and Rehabilitation, UCL Institute of Neurology, London, United Kingdom, 4Department of Neurophysics, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Background: In acute traumatic SCI, MRI following admission is of clinical value to characterize tissue damage and to determine the level and extent of injury, but limited for predicting outcome.

Objective: We aimed to use MRI to assess neuronal degeneration at the level of the lesion after acute spinal cord injury and its relationship with clinical outcome.

Methods: By repeat MRI at 1, 2, 6 and 12 months after injury we evaluated changes to lesion length, width and area and spared tissue bridges using 52 MRI scans of 13 tetraplegic patients. At each time point, patients were clinically assessed including the ISNCSCI protocol and GRASSP.

Results: Only 1/13 patients did not develop a post-traumatic cyst while in 9/13 and 3/13 patients the lesion area occupied either major or full axial cord areas. Lesion width significantly decreased over time (p=0.009). Spared tissue at one month predicted better 12 months outcome on motor, pin-prick and GRASSP score (p<0.05). Lesion length at one month predicted 12 months outcome on motor, pin-prick and light-touch score (p<0.05). Lesion area at one month predicted 12 month outcome on light-touch score (p<0.05).

Conclusion: Standard clinical MRI protocols at 4 weeks following SCI reliably capture anatomical changes at the lesion site that remain stable over time. Both spared tissue bridges and the extent of damage are predictive of outcome at 1 year follow-up and could serve as neuroimaging biomarkers to validate the efficacy of regenerative therapies in the acute and chronic phase of injury.
Spinal Cord Compression in Acute Traumatic Thoracolumbar Injury and Implications for Recovery

Ms Peta Skeers¹, Dr Camila Battistuzzo¹, Mrs Jacqui Agostinello¹, Dr Jillian Clark², Professor Brian Freeman², Dr Peter Batchelor¹

¹University of Melbourne, Parkville, Australia, ²Royal Adelaide Hospital, Adelaide, Australia

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Recent evidence suggests that urgent surgical decompression for spinal cord injured patients can lead to greater functional recovery. The extent of spinal cord compression in patients with a traumatic thoracolumbar spinal cord injury (TLSCI) has not previously been determined. This study aims to quantify maximum cord compression in TLSCI and to correlate this measure with functional recovery.

Methods: 43 patients with TLSCI (injury levels T1-L1 inclusive) admitted to either the Alfred or Austin Hospitals between January 2010-December 2014 and who underwent spinal surgery were reviewed. Maximum canal compromise and spinal cord compression were measured on pre-surgical mid-sagittal T2-weighted magnetic resonance (MR) and computed tomography (CT) images. The American Spinal Injury Association (ASIA) impairment scale (AIS) was used as the measure of functional recovery following surgery and rehabilitation, where this occurred. Cord compression was correlated to both the initial and final AIS grade (AIS A-D).

Results: The overall mean maximum spinal cord compression for these patients was 41%. We found a strong correlation between mean cord compression and functional recovery. Patients who recovered ≥2 grades presented with a significantly lower level of cord compression compared to patients who remained at the same grade (P<0.001). A significant correlation was observed between spinal cord compression and final AIS grade, with grade A and B patients exhibiting greater compression than grades C-D (P< 0.0001).

Conclusions: Traumatic TLSCI is generally accompanied by substantial cord compression. Patients with greater cord compression have less functional recovery, suggesting that urgent surgical decompression may lead to improved outcomes in this population.
The use of flexible nasendoscopy to aid clinical decision making in complex spinal cord injured patients with dysphagia

Miss Sarah Morgan, Miss Hannah Chalke

The London Spinal Cord Injury Centre, The Royal National Orthopaedic Hospital, London, United Kingdom

Introduction
Cervical spinal cord injury patients have a high risk of airway complications and 40% reported incidence of dysphagia. Instrumental assessment can help to better identify impairments, as clinical presentation is subtle. This study retrospectively reviewed SCI referrals to the speech and language therapy (SLT) service at a specialist spinal cord injury centre over two years. Flexible nasendoscopy (FNE) is routinely used to assess swallowing and upper-airway function, as part of the tracheostomy team.

Method
Patient case notes were reviewed for clinical decisions following FNE regarding swallowing and respiratory management. Data was collected on weaning times, route of nutrition, ICU discharge, therapeutic intervention and referral to other specialities.

Results
SLT received 33 referrals, 26 patients underwent FNE. Age range was 12-82 years, with 18 males and 8 females. Level and severity of injury was C1A to T4B with 54% of patients receiving respiratory support via mechanical ventilation and/or tracheostomy. Time of injury to admission ranged from 7 days to 14 months. FNE supported weaning in 60% of patients with 29% decannulated and facilitated ICU discharge in 64%. Swallow rehabilitation was commenced in 69% of patients, with 23% starting oral intake and avoided gastrostomy tube in 26%. Referrals were made to gastroenterology (15%) and ENT (8%).

Conclusion
This study supports the use of FNE to better inform patient management and improve outcomes. With appropriate follow-up interventions, weaning plans can be focussed alongside respiratory management and swallow rehabilitation. Potential cost savings are achieved in reduction of artificial nutrition, ICU transfer and decannulation.
Botulinum Toxin in treatment of neurogenic bladder, a case report

Miss Carolina Barbeiro

Centro Medicina Reabilitação Alcoitão, Parede, Portugal

Botulinum toxin, is currently approved by the FDA for neurogenic detrusor overactivity and overactive bladder refractory to drug therapy. Neurogenic bladder dysfunction due to spinal cord injury poses a significant threat to the well-being of patients. The majority of patients will require management to ensure low pressure reservoir function of the bladder, complete emptying, and dryness. Detrusor overactivity can cause urinary urgency, urinary frequency, and urgency incontinence. Anticholinergic drugs have been the mainstay of therapy. If drug therapy failed, the next option is more invasive procedures like indwelling catheter, suprapubic catheterization and cistotomy. Thus, botulinum toxin injection is an important advance in treatment options.


Began treatment with darifenacin and intermittent self-catheterizations 3/3h. By treatment failure, and maintenance of urinary loss with low emptying debits, Mirabegron was associated. Despite the medication instituted, patient kept the same urinary pattern and so if it was opted for intradetrusor injection of botulinum toxin. After this treatment, patient can continence 3/3h lossless, with indwelling catheter at night time, achieving emptying volumes of 150-200cc, progressing to continence 4/4h with volumes of 250cc.
Efficacy, Tolerability and Safety of Clean Intermittent Catheterization in Spinal Cord Injury patients

Dr Mohammad Jafar Atwi
Imam Sadr Foundation, Tyr, Lebanon

INTRODUCTION: CIC is still the best management in the majority of bladder dysfunction problems of SCI patients.
Objective: to report the efficacy, tolerability, safety of CIC as a management for neurologic bladder disorders of SCI patients.

Methods: the subjects are 37 SCI patients, of different SCI levels, followed up for at least 12 months in Derdghayya SCI Rehabilitation Center, medical history and symptoms are recorded using ISCOS datasets translated into Arabic. Then they undergo a cystometry interpreted according to the ISCOS datasets. CIC procedure was applied in 23 patients, achieving better preservation of renal function, reducing the risk of infection, diapers usage & thus improving the patients' quality of life in a cost effective way. Cystometry tests were repeated after 6 months for estimating improvement in the bladder pressures.

Results: 23 patients have been trained to use CIC in repeated sessions, patients were satisfied with CIC after quitting or reducing diaper usage, less need for hospitalization for UTI or renal failure, 7 patients stayed on indwelling catheter, & 7 patients refused CIC.

Conclusion: educating SCI patients to use CIC by qualified & trained nurses & peer consultant, with a reliable cystometry, helped in improving bladder function and reducing the morbidity & mortality in those patients.
Factors Affecting Bladder Deformation in Patients with Spinal Cord Injury

Dr Woo Hyuk Choi¹, Dr Myung Hoon Moon¹, Dr Soo-Yeon Kim¹, Dr Hyun-yoon Ko¹
¹Department Of Rehabilitation Medicine, Pusan National University School Of Medicine, Yangsan, South Korea

Objective: To identify factors that can affect bladder trabeculation in patients with SCI.

Methods: Eighty with more than 1 year since SCI were enrolled. All fluoroscopic images were classified into 4 groups of trabeculation according to severity. The clinical parameters as demographics, bladder management including voiding methods, medication history, and urologic data (urodynamic study, ultrasonography, VCUG).

Results: According to increasing trabeculation grade, the number of diverticula, vesicourethral reflux and hydronephrosis was increased. Grade 0 group showed significant short duration of injury and significantly lower proportion of motor completeness than grade 1 and 2 groups. There was no significant difference of in sex, age and cause of injury. Grade 3 group showed significant higher maximum detrusor pressure and significant lower bladder compliance. The proportion of low bladder compliance (<10 ml/cmH2O), high maximum detrusor pressure (≥40 cmH2O) and high leak point pressure (≥40 cmH2O) was significantly different between 4 groups. However, there was no significant difference in maximum cystometric volume and detrusor function in storage phase (normal or overactive) between the groups. Neither voiding method (CIC or non-CIC), nor antimuscarinic medication had significant influence on the degree of trabeculation.

Conclusions: The present study identifies that the degree of bladder trabeculation has positive correlation with the following factors: post-injury duration, motor completeness of the injury, low bladder compliance, high maximum detrusor pressure and high leak point pressure. We concluded that appropriate treatment for low bladder compliance and high maximum detrusor pressure is important to prevent bladder deformation in patients with SCI.
Immunosenescence in Persons with Spinal Cord Injuries from the Perspective of Urinary Tract Infections

Mr David Pavlicek¹, Dr. Jörg Krebs³, Prof. Dr. Britta Engelhardt², Prof. Dr. med. Jürgen Pannek³, Dr. Jivko Stoyanov¹
¹Biomedical Laboratories, Swiss Paraplegic Research, Nottwil, Switzerland, ²University Faculty of Medicine, University of Bern, Bern, Switzerland, ³Swiss Paraplegic Centre, Nottwil, Switzerland

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction:
Patients suffering a spinal cord injury (SCI) face a variety of SCI linked health issues including a decreased function of the immune system and chronic urinary tract infections (UTI). We are examining the decline in immune function of SCI patients and test the hypothesis of a premature immunosenescence manifestation. Moreover, we try to assess the role of chronic UTI in the alterations of the immune system after a SCI.

Methods:
A cross sectional study was designed including 168 volunteers, where half of the participants are persons with an SCI that affects normal bladder function and the other half are non SCI persons, serving as a control. Blood and urine samples are analysed for Urine IgA-, plasma IgG- and the concentration of 8 plasma cytokines which are related to ageing and inflammation. Further, we will assess with an in-vitro stimulation assay the ratio of T cells which are specifically reacting against UTI-bacteria. Using flow cytometry we will identify four different T cell memory subtypes whose relative proportion mirrors the immunological age. The proliferative capacity and telomere length analysis of CD4 and CD8 positive lymphocytes will be another parameter for the age of the immune system.

Results
By the time of the abstract submission we collected samples from 147 participants. We expect first results end of July 2016.

Conclusion
The comparison of the assessed parameters between young SCI, young able bodied, old SCI and old able bodied individuals should contribute to the understanding of decreased immune function after an SCI.
incidence and morbidity of spinal cord patient-reported symptomatic urinary tract infections after urodynamics: a single centre prospective study

Dr Lorenza Landi\textsuperscript{1}, Dr Sara Tedeschi\textsuperscript{1}, Dr Aldi Karemani\textsuperscript{1}, Dr Enrica Bonatti\textsuperscript{1}, Dr Ilaria Baroncini\textsuperscript{1}, Dr Stefania Musco\textsuperscript{1}, Prof Gabriele Bazzocchi\textsuperscript{1}

\textsuperscript{1}Montecatone Rehabilitation Institute, Imola, Italy

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction
The aim of our study was to assess the incidence of patient-reported symptomatic UTI and identify risk factors for the development of UTI symptoms after UDS in a single centre cohort of SCL subjects.

Methods
All consecutive SCL individuals who underwent a UDS or video-UDS from November 2014 to January 2015, were enrolled. None were on antibiotic prophylaxis.

Results
95/138 SCL patients were included. 37 of them were hospitalized and 58 were outpatients. Trauma injury was the most frequent cause of SCL (72%); 56.8% of patients were classified as AIS A or B. Neurogenic detrusor overactivity (NDO), with or without reduced compliance, and detrusor acontractility/underactivity were identified in 60/95 and 35/95, respectively.

UTI was reported by 8/95 patients, with an overall incidence of 8.4%. Patients who reported symptomatic UTI, were statistically significant of older age (mean age 55 ± 15 versus 45 ± 16 years; p=0.07), more frequently hospitalized (5.5% versus 1.8%; p=0.059) and often showed a NDO at UDS (6.4 % versus 0.9%; p=0.05).

No correlation was found between type of exam (UDS or video-UDS), presence of indwelling urinary catheter, previous reported symptomatic UTI over the last 3 months, kidney stones, hydronephrosis and the new onset of signs and symptoms as defined for symptomatic UTI after UDS.

Conclusions
Our results can help to identify subgroups of patients with higher risk of infectious complications. Further and larger studies are needed to investigate prognostic factors and identify the appropriate preventive measures for symptomatic and/or complicated UTIs in neurogenic bladder.
Incontinence due to bladder spasticity – the patient’s experience

PD. Dr. Rainer Abel1, Dr. Ronen Elishar1, Dr Dagmar Walluf-Blume2, Roger Busche3

1Klinikum Bayreuth, Bayreuth, Germany, 2SocraTec R&D, Oberursel, Germany, 3Oxyden GmbH, Hamburg, Germany

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Treatment options for hyperreflexive disorders of bladder function include oral anticholinergic medication, intravesical oxybutynin application and botulinum toxin injection into the detrusor muscle. This study aims to rate the result of treatment out of a patient’s perspective.

A questionnaire using simplified questions spanning age, sex, type of underlying neurologic disease, type of treatment and the resulting experience concerning continence, frequency of catheterisation, adverse effects and recorded urinary tract infections was mailed to 1000 patients.

303 questionnaires were returned and 287 could be included (110 paraplegic, 48 tetraplegic SCI patients and 43 spina bifida patients). Treatment regimen groups were formed: oral medication alone (24), intravesical oxybutynin alone (101), a combination hereof (50) and intravesical botulinum toxin injections (12).

Patients with intravesical oxybutynin application and botulinum toxin injections reported the least frequency of involuntary discharge of urine (57/58% vs 67/74%) and needed the least number of incontinence pads (2/3 vs 3/4). The lowest frequency of self-reported incidents of urinary tract infection was seen with intravesical oxybutynin administration (51% vs 63 -70%).

Adverse effects were most frequent and severe with the combination of oral and intravesical medication or oral medication alone (74%/71%) followed by intravesical medication alone (60%).

The results of this patient’s self-report agree well with the literature. In the patient’s view, intravesical application of oxybutynin and botulinum toxin injections give the best results for the incontinence treatment of a spastic bladder. Oral medication is less effective. A combination of oral medication and botulinum injections is not a desirable choice.
Loss of suprapubic-catheter (SPC) track in spinal cord injury patients (SCI): eighteen years of experience

Dr Piera Santullo1, Mr Fadel Derry1
1National Spinal Cord Injury Centre Stoke Mandevile, Aylesbury, United Kingdom

Introduction:
SPC insertions for a subset of SCI patients is inevitable. Catheter displaced that requires theatre is a frequent complication. The purpose of this study was reviewing 18 years’ practice of SPC insertions and see if the rate of SPC reinsertion is related to either demographical factors and SCI level.

Methods:
Retrospective study of SCI patients that had supra pubic catheter insertion between 1998 and 2016 was conducted at the NSIC. Data collected by spinal consultant during eighteen years of experience.
731 procedures for 665 patients were reviewed. 29 patients had cervical level, 18 patients at thoracic level, 1 patient at lumbar level, for 11 patients was not possible finding the level.
For statistical analysis Minitab 14 and Stat-Xact 4

Results: 450 males (68%) and 215 females (32%). The average age was 52. 59 patients (8% of the total), 39 males (66%) and 20 females (34%) lost the SPC. 1 patient had 4 SPC insertions. Regression analysis did not demonstrate association between age and sex with SPC reinsertion rate. No association between level of the injury and number of SPC reinsertion demonstrated. On average 12 years between 1st and 2nd insertion, 2 years between 2nd and 3rd insertion. Minimum time between first and second reinsertion was 26 days.

Conclusions:
Dislodgement of SPC is one of the most common problems encountered by patients with SCI. The careful SPC management in community is essential to prevent complications like this one and to avoid hospitalizations costs.
Prevalence of neurogenic bladder in patients with spinal cord injury in the main Network of Rehabilitation Hospitals in Brazil

Rehabilitation Nursing, Master's Degree Student Giovana Pelosi¹, PhD in Rehabilitation Science. Fabiana Faleiros¹
¹University of São Paulo at Ribeirão Preto College of Nursing, Ribeirão Preto, Brazil

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction
Identify the prevalence of neurogenic bladder in adult patients with spinal cord injury, and describe the profile of these patients, followed in the main Network of Rehabilitation Hospitals in Brazil, may provide a direction for future interventions in health.

Methods
This is a cross-sectional descriptive study, conducted in the SARAH Network of Rehabilitation Hospitals: Brasilia, Belo Horizonte, Rio de Janeiro, Salvador, Fortaleza, São Luis. The population consisted of patients admitted from 1994 to 2015. Data were collected in electronic medical records and through a statistical survey on the Sarah Network databases. A questionnaire to collect data was used, with some items based on the International Spinal Cord Injury data set and International Lower Urinary Tract Function Basic Spinal Cord Injury data set.

Results
The study population consisted of fifty thousand patients, 32% (female) and 67% (male), 60% with traumatic spinal cord injury, and 40% non-traumatic; 55% have a neurogenic bladder diagnosis.

Conclusion:
To analyze more carefully, a representative sample of this population will be selected, so that more detailed clinical information can be evaluated as, ASIA Impairment Scale (AIS), level of injury, date of injury, main bladder emptying method, and other relevant data to profile of this study.

Acknowledgement:
This project will be conducted in order to obtain the Master's degree in Health Sciences, with the support of Sarah Network of Rehabilitation Hospitals and CNPq - National Council for Scientific and Technological Development - Brazil. It was approved by the Research Ethics Committee of the SARAH Network (CAAE: 46255515.9.0000.0022).
Relationship of Bladder Trabeculation and Urodynamic Study in Spinal Cord Injury

Professor Jeong-Hwan Seo¹, Professor Myoung-Hwan Ko¹, Associate Professor Seong-Hee Park¹, Assistant Professor Yoo-Hee Won¹
¹Chonbuk National University, Jeonju, South Korea

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Dysmorphic bladder or bladder trabeculation in neurogenic bladder is a common complication of spinal cord injury. We aimed to investigate the relationship between bladder trabeculation and urinary function including urodynamic study and clinical parameters related to urinary voiding in spinal cord injury.

Methods: The medical records of the patients who visited the spinal cord injury clinic of a University Hospital for symptoms of neurogenic bladder and underwent VCUG and urodynamic study (total of 162 patients) are reviewed retrospectively. Patients were categorized by the grading of bladder trabeculation (from grade 1 to grade 4 according to the severity), and we analyzed the clinical parameters, including voiding volume, bladder capacity, compliance, detrusor pressure, PVR, event of V-U reflux, bladder tone, and bladder activity.

Results: The urodynamic study parameters showed correlations with trabeculation. As the grading of bladder trabeculation increases, voiding volume, bladder capacity, and compliance were decreased. In the contrary, bladder tone, peak detrusor pressure and frequency of vesicoureteral reflux were increased.

Conclusion: We could suggest that more severe bladder trabeculation is related with smaller bladder volume and the higher peak detrusor pressure, and more vesicoureteral reflux.
The spinal urology MDT: what does it generate and contribute to the urological management of the spinal cord injured patient?

**Mr Michael Floyd Jr**, Dr Chalil Vinod, Mr Vasileios Sakalis, Miss Melissa Davies, Ms Melissa Williams, Ms Chloe Price

*Duke Of Cornwall Spinal Treatment Centre, Salisbury, United Kingdom, Department of Urology, Salisbury NHS Foundation Trust, Salisbury, United Kingdom*

**Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM**

Introduction:
The multidisciplinary team meeting is a well established element of modern urological practice. Specific MDT’s exist for oncology, stone and urethral pathologies with input from radiology and pathology colleagues. There remains a paucity of data regarding the spinal urology MDT which involve both urologists and spinal cord injury physicians. The aims of this study were to document the volume of cases discussed over a six month period at a spinal urology MDT and to examine the urological caseload generated as a result.

Methods:
Over a six month period a record was kept of all cases discussed at the weekly spinal urology MDT. An electronic record was updated after each meeting and noted the total cases discussed, the no. of videourodynamic cases discussed, the no. of general anaesthetic cases booked as a result of the meeting, any additional radiology required and whether a designated urology outpatient appointment was required.

Results:
A total of 116 cases in total were discussed with 91 cases devoted to pure videourodynamic discussion. A total of 38 urological procedures requiring general anaesthetic were generated following MDT discussion. Ten outpatient appointments were booked and 9 cases required new radiological investigations. Only 2 patients required flexible cystoscopies and 1 patient was switched to a different catheter regime. Twelve urodynamics were rebooked following MDT.

Conclusions:
The spinal Urology MDT is an important forum for the urological management of the spinal patient. It allows for prompt discussion of recent investigations and appropriate booking of investigations and procedures.
Urinary Tract Infection Frequency and Bowel Problems among Catheter Users

Mrs Sofi Sigvardsson, Mrs Maria Aberg Hakansson, Mr Kristian Neovius, Mr Thomas Lundqvist
1Wellspect, Molndal, Sweden, 2Aux Analysis, Stockholm, Sweden

OBJECTIVES: Neurogenic bladder and bowel disorders are common in spinal cord injury (SCI) patients. This survey investigated the correlation between frequency of urinary tract infections (UTIs) and bowel problems in a group of experienced catheter users and also if the correlation was dependent on gender.

METHODS: An electronic survey containing questions about background, catheter use, complications and bowel problems was sent to a mixed group of 952 users of intermittent urinary catheters.

RESULTS: The response rate was 28%, i.e. 262 patients responded to the questionnaire, and the majority of the patients (60%) had a neurogenic bladder/bowel due to SCI, multiple sclerosis or spina bifida. It was a majority (64%) of male respondents. Bowel problems were reported from 71% and more common among women (78%) than men (67%). Women also suffer from bowel problems more frequently than men with 26% daily and 22% weekly problems as compared to 15% and 16%. A mean of 2.1 UTIs/year was reported and infections seemed more common among women (2.2 UTIs/year) than men (1.8 UTIs/year). In patients with ≤2 UTIs/year 67% were women and 79% men.

There was a significant correlation between >2 UTIs/year and frequent bowel problems (p = 0.010) and the correlation persisted in the female sub-group (p<0.001) but not in the male.

CONCLUSIONS: Bladder and bowel problems are frequent among SCI patients. Here bowel problems are correlated to the frequency of UTIs. Especially women with many UTIs, why these individuals may need special attention related to bowel management in the healthcare system.
Urinary tract infections and antimicrobial resistance surveillance in a SCI Rehabilitation Unit during a period of 15 months follow up

Dr Pedro Caetano, Dr João Constantino, Dr Inês Campos, Dr Jorge Lains

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction
SCI patients have a higher risk of developing UTI. Our objectives were to identify and characterize the bacterial spectrum and antibiotics resistance in a Spinal Cord Unit and to determine the infection according to voiding method and American Spinal Injury Association Impairment Scale (AIS).

Methods
We made a retrospective analysis of 100 patients hospitalized in a SCU since 1/9/2014 until 1/12/2015. 193 urine samples were obtained and microbiologically evaluated. The variables analyzed were: age, gender, AIS classification, antibiotic used in each infection, microorganisms isolated in the urine cultures, voiding method at the time of the infection and the antibiotics resistance.

Results
76% had at least one UTI episode and mostly were due to multidrug-resistant bacteria (72%). The most common bacteria isolated were Klebsiella pneumoniae (39.9%) and Escherichia coli (24.4%). The highest rates of resistance (81.4%) were found among patients in indwelling catheterization. A comparison between pooled groups severe (AIS A and B) vs mild (AIS C and D) was performed and showed a significant higher frequency of multiple ITU in the severe AIS score (p<0.05).

Conclusions
Our results are in line with the increase of multi-resistant infections in SCI patients. There was an association between UTI and indwelling catheterization. Intermittent self-catheterization was the method with less complications. AIS D spontaneously voiding patients were the ones with fewer infections. These results led us to reflection upon the problem of the exponential rise of resistance to antibiotics as well as the need for implementation of more efficient UTI prevention strategies.
Vesicoureteral Reflux and Neurogenic Bladder in a Guillain–Barré Syndrome: A case report

Professor Jeong-hwan Seo
Chonbuk National University, Jeonju, South Korea

Introduction. Guillain–Barré syndrome defines a clinical entity that is characterized by rapidly progressing, limbs weakness and loss of deep tendon reflex. Bladder dysfunction may occur in the early stage and require bladder catheterization. In general, long-term urological dysfunction is uncommon and urological complications, especially vesicoureteral reflux is hard to see. Here, we report a case of Guillain–Barré syndrome with neurogenic bladder and vesicoureteral reflux.

Case Report: A 64-year-old male patient presented with left leg weakness and hypesthesia, voiding difficulty, and diarrhea. He was finally diagnosed as Guillain–Barré syndrome. He has been treated with steroid and immunoglobulin for about 2 months, but voiding difficulty remained. In 3 months from the disease onset, the evaluation of voiding difficulty, such as voiding cystourethrogram (VCUG) and urodynamic study (UDS) was conducted. In VCUG evaluation, vesicoureteral reflux on left was detected with 130cc filling of saline and bladder has grade II trabeculation. UDS findings were hyposensitive, no reflexic, hypotonic and hypoactive bladder type. Afterwards, he is using clean intermittent catheterization.

Discussion. From this case report, we suggest that a patient with Guillain–Barré syndrome can suffer from urological dysfunction and serious complications. We suggest that thorough bladder evaluation should be considered in the management of Guillain–Barré syndrome patients with urological symptoms.
Preliminary findings from the SCI-POEM study: Logistic barriers to early surgical decompression following traumatic spinal cord injury

Dr Henk van De Meent¹, Dr. Joost J. van Middendorp¹, Prof. Giuseppe Barbagallo², Dr. Eugen Cezar Popescu³, Dr. Federico de Iure⁴, Dr. Konstatin Uzunov⁵, Dr. Zvonko Kejla⁶, Dr. Anahi Hurtado-Chong⁷, Dr. Allard J. Hosman¹

¹Radboud University Medical Center, Nijmegen, Netherlands, ²University of Catania, Catania, Italy, ³Spitalul Sfanta Treime, Iasi, Romania, ⁴Ospedale Maggiore, Bologna, Italy, ⁵Institute of emergency medicine “N.I. Pirogov”, Sofia, Bulgaria, ⁶Sisters of Charity Hospital, Zagreb, Croatia, ⁷AO Clinical Investigation and Documentation (AOCID), Dubendorf, Switzerland

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Surgical decompression is a treatment option for traumatic spinal cord injury (tSCI). To determine the best therapeutic treatment window, this study assesses whether early surgical decompression (<12 hours after injury) leads to superior 1-year outcomes compared to late surgical decompression (>12 hours to <14 days after injury) in patients with acute tSCI.

Methods: This is a prospective, multicenter, European cohort study. Included patients are 18 years or older and were classified according to ASIA grades A–D. Sample size calculation indicated the need for 300 included patients.

Results: The median (min;max) age of 178 enrolled patients was 44.0 (18.0;89.0). There were 124 (69.7%) patients with high energy trauma. In 84 (47.2%) patients, traumatic lesion occurred at a single, isolated vertebral level. Pre-surgery, 71 (39.9%) patients were classified as ASIA Grade A. The median (min;max) time from injury to surgery was 10.5 hours (0.5;216.8); 83 (48%) patients underwent early decompression. Unwanted treatment delays were reported for 53 (29.8%) patients due to several reasons like pre-hospital transfers (24 patients), limited availabilities of resources (29 patients), medical treatment (10 patients), and/or other reasons (13 patients).

Conclusion: Unlike the anticipated 1:2 ratio of early versus delayed surgery, half of patients underwent early decompression. A considerable number of unwanted delays were reported, mostly due to circumstances beyond the physician’s control. Final data analysis will demonstrate whether improvements in resource planning across Europe may lead to improved neurological outcomes in tSCI.
Pre-procedural antibiotics for urological procedures: current practice patterns in Specialised Spinal Cord Injury (SCI) Centres, UK

Dr Ineta Zobina, Mr Sreedhar Kolli
1 The Welsh Spinal Cord Injury Rehabilitation Centre, Rookwood Hospital, Cardiff, United Kingdom

Introduction: Antimicrobial prophylaxis for urologic procedures is a major issue as potential advantages of antibiotic administration should be carefully weighed against potential side effects, microbial resistance and health care costs. Identifying bacteriuria prior to diagnostic and therapeutic procedures is recently recommended to reduce the risk of infectious complications by controlling any pre-operative detected bacteriuria and to streamline the antimicrobial coverage in conjunction with the procedure. Literature search showed that SCI individuals with asymptomatic bacteriuria may be able to safely undergo most endoscopic urological procedures with a single dose of pre-procedural antibiotics.

Methods: A 4 question survey via telephone&email, involving 12 specialised SCI centres in UK, during period from November to December 2015. Responses analysed as number of responses.

Results: Response rate was 10 or 83 % (4 questions answered by 8 centres, but 2 centres responded to 2 questions). (1) majority of specialised SCI centres use antibiotics before cystoscopies (90% or 9/10) and most used is single dose of Gentamicin (60% or 6/10). (2) Majority of specialised SCI centres use antibiotics before urodynamic studies (70% or 7/10) and most used is single dose of Gentamicin (86% or 6/7). (3) There is no routine use of prophylactic antibiotics in postoperative period.(4) Antibiotic use at the time of bladder management change is happening routinely in half of responded specialised SCI centres (50% or 4/8).

Conclusion: There is generally no standardized management of pre-procedural antibiotics for urological procedures for SCI patients in UK but main tendency is to use single dose of Gentamicin.
ProSCIUTTU trial: probiotics (LGG-BB12 and/or RC14-GR1) prophylaxis for urinary tract infection in persons with spinal cord injury: baseline microbiological data

Dr Swee-Ling Toh1,2, Dr Bon San Bonne Lee1,3, Dr. Kate Clezy1, Prof Judy Simpson2, Dr. Obaydullah Marial1, Ms Suzanne Ryan3

1Prince Of Wales Hospital, Sydney, Australia, 2University of Sydney, Sydney, Australia, 3Neuroscience Research Australia, Randwick, Australia

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Background
Among the spinal cord injury (SCI) population there is a 40-50% rate of multi-resistant organism (MRO) colonisation. MROs are resistant to two or more classes of antibiotics. There has been an emergence of extended beta-lactamase (ESBL) gram negative bacteria in urinary tract infections (UTIs) among the SCI population. UTIs with ESBL/MRO often require hospitalisation for treatment. ProSCIUTTU was a randomised double-blind controlled trial. Its secondary outcome was to determine whether probiotics alters the colonisation of MROs in SCI population.

Methods:
Eligible participants were randomised to one of four arms – RC14-GR1+LGG-BB12, RC14GR1+placebo, LGG-BB12+placebo or double placebo. Participants had microbiological swabs of rectum, nose and groin and urine cultures taken at baseline, three and six months.

Results:
Baseline nose swabs revealed 27/207 (13%) of participants were colonised with Methicillin-resistant Staphylococcus aureus (MRSA). Baseline groin swabs revealed 17/206 (8%) of participants were colonised with MRSA.

Baseline faecal sample/rectal swab revealed 2/207 (1%) of participants had vancomycin-resistant Enterococci (VRE). In addition 2% of rectal swab/faecal sample grew ESBL.

In the baseline urine culture, 87/207 (42%) had positive growth in urine culture. 83% of participants with positive urine cultures were outpatients and 49% had suprapubic catheters. Predominant organisms were gram negatives: E. coli (21%), Klebsiella sp (20%), Citrobacter sp (10%) and Enteroccoccus faecalis (8%). 11% of urine grew MRSA. ESBL were present in 8% of baseline urine culture.

Conclusion: From this population of participants, it is reassuring that the rate of MRO colonisation is lower than previously reported.
Surgical rationale and techniques for large ossification of the posterior longitudinal ligament of the cervical spine with silent cord compression

Dr Juncihi Mizuno

Shin-yurigaoka General Hospital, Kawasaki, Japan

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Ossification of the posterior longitudinal ligament (OPLL) of the cervical spine is a relatively common pathology of cervical myelopathy and radiculopathy. OPLL grows slowly to be large occupying canal stenosis severely. OPLL together with herniated discs, spur or hypertrophy of the ligament develops progressive radiculo-myelopathy, however some of large non-segmental OPLL with severe canal stenosis shows minimal symptoms. In this paper, we will present such cases and discuss surgical indication and techniques.

(Materials and methods) 12 large (non-segmental type) OPLL patients with minimal symptoms in the past 6 years were included in this study. 3 cases were under the observation, and 9 cases were treated surgically. Anterior approach was performed in 2 cases, while laminoplasty was performed in the rest of 7 cases. Intraoperative neurophysiological monitoring was performed in 8 cases. The term “minimal symptoms” is defined as slight numbness of the upper extremities with or without mild motor dysfunction in the upper and lower extremities.

(Result and Discussion) 3 cases treated conservatively showed no major neurological changes. Of surgically treated 9 cases, one case treated by anterior procedure showed worsening of spasticity and C5 palsy by cord and nerve injury. Informed consent prior to surgery is important. Anterior approach should be avoided in cases of dural ossification shown with CT. Intraoperative neurophysiological monitoring is useful at the positioning as well as at decompression. Although there are few literatures in the decision making process, canal stenosis over 60% by occupation of OPLL may be a candidate for surgery.
Assessment of severity of neurogenic bowel dysfunction in chronic patients with a simple 1-item questionnaire (PGI-S)

Dr Jean Gabriel PREVINAIRE¹, Dr Jean Marc SOLER², Dr Pierre Eugene MORTIER¹
¹Fondation Hopale, Berck-sur-mer, France, ²Centre Bouffard Vercelli, Cerbere, France

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction
Bowel symptoms (constipation and incontinence) are frequent in patients with a neurologic disease, but rarely assessed in rehabilitation centres.

Aim
To study the prevalence of neurogenic bowel dysfunction (NBD) in those patients, and to assess its severity with the Patient Global Impression of Severity (PGI-S).

Material
Prospective study by questionnaires, with the Neurogenic Bowel Dysfunction Score (0 - 47) and the PGI-S, a 1-item questionnaire (absent, mild, moderate, severe) for the severity of the bowel symptoms, and the Bristol Stool Chart for stool consistency.
All patients presenting a chronic (> 2 months) neurological disease were included.

Results
Inclusion of 169 patients, 97 with spinal cord injury, 42 with multiple sclerosis and 30 with hemiplegia. In each population, prevalence of constipation was 67%, 45% and 17%, of pelvic floor dyssynergia 82%, 45% and 27%, and leakages (gas or stools) de 74%, 48% and 43%, respectively. Moderate to severe bowel symptoms were seen in 61% of spinal cord injury, 43% of multiple sclerosis and 23% of hemiplegic patients, with NBD scores of 11.9 ± 6.5, 5.7 ± 4.9 et 3.7 ± 4.2, respectively (p<0.01). There was a significant relation between PGI-S and NBD score (p<0.01). Significant lower NBD scores were associated with normal stool consistency (Bristol type 3 or 4) (p<0.01). In case of severe bowel symptoms, the use of transanal irrigation was hampered by patients’ motivation and acceptation, and their autonomy.

Conclusion
PGI-S and Bristol Stool Chart are reliable tools to assess the presence of bowel symptoms in clinical practice.
Functional Imaging Study on Brain Plasticity After Defecation Reconstruction Following Spinal Cord Injury

Professor Xianyou Zheng¹, Kai Fu¹, Bingbo Bao¹, Xiaozhong Zhu¹
¹Shanghai Jiao Tong University, Shanghai, China

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Through use of 7.0T fMRI, brain plasticity after defecation reconstruction via neural approaches was explored in rats with spinal cord injury.

Methods: Forty-five adult SD rats (weighing 200-250g) were divided into 3 groups randomly. Bilateral anastomosis of L5 root and S1 root following spinal cord transection between L5 segment and S1 segment was performed in Group A (experimental group, n=15). The only transection of spinal cord between L5 segment and S1 segment was performed in Group B (experimental control group, n=15). Nothing was done to rats in Group C (control group, n=15). Brain resting-state fMRI was performed using 7.0T fMRI in normal rats under different pressure stimulations to the anal canal and rectum. Brain resting-state fMRI was performed to the 3 groups’ rats 1, 6 and 12 months after the surgery. After raw data processing, AFLL was used to analyze the change of brain functional areas.

Results: Somatosensory and motor cortex, thalamus and insula were activated when anal canal and rectum were under different pressure stimulations. Compared with normal rats, somatosensory and motor cortex in rats of experimental rats was deactivated 1 month after the surgery, activated 6 months after the surgery and same at 12 months. While the relevant functional areas in the experimental control group present deactivated firstly and normal with no significant changes thereafter.

Conclusions: Relevant brain functional areas were changed after defecation reconstruction through somato-autonomic nerve transfer. The experiment results can provide experimental basis for patients with spinal cord injury to achieve voluntary defecation.
Long-term effects of spinal cord injury on bowel function

Dr Steffen Dam Nielsen¹, Dr Pia Møller Faaborg², Professor Nanna Brix Finnerup³, Professor Peter Christensen², Professor Klaus Krogh¹

¹Neurogastroenterology Unit, Department of Hepatology and Gastroenterology, Aarhus University Hospital, Aarhus, Denmark, ²Pelvic Floor Unit, Department of Surgery, Aarhus University Hospital, Aarhus, Denmark, ³Danish Pain Research Center Department of Clinical Medicine, Aarhus University, Aarhus, Denmark

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: There are indications that bowel function deteriorates with time since spinal cord injury (SCI), but prospective long-term studies are needed.

Setting: Members of the Danish SCI Association.

Methods: In 1996, a validated questionnaire on bowel function was sent to the members of the Danish SCI association (n=589). The same questionnaire was sent to all surviving members in 2006 (n=284) and in 2015 (n=178). All ranges in level and severity of SCI were included.

Results: A total of 109 responded both in 1996 and 2015, including 103 who had also responded in 2006. Comparing data from 2015 with those from the exact same subjects in 1996, the proportion of respondents needing more than 30 minutes for each defecation increased from 21% to 39% (p<0.01), the use of laxatives increased (p<0.05), and the proportion considering themselves very constipated increased from 19% to 31% (p<0.01). In contrast, the proportion suffering from faecal incontinence remained stable at 19% in 1996 and 19% in 2015. From 2006 to 2015 the use of laxatives had increased (p<0.05). During the 19 years period, 22 (20%) respondents had undergone surgery for bowel dysfunction, including 11 (10%) that had some form of stoma.

Conclusion: In subjects with SCI followed prospectively for 19 years, the severity of constipation had increased with time, while the severity of faecal incontinence remained stable. A surprisingly large proportion had undergone stoma surgery.
Neurogenic bowel dysfunction after spinal cord injury: impact in quality of life and ICF domains

Miss Jennifer Pires¹, Mrs Ana Ferreira¹, Mr Gil Andrade¹, Miss Filipa Rocha¹, Miss Nilza Pinto², Mrs Inês Campos¹, Mr Paulo Margalho¹, Mr Jorge Lains¹

¹Rovisco Pais Rehabilitation Centre, Tocha, Portugal, ²São João Hospital Centre, Oporto, Portugal

Introduction
Neurogenic bowel dysfunction (NBD) is a major cause of morbidity after spinal cord injury (SCI). Its impact on quality of life (QoL) and ICF domains are understudied.

Method:
Retrospective data analysis and cross-sectional phone survey of SCI patients admitted for inpatient rehabilitation program between 2008 and 2010. Variables assessed: bowel management (BM), NBD Score, Likert scale questionnaire about the impact in ICF domains and QoL.

Results:
64 patients out of 88 (72.7%) answered to the questionnaire. The majority was male (65.6%), mean age 56.8±15.6 years, AIS A lesion (39.1%), from traumatic cause (71.9%). At last hospitalization, 79.7% patients reported abnormal bowel function versus 67.2% since discharge. The mean number of drugs used for BM was 2.1±1.4 at last hospitalization versus 1.5±1.1 since discharge. The main BM were contact laxatives, suppository and osmotic laxatives, both at last hospitalization and since discharge. Moderate or severe NBD were present in 50.1% patients. Considering ICF domains, the greatest impact was in personal and environmental factors, with 39.1% reporting impact in financial costs, 45.3% in need of assistance, 45.3% in emotional health and 46.9% in loss of privacy. 59.4% reported major impact of NBD in QoL. There was a significant association between severity of NBD and negative impact in QoL (p<0.05).

Conclusions:
This study confirms major impact of NBD in QoL after SCI. It is relevant to identify ICF domains in order to address targeted interventions, working toward changes in health policies, psychosocial aspects and treatment paradigm.
Prevalence of moderate and severe Bowel Dysfunction in chronic Spinal Cord out-patients: is the NBD scoring predictable?

Professor Gabriele Bazzocchi¹, M.D. Aldi Karemani¹, M.D. Stefania Musco¹, M.D. Davide Villa¹, M.D. Lorenza Maria Landi¹

¹Montecatone Rehabilitation Institute, University Of Bologna, Italy, Imola (bo), Italy

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

We evaluate the prevalence of bowel dysfunctions and its symptoms based-scoring in chronic SCI outpatients attending to our Spinal Unit for any reason apart from bowel management unsatisfactory. Defecation disorders were investigated according to the ISCoS Bowel Function Basic and Extended Data Set questionnaires, and Neurogenic Bowel Dysfunction (NBD) score was calculated in each consecutive SCI patients admitted from September 2015 to February 2016.

Thirty-four SCI patients, 10 (29%) affected by tetraplegia, were included in our study. Overall, Asia impairment scale (AIS) was A in 42% and B in 33%. Fifteen out of 34 were non-traumatic (NT-SCI) and 19 (56%) post-traumatic (PT-SCI), respectively. Time from neurological lesion was never < 8 months and > 3 years in 68% in PT-SCI and 73% in NT-SCI patients. NBD score resulted ≥ 10 (moderate and severe dysfunction) in 11 pts (32%). Six out of 11 were PT-SCI, whereas 5 (45%) were NT-SCI. No differences between both SCI groups in terms of time from lesion, level and completeness, bowel management adopted were found in patients with NBD score ≥10 or ≤9. Scheduled defecation was adopted in overall patients with NBD ≥10 and in 65% of patients with NBD ≤9 (p = 0.02). The NBD item #8 never contributed to score calculation.

One over 3 chronic SCI pts showed high degrees of bowel disturbances and this is independently from etiology, lesion parameters and bowel care adopted. Revision of NBD questionnaire for better discriminate patients seeking for more satisfying bowel management might be necessary.
The in 2014 actualized osteoporosis guidelines of the German speaking bone research societies and their meaning for paralyzed elderly patients

Dr Yorck Kalke
SCI Centre Ulm University, Ulm, Germany

In the German 28 SCI centres an increasing number of elderly patients with traumatic and nontraumatic SCI gets admitted. A lot of these patients have osteoporosis or are even admitted because of osteoporotic fractures with spinal cord involvement. The in 2014 actualized guidelines of the joint organizations of the German speaking bone research societies should be used in this very special patient group.

The subjects of the guidelines are prevention, diagnostic assessment and treatment of osteoporosis in post-menopausal women and in elderly men. For glucocorticoid-induced osteoporosis there are separate guidelines.

Diagnostic assessment means specific medical history, x-ray, laboratory studies and osteodensitometry with DXA measurements of lumbar spine and femur. In the next step measures like nutrition rich in calcium, evaluation of osteoporosis supporting medication and if necessary further work up of secondary causes are initiated. Depending on vertebral fractures, gender, age, the DXA t-score and defined risk factors the patient will be treated with bisphosphonates or osteoanabolica together with supplementation of calcium and vitamin D.

These osteoporosis guidelines should be used in the SCI centres but require special knowledge for diagnostic tools, medical therapy and secondary effects of the different antiosteoporotic drugs. The DMGP founded therefore a specialized working group for "SCI and Osteoporosis".
The relationship of spasticity and bone mineral density in patients with traumatic spinal cord injury

Dr Ekin Ilke Sen¹, Dr Betül Yavuz Keleş¹, Dr Fatma Nur Kesiktaş¹, Dr Nurdan Paker¹, Dr Derya Buğdaycı¹, Dr Ayşenur Bardak¹, Dr Kadriye Öneş¹

¹Istanbul Physical Therapy Rehabilitation Training and Research Hospital, Istanbul, Turkey

INTRODUCTION: The aim of this study is to examine the relationship between the bone mineral density (BMD) and the level of spasticity in traumatic spinal cord injury patients.

METHODS: The data of two hundred fifty patients with spinal cord injury who admitted to our inpatient rehabilitation unit were retrospectively analyzed. Patients with traumatic etiology who had assessments of spasticity according to the Modified Ashworth Scale, and femur neck and total femur BMD values, assessed by the method of Dual-energy X-ray Absorptiometry (DXA) were included. Patients who had time less than three months since injury, postmenopausal women, and those who had diseases that can cause secondary osteoporosis were excluded from the study. The relationships between these factors were analyzed by Spearman's correlation tests.

RESULTS: A total of 66 patients were included in the study. The mean age of the patients was 37.3 ± 13.1 years. According to ASIA classification, 62.1% of the patients had a motor complete (ASIA A-B) injury, and 78.8% were considered as paraplegic. The average BMD at total femur and femur neck was 0.939 ± 0.175 and 0.934 ± 0.185 g/cm² respectively. Thirty four (51.5%) patients had lower limbs spasticity. A significant positive correlation was detected between the level of spasticity and femur neck (r=0.261, p=0.034) BMD values, but there was no statistically significant relationship between the total femur (r=0.224, p=0.071) and the level of spasticity.

CONCLUSION: These findings suggest that, spasticity seems to have a protective effect on femur neck BMD in patients with traumatic spinal cord injury.
Transanal irrigation for the management of neurogenic bowel dysfunction: evidence in spinal unit

Dr Domenico Nicolotti¹, Dr Silvia Di Lollo²

¹Unita' Spinale G. Verdi Villanova Ausl Pc Italia, Villanova Sull'Arda, Italy

Neurogenic bowel dysfunction (NBD) is a common occurrence after spinal cord injury (SCI), and patients with spina bifida, multiple sclerosis and other neurological disease. The extent of the symptoms of NBD is determined by underlying pathology. The so-called conservative management strategies are widely used, comprising diet modification, laxatives, rectal suppositories, digital stimulation and digital evacuation. The goals of bowel care for people with NBD should include promoting dignity and autonomy; these goals are as essential as reducing urinary tract infection and skin damage. Approximately 80% of patients with SCI, MMC and MS are treated conservatively. Evidence for conservative treatment modalities such as dietary adjustments, oral laxatives, suppositories and others in NBD is scarce. Recently the use of dedicated rectal probe for trans anal irrigation assures anal continence during colonic irrigation and represents a valid tool to manage constipation and prevent anal incontinence in such patients so Bowel management has therefore changed. Our purpose is illustrating the use of transanal irrigation as unconservative management of NBD. Patients hospedalized in “Spinal Unit G. Verdi Villanova Sull'Arda (PC)” are trained by multidisciplinary equipe in the use of TAI, in order to achieve their greatest outcomes in daily life activities. Our approach differentiates from common procedure in that it faster both patient and caregivers training in the management of severe intestinal constipation. To better quality of life, we demonstrate that higher level of training in TAI decrease both total execution time of evacuation and inter evacuation fecal leakages in neurogenic periferical bowel.
Introduction
Individuals with spinal cord injury (SCI) may lose control over their bowels and independent bowel management is an important rehabilitation goal. The ART Department of De Hoogstraat Rehabilitation has developed devices to enhance independent toileting by individuals with SCI. The objectives of this study were to (1) examine whether these bowel management devices increased their independence in toileting, and (2) to describe the experiences of the users of these devices.

Methods
Semi-structured interviews with 11 persons (out of 27 invited) with SCI who were provided with one or more bowel management devices. Eleven matched controls were selected from an existing database. Independence in bowel management and toileting was assessed using SCIM-items, satisfaction with the Quebec User Evaluation of Satisfaction with assistive Technology, and quality of life with the Fecal Incontinence Quality of Life Scale.

Results
Most participants (8/11) still used and expressed satisfaction with their devices. They described how these devices made them more independent and gave them much rewarded privacy. However, we did not find statistically significant differences in functional independence or quality of life between users and controls. Reasons for stopping included unrelated shoulder problems, being dependent on help anyway, and digital stimulation being more effective than transanal irrigation with the device.

Conclusions: The prescription of bowel management devices by ART seems effective, meaning that most prescribed devices were still in use and users were satisfied with their device. However, this study suffered from a low response rate and potential selection bias. Future research should utilize larger populations.
Barriers to Self Administration of Medicines on a Spinal Rehabilitation Unit

Dr Javvad Haider¹, Dr Jenni Carr¹, Mr Sreedhar Kolli¹, Dr John Kirby¹

¹Welsh Spinal Cord Injury Rehabilitation Centre, Cardiff, United Kingdom

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction:
Inpatient spinal rehabilitation program aim for independent activity and participation. At a regional spinal rehabilitation centre the majority of our current inpatients were fully dependent on qualified nurses for administration of medication. We performed a retrospective audit on inpatients receiving rehabilitation to determine barriers to SAM.

Method:
We collected data from 20 inpatients residing in a spinal rehabilitation unit. Length of admission, diagnosis, neurological impairment, number of medications, level of SAM and nurse reported barriers were recorded. We also collected parameters on hand function including tripod, pinch, gross grip as assessed by an occupational therapist.

Results:
11 paraplegic and 9 tetraplegic patients had a mean length of stay of 179 days (range 7 – 1078). Of the 9 tetraplegics 4 were able to achieve a gross and tripod grip and 6 pincer pinch. Only 2 of all inpatients (both paraplegics) were medicating independently while the rest relied on nursing staff. Nursing reported barriers to SAM included inability to access drug locker independently (7), poor hand function (4), cognitive impairment (2), mental health (3) and not assessed (2).

Conclusion:
From our results we could not correlate SAM with any of the clinical parameters. The 2 patients that were achieving SAM had been doing so prior to admission. Barriers to SAM were mainly related to environmental factors i.e. access to medication due to nursing regulations related to storage of medication. Potential solutions include accessible storage of medication and the use of medication aids e.g. dosette boxes.
Complications with Neurogenic Bowel and Bladder among Veterans and Civilians with Spinal Cord Injury (SCI)

Professor Denise Tate, Dr. Edward Rohn, Mr. Martin Forchheimer

University Of Michigan, Ann Arbor, United States

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction
Complications related to neurogenic bowel (i.e. incontinence, constipation) and bladder (i.e. incontinence, urinary tract infections) are very frequent after SCI. These have a major impact on people’s quality of life. The objective of this presentation is to discuss differences between veterans of war and civilians with SCI.

Methods
This study used a mixed method approach. Participants were 40 persons with SCI with a mean age of 47 years old. Most were between 15 and 25 years since injury. Data were collected via qualitative interviews, focus groups and using standard questionnaires, including the International Data sets for bowel and bladder.

Results:
Bladder complications were quite prevalent among participants. Of veterans, 50% experienced urinary tract infections (UTIs) during last year compared to 78% of civilians. Conversely, 67% of veterans reported bowel incontinence compared to 44% of civilians. Compared to civilians, Veterans relied more heavily on surgical interventions to manage their bladder and bowel dysfunction. Of those who reported UTIs, Catheterization was often mentioned as related to the re-occurrence of UTIs.

Conclusion
The results of this study show important patterns in the complications experienced by participants with clear differences between the two samples in terms of reported bladder and bowel complications. These findings suggest the need to further examine patterns of clinical care received by those with SCI in military versus non-military facilities.
Development of Spinal Cord Injury Rehabilitation in a developing country - Madagascar

Dr Ram Hariharan1, Dr Renaud RAKOTONIRAINY Jean Jacques, Prof Anne Chamberlain

Sheffield Teaching Hospitals NHS Trust, Wakefield, United Kingdom

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: The development of spinal cord injury [SCI] rehabilitation services along with a mid-level teaching programme for doctors mainly seconded from general practice in Madagascar to direct regional and national rehabilitation services is described. It is hoped that this will be of use in similar situations in low-resource countries.

Methods: Teaching input was given by a consultant clinician from a teaching hospital in England. One of the Malagasy doctors took on as the lead to develop the SCI services. It was identified that SCI patients were being admitted to the neurosurgical department where they underwent surgery and got discharged with no further follow up. It was therefore decided to set up regular meetings with the neurosurgical team to create a pathway for patients with SCI. This started in 2008 with just the rehabilitation doctor who has gradually built a team consisting of a physiotherapist and a nurse. Since the start of the meetings all SCI patients are being referred to the rehab team. A data base of these patients that never existed is now being maintained. The rehab team has also set up long term follow up for SCI patients including community visits for those who are unable to come to the hospital.

Results: Better outcome for SCI patients [reduction in pressure ulcers and UTIs']
The team have joined the African Spinal Cord Injury network that will help maintain and expand the services in the long term.
In the process of setting up a centre of excellence for SCI rehab in the main hospital.
Impact of a Norovirus Outbreak on an Inpatient Spinal Rehabilitation Unit

Dr Javvad Haider, Dr John Kirby, Dr Krishanthini Balasubramanian
Welsh Spinal Cord Injury Rehabilitation Centre, Cardiff, United Kingdom

Introduction
The NHS and other organisations have experienced increasing burden and cost of norovirus disease in recent years. Outbreaks of diarrhoea and vomiting (D&V) have an enhanced impact on patients with SCI. We performed a retrospective audit to assess the impact of a norovirus outbreak on patients with SCI on an inpatient spinal rehabilitation unit.

Methods
Data was collected retrospectively for 11 patients who experienced D&V with a positive norovirus PCR test. This included SCIM and RCS scores and number of nursing interventions in 24h for each patient before during and after the norovirus episode.

Results
Mean total SCIM scores decreased during the norovirus episode (before 37.7 during 26.1 after 25.6) while RCS scores increased (before 9 during 31 after 19.3). Almost all patients recovered their baseline SCIM and RCS within 48 hours of resolving of D&V with the exception of 2 patients who had a lower SCIM level and 1 had a higher RCS score. There was no significant difference in the number of nursing interventions recorded. A total of 42 hours of therapy was cancelled during this episode.

Conclusion
We demonstrate that during an episode of norovirus outbreak patients on average became more dependent and their rehabilitation complexity increased. This interestingly did not translate to an increase in number of nursing interventions. Most patients regained their pre-outbreak level of independence within 48 hours of D&V resolving. There were 2 cases of patients not recovering their SCIM and RCS to baseline after resolving of D&V.
Improving care standards for patients with traumatic spinal cord injury (TSCI)

Dr Lisa Sharwood¹,²,³, Dr Ralph Stanford⁵, Associate Professor Brian Burns⁸, Associate Professor Tony Joseph¹,⁵, Dr Oliver Flower⁵, Dr Oran Rigby⁶,⁸, Ms Shelly Dhaliwal²,³, Associate Professor James Middleton¹,²,³,⁷

¹University Of Sydney, Sydney Medical School Northern, St Leonards, Australia, ²Kolling Institute for Medical Research, St Leonards, Australia, ³John Walsh Centre for Rehabilitation Research, St Leonards, Australia, ⁴Prince of Wales Hospital, Randwick, Australia, ⁵Royal North Shore Hospital, St Leonards, Australia, ⁶Institute for Trauma and Injury Management, NSW Agency for Clinical Innovation, Chatswood, Australia, ⁷State Spinal Cord Injury Service, NSW Agency for Clinical Innovation, Chatswood, Australia, ⁸Greater Sydney Area Helicopter Emergency Medical Service, Sydney, Australia

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Defining ‘agreed practice standards’ is one of the first and most crucial steps in the translation of knowledge into policy and practice, enabling identification of current evidence-practice gaps and facilitating implementation of an improved model of care. This study aimed to develop consensus and agreed standards of care for patients with acute TSCI and identify barriers to achieving this.

Methods: A rapid literature review identified ‘best practice’ evidence across specific clinical practice areas in early TSCI care (2005 – 2015). A modified e-Delphi survey process was used to build consensus across pre-hospital care, spinal immobilisation, imaging, haemodynamic management, time to surgery and referral pathways and processes.

Results: Survey respondents were experienced practitioners from Emergency Medicine (33%), Trauma Medical (16%), Surgical (15%), Nursing (11%) and Paramedic (12%); 66% using locally written protocols for acute TSCI care. There was >80% consensus regarding: pre-hospital diagnosis of isolated TSCI and transfer decisions, the transfer of patients with TSCI to a specialist service within 24 hours, specific preparation for patient transfer and imaging requirements for diagnosis/clearance. Induced hypertension with related invasive monitoring was not agreed by the majority, neither the location of necessary decompressive surgery or closed reduction in the first 12-24 hours.

Conclusions: These findings will be explored within individual stakeholder interviews to further understand specific drivers (barrier/facilitators) of achieving agreed standards. Clinical variation audit will measure evidence-practice gaps, finding target areas amenable to change. These findings will inform national discussion toward consistent approaches to triage, treatment, transport and definitive care for TSCI.
Rehabilitation Programme Management (RPM) – changing the outcomes of in-patient rehabilitation for SCI individuals.

Miss Rita Henn¹, Dr Megan Knox¹, Mrs Lauren Paiken¹, Mrs Rae Tovell-Holdt¹

¹Summit Rehab, Centurion, South Africa

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Objective: To determine if assigning a dedicated rehabilitation programme manager for an inpatient spinal patient unit positively affects length of stay, functional outcomes, quality of clinical documentation and reporting.

Design: Retrospective and prospective cohort of patients with spinal cord injury receiving in-patient rehabilitation

Setting: A rehabilitation hospital in Gauteng. Thirty subjects’ pre- and post-programme implementation

Methods: Implementation of a management programme which assigned a dedicated co-ordinator to oversee each spinal patient’s rehabilitation programme from admission to discharge over the period of 1 year.

Results: Summary statistics and percentages of various outcomes is presented.

Conclusion: While the RPM programme increased FIM score changes, the standard of reporting for funders and records it did not reduce rehabilitation LOS.

Discussion: Challenges shall be presented and recommendations for project development
SIA Nurse Advocates reaching out to non-specialist settings

Miss Debbie Green¹, Mrs Carol Adcock¹
¹Spinal Injuries Association, Milton Keynes, United Kingdom

Introduction
It is estimated that there are around 40,000 people living with spinal cord injury (SCI) in the UK. Rising numbers of people living with SCI and the reduction in available beds in specialist spinal cord injury centres (SCIC) is resulting in more people with SCI being treated in non-specialist settings by staff with limited experience and skills in SCI nursing, which is exacerbated by the lack of specialist education available.

Methods
Interrogation of the 1,687 referrals to the National Spinal Cord Injury Database in 2014/15, confirmed the large numbers of newly injured people who were not accessing specialist services in a timely manner. Evidence was also gathered from the SIA Regional Peer Support Service and surveys were carried out amongst the members of the Spinal Injuries Association.

Results
The lack of specialist input results in a lack of confidence in the service available in non-specialist settings and many individuals stated they would seek the advice of an independent Nurse Advocate if the service was available.

Conclusion
This shows that the care and rehabilitation that a patient receives directly after injury doesn’t simply affect their risk of a secondary complication but also can have a long-term impact.

To address some of these issues, the SIA have recruited two Nurse Advocates who are well experienced in the nursing care of individuals with SCI. The Nurse Advocates work with a range of stakeholders and have been very well accepted – working as a model for further third sector and NHS collaboration.
The Key Elements in Rehabilitation Process Patient with High Spinal Cord Injury

Mrs Heli Nyberg¹
¹Validia Rehabilitation Helsinki, Helsinki, Finland

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

The purpose of this study was to describe the key elements in the rehabilitation process for patients with high spinal cord injury (SCI). The aim was to report which factors facilitate or hinder recovery from the patient’s perspective and describe the key elements in the rehabilitation process used by multi-professional team in Validia Rehabilitation Helsinki. The goal of the project was to improve the functioning of the patient with high SCI. This study was carried out using a functional research approach.

For example, the patients found that a facilitating factor was purposeful and consistent support during the rehabilitation period as well as support of the family and friends. High tech equipment and power wheelchairs were also important. The main factors hindering recovery were for example conflicts between patient and home service concerning autonomy and privacy. The patient felt that they did not trust all the members of the home service. Discussions improved situation.

The facilitating and hindering factors were used to influence the key elements in the rehabilitation process described by multi-professional team. The key elements in the rehabilitation process were the strengths of the rehabilitation center, building trust, supporting and paying attention to family and friends, as well as peer support and developing peer support. The key element privacy, should be observed already during the rehabilitation period. Supporting the patients empowerment as well as functioning in the living environment during the rehabilitation period, tightening the cooperation with patients services were also key elements. Practical suggestions came up.
The Use of Antibiotics and Incidence of Associated Diarrhea: the Welsh Spinal Cord Injury Rehabilitation Centre (WSCIRC) experience.

Dr Ineta Zobina¹, Mr. Sreedhar Kolli¹, Dr. Javvaid Haider¹, Dr. Shuja Kazmi¹

¹The Welsh Spinal Cord Injury Rehabilitation Centre, Rookwood Hospital, Cardiff, United Kingdom

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Antibiotic-associated diarrhea (AAD) is a common complication of antibiotic use. If diarrhea develops, rehabilitation will be delayed, affecting not just the patient (risk of developing pressure ulcers and delay in wound healing), but also causing a lot of extra cost to the healthcare system and reducing the quality of life. Our aim was to (1) record the use of antibiotics; (2) establish the incidence of AAD and; (3) assess if any seasonal variation on antibiotic use and incidence of AAD.

Methods: A retrospective audit was conducted as part of collaborative multicenter study during period of September 2014 to July 2015. Data was collected from individual patient notes using a standardised questionnaire. Definition of AAD was as 2 or more watery stools type 5, 6 or 7 (Bristol stool scale) over 24 hours.

Results: 177 notes screened and 129 patients (mean age: 45.7 years, 62 % male and 38% female) with SCI (43% tetraplegia and 57% paraplegia; 37% complete; 68% traumatic SCI) were included. Of 21 (16%) patients on antibiotics, the top indications for antibiotic use were urinary-tract infections (62%), skin-infections (14%). 3 of 21 (14.3%) developed AAD. AAD occurrence was observed in the summer season when was highest use of antibiotics (38%).

Conclusion: This survey found AAD is common in SCI patients in WSCIRC and maybe a risk factor for poorer outcomes and increased hospital cost. A multicenter study is underway to establish the incidence and risk factors for AAD.
Assessment of patients' and caregiver's perceived need to start actively participated outcome measures in Spinal Cord Injury research

Dr Renee Maschke, Doctor Maria Cristina Pagliacci¹, Doctor Sauro Biscotto¹, Doctor Renee Maske¹, Doctor Rossella Papetti², Doctor Luisa Baiocco², Doctor Innocenza Ritacco¹, Doctor Maristella Mancino¹, Doctor Maria Grazia Celani², Doctor Teresa Anna Cantisani², Professor Angelo Bignamini³
¹Azienda Ospedaliera Universitaria Di Perugia, Perugia, Italy, ²Cochrane Neurosciences Filed, Perugia, Italy, ³Department of Pharmaceutical Sciences, University of Milan, Milano, Italy

Introduction: “End-user of treatments” perspectives, ideas and values is needed to reach an agreement between different stakeholders

Methods: The study was conducted in Umbria (Italy) on adult population affected by SCI. It was structured through the use of Focus Groups. Patients and carers were recruited by telephone calls from the patients lists maintained by hospital wards and outpatients clinics. From the respondents, two groups of patients and two groups of carers were formed for 3 level of severity based on: incomplete, complete paraplegic, complete tetraplegic patients. Two psychologists conducted recruitment, used predetermined semi-structured questions to interview attendees, and moderated group discussions. These were digitally recorded and transcribed into text-files, blindly analyzed and elaborated into key semantic meanings expressing perceived needs and emotions in relation to the disease and its consequences.

Results: Focus Organization is still on course. By now 21 patients and 20 carers participated (40% of people contacted), and were organized into 5 groups of patients and 5 groups of Caregivers. In a qualitative analysis frequently expressed needs were “autonomy”, “normal life” and "concern to be handled by people without expertise in SCI physical needs". Emotions frequently expressed were anger and fear, but also hope and acceptance. To approach a semiquantitative analysis these codes will be analyzed using «Concordance» software.

Conclusion: Patient and carers' priorities are based on intense personal insight, representing a starting point to work for shared outcome measures between different stakeholders (patients, carers, health professionals, decision makers, researchers) in clinical practice and clinical trials
Background
Online communities enable persons with chronic and rare health conditions, like spinal cord injury (SCI), to connect to peers and exchange their health-related experiences. We propose that collaborating with these communities may be a promising strategy to inform patient-centered care in the field of SCI. The objective of this study was therefore to determine whether online communities provide a fertile ground for collaboration between different stakeholders in the field of SCI.

Methods
A descriptive qualitative research design was used. A total of 11 online communities for people with disabilities were included in the analysis. Interviews were conducted with community managers (N=9). In addition, the terms and conditions, privacy statements, forum rules, and official administrative communication via the message boards were retrieved. Data was analyzed using thematic analysis.

Results
Building and maintaining active online communities, as well as protecting members’ interests were identified as key challenges by community managers. Principles stressed in most communities were tolerance, support, and openness - particularly towards ‘newcomers’. In this context, many interviewees also underlined the importance of involving tomorrow’s health professionals in the community to sensitize them to patients’ needs. In addition to dedicated forum-sections for collaboration with researchers, several interviewees actively offered to assist with future research projects.

Conclusion
Most communities are open to collaboration and have an inherent interest to engage with health professionals and researchers. Actively involving these communities in the research process constitutes a promising strategy to capture and integrate the insights of persons with SCI into the healthcare system.
Inpatient Hospitalization of Individuals with Spinal Cord Injury in Switzerland: Paraplegic Centers versus Non-specialized Centers

MA Melissa Viloria1,2, MD Anke Scheel-Sailer3,4, PhD Armin Gemperli1,2,4
1 Swiss Paraplegic Research, Nottwil, Switzerland, 2 Department of Health Sciences and Health Policy, University of Lucerne, Lucerne, Switzerland, 3 Swiss Paraplegic Centre, Nottwil, Switzerland, 4 Interest Group "Policy, Services and Care Perspective" of the Swiss Spinal Cord Injury Cohort Study, , Switzerland

Objective: A comparison of populations with spinal cord injury (SCI) admitted either to specialized paraplegic centers or non-specialized centers for acute or follow-up treatments, in terms of differences in diagnoses, demographics and patient pathways.

Methods: Secondary analysis of a nationwide registry of all inpatient hospitalizations in Switzerland for the years 2012 and 2013.

Results: Of 11,562 hospitalizations, 590 were acute cases and 10,972 cases of chronic SCI. Treated in non-specialized clinics were 365 (62%) acute cases and 8,766 (80%) cases with chronic SCI. Persons seeking follow-up treatments in specialized clinics were more likely traumatic, male and young, and referred by other hospitals. The average length of stay was 50 and 19 days in specialized and nonspecialized clinics, respectively. SCI patients mostly visit specialized paraplegic centers for spasticity, University hospitals for cardiovascular diseases and thromboses, cantonal hospitals for urinary tract infections, pneumonia and fractures, and regional hospitals for a wide range of diagnoses at moderate caseload. Patients in specialized clinics were more likely discharged to home and less likely to other care institutions.

Conclusions: In a political environment with free choice of provider, a substantial number of older, multimorbid SCI patients are admitted to local, general medical care providers. Specialized paraplegic centers play an important role in supplying patients with more severe injuries and complement regional hospitals in expertise and services.
Leisure time physical activity among older adults with long-term spinal cord injury

Dr Sophie Jörgensen¹², Professor Kathleen Martin Ginis³, Professor Jan Lexell¹²
¹Department of Health Sciences, Lund University, Lund, Sweden, ²Department of Neurology and Rehabilitation Medicine, Skåne University Hospital, Lund, Sweden, ³McMaster University/University of British Columbia, Hamilton/Kelowna, Canada

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: More people are living longer with spinal cord injury (SCI). However, very little is known about leisure time physical activity (LTPA) among older adults with long-term SCI. The objectives of this study were to describe the average amount, intensity and type of LTPA reported by this group, and to investigate if participation in LTPA is associated with sociodemographics and injury characteristics.

Methods: Participants were 119 men and women, injury levels C1-T12, AIS A-D. Mean age was 63 years and mean time since injury was 24 years. Participants were part of the Swedish Aging with Spinal Cord Injury Study (SASCIS). They completed an interview protocol in their homes, including the Physical Activity Recall Assessment for people with Spinal Cord Injury (PARA-SCI) as a measure of LTPA. Associations between variables were analyzed using hierarchical multiple regression.

Results: A total of 71% engaged in some form of LTPA, whereas only 53% performed LTPA at a moderate intensity or greater. On average, participants reported 34.7±41.5 minutes/day of total LTPA and 22.5±35.1 minutes/day of moderate-heavy intensity LTPA. Sociodemographics and injury characteristics explained 12.8% of the variance in moderate-heavy LTPA; being a woman (B=-14.6), using a manual (B=-26.7) or powered (B=-34.2) wheelchair and being employed (B=-16.0) were significantly associated with less moderate-heavy LTPA, all ps<.05.

Conclusion: There is large variation in daily LTPA among older adults with long-term SCI and many are insufficiently active to achieve fitness benefits. These results can be used to identify groups that are in particular need of activity enhancing interventions.
Purpose: To gain more insights into the current health status through reports of utilization of health care services and measuring psychological distress and well-being among a Norwegian population who sustained a traumatic SCI more than 20 years ago. Method: 147 persons were interviewed in 2004 using a semi-structured questionnaire (SSQ), and General Health Questionnaire (GHQ20), blood samples and a neurological examination (including American Spinal Injury Association Impairment Scale (AIS)) were performed. Descriptive statistics and a logistic regression analysis were conducted to identify variables associated with psychological distress. Results: The majority received SCI-follow-up health-services at least once after initial rehabilitation and in general they seemed satisfied with health services provided. Concerning psychological distress, 34 persons were "cases" according to the GHQ-20. The “cases” did not differ from “non-cases” concerning demography, time since injury, injury mechanism (cause) or SCI severity. When analyzing associations between SSQ-variables and GHQ-score, participants who never had been to follow-up after SCI (p=0.044) were associated with low GHQ-scores whereas participants reporting pain (p = 0.054) and psychological issues as the worst health concern (p= 0.058) with high GHQ score. Age, gender, injury level and number of spasms, fractures or ulcers did not influence GHQ score. Conclusion: In this cohort, the majority are satisfied with their health-care experiences. Psychological distress is common even many years past injury, and needs attention during routinely follow-up care.
Quality of Life (QoL) in people with SCI from five countries measured with the International SCI QoL Basic Data Set

Professor Marcel Post\(^1\), Professor Denise Tate\(^3\), Dr. Susan Charlifue\(^4\), Dr. Peter New\(^5\), Dr. Divya Parashar\(^7\)  
\(^1\)De Hoogstraat Rehabilitation, Utrecht, Netherlands, \(^2\)University of Groningen, University Medical Center Groningen, Center for Rehabilitation, Groningen, Netherlands, \(^3\)University of Michigan Spinal Cord Injury Model System (SCIMS), Department of Physical Medicine and Rehabilitation, University of Michigan Medical School, Ann Arbor, United States, \(^4\)Craig Hospital, Englewood, United States, \(^5\)Spinal Rehabilitation Service, Caulfield Hospital, Alfred Health, Caulfield, Australia, \(^6\)Ewport-Monash Rehabilitation Medicine Unit, Southern Medical School, Monash University, Melbourne, Australia, \(^7\)Department of Psychology, Indian Spinal Injuries Centre, Delhi, India

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction
The International SCI Quality of Life Basic Data Set (QoL BDS) was developed as a common measure of QoL for clinical practice and research. The objective of this paper is to describe and compare QoL in people with chronic SCI in multiple countries using this instrument.

Methods
Data on a total of 624 participants with chronic SCI from Australia, India, Netherlands, United Stated and Brazil were collected. Most participants (64.4%) were male, and 90.3% of all SCIs were traumatic, 59.3% were paraplegic and 74.5% were complete. The QoL BDS consists of three questions on satisfaction with life as a whole, physical health and mental health, to be answered on a 0-10 numerical rating scale.

Results
The QoL BDS showed significant differences between countries for satisfaction with life as a whole and satisfaction with mental health. Post-hoc analyses showed lower satisfaction with life as a whole in individuals with chronic SCI in Australia as compared to those from the Netherlands (p<0.001), United States (p=0.005) and Brazil (p=0.006). No differences with respect to satisfaction with physical health were found. Satisfaction with mental health was higher in Brazil as compared to Australia (p=0.001) and India (p=0.001). Differences between countries remained significant after correction for demographic and SCI characteristics in a linear mixed model.

Conclusion
The results of this study show differences in QoL of people with SCI between countries that need further exploration and support the use of the QoL BDS in SCI studies.
Socio-economic factors and employment factors predicting employment after spinal cord injury (SCI) in Norway, Denmark, the Netherlands and Switzerland

MA Annelie Schedin Leiulfsrud, Professor Marcel Post, Professor Jan D Reinhardt, President ESCIF Jane Horsewell, Professor Fin Biering-Sorensen, Professor Hakon Leiulfsrud, Researcher Erling Solheim

1 St Olav University Hospital, Spinal Cord Unit, Trondheim, Norway, 2 Center of Excellence in Rehabilitation Medicine, Utrecht, Netherlands, 3 University of Groningen, Groningen, Netherlands, 4 Institute for Disaster Management and Reconstruction of Sichuan University and Hong Kong Polytechnic University, Chengdu, China, 5 Swiss Paraplegic Research, Nottwil, Switzerland, 6 ESCIF, Swiss Paraplegic Association, Nottwil, Switzerland, 7 Clinic for spinal cord injuries, Neuroscience Centre, Rigshospitalet, Copenhagen, Denmark, 8 University of Copenhagen, Copenhagen, Denmark, 9 Norwegian University of Science and Technology, Trondheim, Norway

Objective: To examine socio-economic and employment-related determinants of employment after SCI.

Design: National cross-sectional surveys of persons aged 18-65 with SCI in 2012.

Method: Descriptive statistics, bivariate associations and logistic regression.

Results: In Norway, 69.5 percent had been employed at some point in time after the injury. 44.5 percent remained employed at the time of interview. In congruence with our hypothesis young age at SCI, less education and tetraplegia decreased the probability of long lasting employment after SCI, but with stronger associations among men. Vocational rehabilitation had limited effects, whereas possibility to work in the same organization after SCI had long lasting effects on employment, particularly among men. Employment post SCI is, as expected, favouring persons in middle class jobs, but becomes non-significant controlled for other factors, especially education and ability to work in the same organization pre-and post SCI. A higher share of women than men are in employment post SCI. Similar analyses will be performed with data representing the other three countries to identify country-specific associations with employment.

Conclusion: The study is unique as it includes data from several countries and in its focus on occupational class and gender. The weaker associations between predictors and employment for women deserve more attention in SCI research with limited interest in women’s challenges in the labour market. The strong associations between ability to work in the same organization post SCI and future market participation are of particular interest in medical rehabilitation programs with limited interest in employment post injury.
Study design and profile of the inception cohort of the Swiss Spinal Cord Injury (SwiSCI) study.

Dr Martin WG Brinkhof¹,²
¹Swiss Paraplegic Research, Nottwil, Switzerland, ²Department of Health Sciences and Health Policy, University of Lucerne, Lucerne, Switzerland

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Prospective cohort studies may provide the strongest scientific evidence based on observational data, also establish an operational platform for nested research. With this notion the inception cohort of the SwiSCI cohort study was initiated, aiming to achieve a comprehensive understanding of functioning, health maintenance, quality of life and life expectancy following spinal cord injury.

Methods: The inception cohort is conducted in collaboration with all four specialized rehabilitation centers, recruiting resident persons, 16 years or older, who have a new diagnoses of traumatic SCI (TSCI) or non-traumatic SCI (NTSCI). Data collection uses a comprehensive ICF-based data model, the full data set involving additional assessments beyond the clinical routine (minimal data set).

Results: Between May 2013 until May 2016, in total 536 newly injured persons were recruited (participation rate 90.8%) and 301 (56.2%) consented to full data collection. 67.4% were male and the median age was 52 (IQR 34-69) years in TSCI (60.9% of cases) and 63 (52-73) years in NTSCI (39.1%). SCI diagnosis was paraplegia in 60.9%; predominant ASIA scores at discharge were grades D (61.5%) and A (19.5%). The efficacy of first rehabilitation was indicated by improvements in various outcomes, such as enhanced functional independence (SCIM score) and decreased psychological strain. Other instrumental data include the incidence of secondary complications, such as pain or pressure ulcers.

Conclusion: The ongoing inception cohort study of SwiSCI is anticipated to facilitate comprehensive and causal research aiming to improve our understanding of functioning, disability and health over the life-course of persons with SCI.
Successful (Re-)Integration after a Spinal Cord Injury

Mrs Gunilla Ahren, Mrs Jane Horsewell

European Spinal Cord Injury Federation, Europe

Introduction
Social inclusion is a central tenet of the UNCRPD. The European Spinal Cord Injury Federation (ESCIF), a pan-European umbrella of SCI consumer advocacy organisations, performed a multi-national project to address this issue. The project focused on factors that are essential to the successful (re-)integration of people with SCI.

The aim was to draw upon the knowledge and experience of member organisations throughout Europe to answer the following question: “What can your organisation do to facilitate the successful (re-)integration of people with spinal cord injury in the community?”

As with all other ESCIF projects, the overall aim is to provide member organisations with information, shared experience and recommendations that will help them in their efforts to improve the quality of life of people living with SCI in their countries.

Methods
5 working groups focusing on one of the following; Employment and education, Leisure activities, Family roles, Assistive devices and Quality of life and access to information.

The groups included participants from 16 organizations in 13 countries.

The groups selected different methods of data collection: literature reviews, questionnaires, telephone interviews, compilation of case studies, studies of organisations’ own materials.

Results
Regardless of the focus area all the groups identified facilitators and barriers for successful integration. They were identified as either external or endogenous factors. The external factors involved areas like accessibility, discrimination, economic and legislative. The endogenous factors involved areas like self-motivation and personal capacities.

Conclusions
The organisations need to provide services for individual support but also work with lobbying interventions.
Supported Employment for Persons with Spinal Cord Injuries in Taiwanese Technology Factories: the Employers’ Experiences

**Professor LI-JUNG MAI**<sup>1,2</sup>, Mr. YANG-PIN LIN<sup>3</sup>

<sup>1</sup>Yaun Ze University, Taoyuan, Taiwan; <sup>2</sup>Spinal Cord Injury Foundation, Taipei, Taiwan; <sup>3</sup>The Potential Development Center for Spinal Cord Sufferers, Taoyuan, Taiwan

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

**Introduction**

Facilitating the employment of persons with spinal cord injuries (SCI) is difficult and challenging. From 2010 to 2015, approximately 84 individuals with thoracic and lumbar spinal cord injury were hired by three technology factories in Taiwan. The purpose of this study was to investigate employers’ experiences in hiring individuals with SCI and support mechanisms that were adopted to help them retain their positions.

**Methods**

The qualitative approach was applied. Twelve individuals in human resources, manufacturing, production line, and nursing positions from three factories participated in this study. They were invited into three groups for focusing group interviews. Each interviews lasted an average of 3 hours.

**Results**

1) Initially employers were skeptical about hiring individuals with SCI, but ultimately recognized their capabilities.
2) The determination of senior management was critical in continuing hiring policies and working through internal resistance initially.
3) Positions and working environments were adapted through a job accommodation process and the efforts of HR and production line managers.
4) All three companies were satisfied with their decisions to hire employees with SCI, incorporating the practice into their corporate culture.
5) Employers recognized the important role and function of the Potential Development Center for Spinal Cord Sufferers, which provided education and consultation for both sides.

**Conclusions**

With moderate support mechanism and job accommodation, assembly positions in technology factories can be an ideal employment option for individuals with SCI. The findings can serve as references for other technology factories.
The CoMoSS program—an effective condensed client-centred modular spinal cord injury rehabilitation service

PhD Hanneke Bouwsema1,2, PhD Annemie Spooren3, PhD Ghislaine van Mastrigt4, MSc Diana Vanmulken5, MD Helma Bongers5, PhD Henk Seelen1,2

1Adelante Centre of Expertise in Rehabilitation and Audiology, Hoensbroek, Netherlands, 2Maastricht University, Department of Rehabilitation Medicine, Research School CAPHRI, Maastricht, Netherlands, 3PHL University College Hasselt, Department of Healthcare, Hasselt, Belgium, 4Maastricht University, Department of Health Services Research, Maastricht, Netherlands, 5Adelante Rehabilitation Centre, Hoensbroek, Netherlands

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Typical rehabilitation of persons with a spinal cord injury (SCI) consists of general rehabilitation with long inpatient stay and high costs. Duration and costs may be reduced (at equal/better functional outcome) when patients are offered a condensed client-centred program.

Objective: To evaluate and implement a condensed, modular client-centred SCI rehabilitation service (CoMoSS), consisting of: a) short clinical rehabilitation; b) early home-phase; and c) client-centred modules focussing on patient’s individual goals.

Methods: The following measures were taken at admittance, discharge, and during 3 follow-up moments (8-weeks, 6-months, and 12-months post-discharge (currently being assessed)): length-of-stay (LOS), functional status (FIM, SCIM), quality of life (QoL: SF-36, well-being, self-efficacy, satisfaction with care), and cost-effectiveness. Results were compared with a matched-control group who received standard rehabilitation.

Results: 47 patients with a recently-acquired SCI started the CoMoSS-program (32 male, 15 female; mean(SD) age: 58.15(16.41); AIS-A:12/AIS-B:2/AIS-C:8/AIS-D:25, 34% tetraplegic). Mean(SD) LOS of CoMoSS vs. controls: 137.3 (84.6) vs. 183.0 (93.4) days. The CoMoSS-group improved significantly during rehabilitation on functional status (FIM, SCIM), quality of life (QoL: SF-36, well-being, self-efficacy, satisfaction with care), and cost-effectiveness. Results were compared with a matched-control group who received standard rehabilitation.

Conclusions: Despite a shortened LOS, CoMoSS is as effective as standard rehabilitation regarding functional status and QoL. Cost-effectiveness is currently assessed.
The lived experience of people with acute cervical spinal cord injury in non-specialist units in UK

**Mrs Jackie McRae**, Dr Christina Smith, Dr Anton Emmanuel, Dr Suzanne Beeke

1Division of Medicine, University College London, London, United Kingdom, 2Division of Psychology and Language Sciences, University College London, London, United Kingdom

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction
For many spinal cord injury patients, admission to a specialist centre is delayed due to limited bed availability. Mechanical ventilation via a tracheostomy is often required for cervical spinal cord injuries (CSCI) at or above C4 level, with 40% experiencing associated dysphagia. This increases the complexity of speaking and eating. This study captures the experiences of CSCI patients and their partners during acute admission.

Methods
Semi-structured interviews were carried out with CSCI patients and their partners/carers, who supported their communication. Questions targeted the experience of acute respiratory, nutritional and communication management from admission to the present time. Interviews were audio-recorded, transcribed and subjected to a process of thematic analysis (Braun & Clarke, 2006).

Results
Eight CSCI patients (6 male, mean age 54 years, injury levels C2-C6) were interviewed in their current setting with a partner/carer present. Mean time since injury was 12 months (range 5-27) with average time spent in an intensive care setting being 6 months (range 2-16) before transfer to a SIU. Seven themes were identified: adjustment to acute hospital life, variability of care, communication challenges, dealing with swallowing problems, rehabilitation experience, planning for discharge and emotional impact.

Conclusions
CSCI patients and partners experience extreme emotions and make dramatic adjustments to cope with acute hospital stay, with variations in care creating confusion and anxiety. Despite the devastating injury, transfer delays and variable rehabilitation opportunities, many remain positive about their future life. Staff should maintain consistency of care as this is important for CSCI patients and their families.
The perception of spinal cord injury amongst patients and healthcare providers

Dr Francois Theron¹, Dr A. H Van Niekerk¹, Prof J.G Myburgh¹

¹Consultant Orthopedic Surgeon, Department of Orthopedic Surgery, Pretoria, South Africa

Purpose of the study:
The perception regarding quality of life and outcomes of spinal cord injury (SCI) likely differs amongst healthcare providers compared to survivors of SCI. Reluctance with resuscitative efforts might be based on perceived quality of life following survival of a SCI.

Methods:
Descriptive, cross-sectional study. A web-based questionnaire was distributed to members of QuadPara Association of South Africa (QASA), casualty and rehabilitation centre doctors, registrars, specialists of various disciplines and nurses. Questionnaires were also distributed at the spinal outpatient and rehabilitation clinics.

Results:
From a sample size of 95 SCI individuals, 79% sustained complete SCI with 50% cervical level SCI. A total of 106 medical personnel from various disciplines completed the survey.
62% of medical professionals feel you can enjoy quality life after SCI and 49% would opt not to be resuscitated after personally sustaining a complete quadriplegic SCI, compared to 15% of patients. 62% of medical personnel feel SCI individuals can live a contented life, compared to 83% of patients. 70% of medical personnel feel that quality of life deteriorate over time after SCI, compared to 77% of patients.
46% of doctors have been in a situation where a decision regarding resuscitation of a spinal cord injured patient had to be made.

Conclusion:
Perception amongst medical personnel regarding the quality of life of the spinal cord injured may influence their critical decision making. Healthcare providers’ attitude may affect the care they provide, and influence patients and their families in decision making.
Effect of marital status on satisfaction with life in individuals with spinal cord injury (SCI)

Dr Ioannis - Alexandros Tzanos\textsuperscript{1}, Dr Andreas Mavrogenis\textsuperscript{2}, Dr Evanthia Mitsiokapa\textsuperscript{2}, Dr Konstantina Tziotzou\textsuperscript{1}, Dr Konstantina Gioti\textsuperscript{1}, Dr Nikolaos Groumas\textsuperscript{1}, Dr Panagiotis Papaggelopoulos\textsuperscript{2}

\textsuperscript{1}National Rehabilitation Centre, Ilion, Greece, \textsuperscript{2}Attikon Hospital, Haidari, Greece

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Spinal cord injury individuals usually experience the challenge of beginning a new personal relationship. The potentially beneficial effects of marital life on satisfaction with life of persons with SCI was the purpose of this study.

Methods: One hundred sixty four SCI individuals with a history of SCI of different causes were studied in this survey. They were residents of urban, suburban and rural areas of the greek territory. Questionnaires were completed for each one in interview form and when needed, clinical examination was performed for data collection. The questionnaire included demographic and clinical characteristics. Satisfaction with Life Scale was used for determination of satisfaction with life. Statistical analysis of the findings was performed with t-test.

Results: Married individuals exhibit statistically significantly higher satisfaction with life compared with those who are unmarried (p=0.0005).

Conclusion: Marital life is an important key factor for high satisfaction with life in people with SCI.
Emerging SCI Statistics In Haiti: Challenges and Progress

Miss Fiona Stephenson¹, Dr Herndon Murray², Ms Nathalie Duverger³, Mr Suy Bazelais⁴, Mr David Charles⁵, Ms Sibille Buehlmann⁶

¹Haiti Spinal Cord Injury Working Group, UK, ²Haiti SCI Working Group, USA, ³Haiti SCI Working Group, Port au Prince, Haiti, ⁴Haiti SCI Working Group, Port au Prince, Haiti, ⁵Haiti SCI Working Group, Port au Prince, Haiti, ⁶Haiti SCI Working Group, Cap Haitien, Haiti

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Haiti remains the poorest country in the western hemisphere and faces many challenges. Data relating to Spinal Cord Injury (SCI) has been collected over the past six years by the Haiti SCI Working Group, with the aim of highlighting the needs of men, women and children who have sustained a SCI. A ‘Link Worker’, with a SCI himself, employed by the group has been proactively seeking out patients newly admitted into Port au Prince hospitals, providing support and advice, whilst collecting invaluable data related to their SCI. The emerging statistics continue to reflect progress as well as challenges. Data collected includes mechanism and level of injury, ASIA, survival information, and patient demographics. This vital information is shared with the Haitian Governments’ Department of Disability (BSEIPH), and is helping to highlight the needs of people with disabilities, the requirement for mobility aids, follow up and SCI education.
Physical Disability in a Group of Syrian Refugees in Turkey

Mrs Mediha Guroze\textsuperscript{2}, Asc Prof Nurdan Paker\textsuperscript{1}, Asc Prof Nur Kesiktas\textsuperscript{1}

\textsuperscript{1}Istanbul Pmr Education Research Hospital, Istanbul, Turkey, \textsuperscript{2}TAKMED Eğitim ve Sağlık, Istanbul, Turkey

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: The aim of this study was to determine the disability ratio in between the refugees in Suruç and identifying their needs as well as obtaining them.

Method: On 2.10.2014, on behalf of the Spinal Cord Paralytics Association of Turkey, a comission visited Suruç for six days. Refugees in Suruç were scanned and individuals having a physical disability were recorded.

Results: Ten thousand refugees were scanned within six days. Among them thirtynine were physically disabled. Mean age was 36.4±24.4(1.5-80). Fourteen were female and twentyfive were male. Twentyfive individuals were single (64%), twelve were married (31%) and two (5%) were divorced. Among the disabled group, two individuals were not literate. Identified disabilities were as follows: twenty people (55%) were having paraplegia due to spinal cord injury. Three of them had other disabilities except paraplegia. One had paraplegia and blindness and the other one had paraplegia, mental disability and blindness. The last one had paraplegia and mental disability. six individuals (15%) were having hemiplegia, cerebral palsy were detected in eight children (20%), two people were bearing with poliomyelitis sequelae and two people were having lower extremity amputation (10%).

Conclusion: The physical disability ratio was 0.39% among the refugee group included in the study. Between them almost ¼ were children.
Reported study and sample characteristics in degenerative cervical myelopathy: a systematic review

Mr Benjamin Davies¹, Miss Maire McHugh¹, Dr Ali Elgheriani², Mr Angelos Kolias¹, Dr Lindsay Tetreault², Prof Peter Hutchinson¹, Mr Michael Fehlings², Dr Mark Kotter¹

¹University Of Cambridge, Cambridge, United Kingdom, ²Toronto Western Hospital, Toronto, Canada

Object. Degenerative cervical myelopathy [DCM] is a disabling and increasingly prevalent group of diseases. Variable reporting in interventional trials of study design and sample characteristics limits the interpretation of pooled outcomes. This is pertinent in DCM where baseline factors are known to influence outcome. The present study aims to assess the reporting of the study design and baseline characteristics in DCM as the premise for the development of a standardised reporting set.

Methods. A systematic review of MEDLINE and EMBASE databases, registered with PROSPERO (CRD42015025497) was conducted in accordance with PRISMA guidelines. Full text articles in English, with >50 patients (prospective) or >200 patients (retrospective), reporting outcomes of DCM were eligible.

Results. 108 studies involving 23,876 patients, conducted world-wide, were identified. 33 (31%) specified a clear primary objective. Study populations often included radiculopathy (51, 47%) but excluded patients who had undergone previous surgery (42, 39%). Diagnostic criteria for myelopathy were often uncertain; MRI assessment was specified in only 67 (62%) of studies. Patient comorbidities were referenced by 37 (34%) studies. Symptom duration was reported by 46 (43%) studies. Multivariate analysis was used to control for baseline characteristics in 33 (31%) of studies.

Conclusions. The reporting of study design and sample characteristics is variable. The development of a consensus minimum dataset will facilitate future research synthesis in the future.
Risk factors for dysphagia in acute cervical spinal cord injury

Dr Tetsuo Hayashi¹, Yuichi Fujiwara², Dr Hiroaki Sakai¹, Dr Takeshi Maeda¹, Dr Keiichiro Shiba¹
¹Department of Orthopaedic Surgery, Japan Labour Health and Welfare Organization, Spinal Injuries Center, Iizuka, Japan, ²Nursing department, Japan Labour Health and Welfare Organization, Spinal Injuries Center, Iizuka, Japan

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction. Dysphagia following acute cervical spinal cord injury (CSCI) can increase the risk of pulmonary complications that may cause life-threatening condition. Although several risk factors for dysphagia have been postulated in patients with CSCI, no definitive factors have yet been established, according to a multivariate analysis. The purpose of this study was to elucidate the incidence and risk factors of dysphagia in patients with acute CSCI.

Methods. A total of 298 patients with acute CSCI, who were evaluated for neurological impairment within 3 days after injury, were retrospectively reviewed. CSCI patients with tube dependence due to obvious aspiration after injury were defined as having dysphagia. The factors postulated to increase the risk for dysphagia, including the patient’s age, sex, ASIA impairment scale at three days after injury, level of injury, tracheostomy, and operative treatment, were analyzed by using a multiple logistic regression model.

Results. Of 298 patients, 21 were suffering from severe dysphagia after acute CSCI (7.0%). Of these 21 patients, 12 (57%) had CSCI at the C3-4 level. Multivariable logistic regression analysis revealed that old age (>72 years), severe ASIA impairment scale (A or B), and presence of tracheostomy were significant risk factors of dysphagia. Level of injury ≥C3-4 was not a significant risk factor after adjustment for several potential confounders.

Conclusion. The incidence of dysphagia associated with aspiration was 7%. Old age, severe paralysis, and presence of tracheostomy may be the risk factors for dysphagia. The risk of dysphagia should be evaluated to prevent aspiration pneumonia.
OBJECTIVE: In the last decade, patients with spinal cord injury were aimed to determine the changes in the demographic data, etiology and rehabilitation.

METHODS: Spinal cord injured patients who admitted in our spinal cord rehabilitation unit between 2003-2006 and 2013-2016 were retrospectively analyzed and compared. 100 patients who rehabilitated inpatient in previous years (R1), and 100 patients who rehabilitated inpatient in recent years (R2), were included in the study.

RESULTS: The mean age of R1 was 39,3 ± 14,7 years, and the mean age of R2 was 41,02 ± 17,6 years. The most common etiological factors in R1 were found to be 34% falls, 25% motor vehicle accidents (MVA), 14% gunshot wounds, 6% iatrogenic factors, and the most common etiological factors for R2 were determined as 31% falls, 17% MVA, 11% gunshot wounds, 12% iatrogenic factors. 51% of R1 was admitted for the first time in rehabilitation, and this rate was 46% in R2. The duration of hospitalization of R1 was 2,19 ± 1,2 months and it was 18,42 ± 26,8 months for time since injury, and the duration of hospitalization was 2,07 ± 1,05 months in R2 and time since injury was 26,5 ± 49,5 months, were calculated.

CONCLUSION: The ranking of the most common causes of etiologic factors was unchanged however there is a significant decrease in VMA and increase in iatrogenic causes. Also there seems to be an increase in apply for re-rehabilitation and a decrease in the duration of hospitalization, in recent years.
Spine and spinal cord injuries in a Hill state of India: An epidemiological study

Dr Pranshu Bhargava\(^1\), Dr Rahul Singh\(^2\)
\(^1\)Max Hospital, Dehradun, India, \(^2\)Krishna Hospital, Haldwani, India

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Aim/Introduction: To study the modes of spinal injuries, regional distribution and its relation to topography in the hill state of Uttarakhand, India so as to implement better preventive and prehospital care measures.

Materials and methods: Patients of spinal injuries presenting to two tertiary care centers between January 2013 to September 2015 were included in this study. Data regarding age of patient, mode of injury, level of injury, geographical region, neurological deficit were tabulated. Analysis was also done comparing various levels of injury with the mode of accident and the geographical distribution (Hills vs. plains; Urban vs. rural)

Results: There were a total of 148 patients, 70.3% males; Maximum injuries were in the age group of 20-39 years (41.2%). Most common region involved was cervical (47.9%) followed by lumbar (27.7%). The common modes of injury were Road accident (39.1%) and Fall from height (34.4%): The commonest mode of injury being Road accident for cervical as well as lumbar injuries. For thoracic the commonest mode was road accident. Other modes of injury were simple fall, being hit by animal, fall of heavy object on body, machine related, diving and firearm injuries.

Maximum injuries occurred in urban plains (49.3%) followed by Rural hills. Cervical spine injury accounted for maximum number of cases in both regions, however injuries to lumbar region were more common in urban plains. Cord injury and neurological deficit was seen in 58.1% of patients

Limitation: No follow up
Awareness and current practices in exercise testing and training amongst professionals dealing with wheelchair SCI sports in India- A survey.

Miss Nisha Rawat
Indian Spinal Injury Centre, New Delhi, India

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Gaining popularity of wheelchair competitive sports amongst SCI is directing towards the need to have a uniform framework to assess the physiological changes and corresponding exercise testing and training methods used for them. A survey is conducted in India for the same in which questions were targeted to two group of respondents. Group A were those professionals who are practically providing training to SCI athletes and Group B included physiotherapist and occupational therapist who are not practically dealing with them but have experienced of working in spine rehabilitation.

Methods: A questionnaire is constructed with Expert Panel members. Content validation is done and questions on domains such as physiological changes, barriers and exercise testing and training considerations were included. It was hypothesized that Group A professionals are more aware than Group B. Descriptive data analysis is then done using Xcel.

Results: Z score for difference in group B and A percentages resulted in highly significant p value of <.01 in 90% of the answered questions reflecting lack of awareness in majority of group A respondents. 8% of the responses had very less significant difference of Z score values of <2 and non-significant p values. Negative Z score value appeared in 2% of the given responses.

Conclusion: There is need to recruit qualified trained professionals for SCI athletes. Education programs should be included for the same at national level. Also respondents selected within the group were not stratified according to different states or zones within India which otherwise would have given more broader picture to this survey.
Comparison of the Features of the Spinal Cord Injuries due to Falling Trees and the Other Falls

Asc Prof Nurdan Paker\(^1\), Asc Prof Derya Buğdaycı\(^1\), Dr Demet Tekdöş\(^2\), Dr Halime Kibar\(^1\), Asc Prof Nur Kesiktas\(^1\)

\(^1\)İstanbul Pmr Education Research Hospital, Istanbul, Turkey, \(^2\)Private Hospital, Istanbul, Turkey

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Aim: The aim was to compare the features in spinal cord injured patients due to falling a tree and other falls.

Method: 102 persons with tetraplegia or paraplegia due to a fall from high were included in this cross-sectional study. Demographic and clinical characteristics were recorded. Severity of injury was assessed with American Spinal Cord Injury Association Impairment Scale (AIS). Functional status was evaluated by Functional Independence Measurement (FIM).

Results: 25 people (24.5\%) had tetraplegia or paraplegia due to a fall from tree. Mean age was 47.04 ±14.4 in the falling a tree group and was 35.8 ±15.7 years in the other falls group (p=0.01). Twenty persons (80\%) were men in the falling a tree group. Mean falling height was 4.12±2.223 m in the falling a tree group and was 5.91 ± 4.159 m in the other falls group (p=0.07). AIS was 1.52±0.823 in the falling a tree group and was 1.95±1.146 in the other falls group (p>0.05). Time since injury was 16.68±28.698 months in the falling a tree group and was 13.49±23.352 months in the other group (p>0.05).

Conclusion: As a result, more than 1/4 of the spinal cord injuries due to falling high were due to falling trees. Falling a tree causes a spinal cord injury similar to the other falls from high in terms of injury severity and functional impairment. Because of all the falls were from a fruit tree, using modern picking methods or dwarf junipers for cultivating fruit may help to prevent the injuries.
Does age affect the functional recovery in spinal cord injury (SCI)?

Mr Srinivasa Chakravarty Budithi¹, Dr Laura Smith¹, Dr Alison Seymour¹, Dr Pedro Silva¹, Mr Joy Chowdhury¹

¹Midland Centre for Spinal Injuries, Robert Jones and Agnes Hunt Orthopaedic Hospital, Oswestry, UK, SY10 7AG, United Kingdom

Introduction:
It is still debatable whether age influences functional outcome after SCI. The aim of this study is to analyse the functional outcome in elderly patients with SCI admitted to a specialist rehabilitation centre in comparison to the younger group of patients.

Methods:
Retrospective review of consecutive newly injured patients admitted to a regional spinal injuries centre in UK from April 2014 to March 2015. Demographics, neurological level and impairment were recorded. Functional outcomes using Spinal Cord Independence Measure version III (SCIM III) at the time of mobilisation and discharge were recorded. The SCIM III scores for elderly group of patients (65 years or above) were compared to those of the younger patients in the cohort. T test was used for analysis. p<0.05 was considered significant.

Results:
A total of 130 patients were included. There were 40 patients in the elderly group (Mean age, 73.8; range 65-89) and 90 in the younger group (Mean age, 44.5; range 12-64). Functional improvement was noted in both groups in total SCIM III scores (Mean 19.06, SD 13.29 for the elderly group and Mean 23.62, SD 16.54 for the younger group). However, there was no statistically significant difference between the two groups (p = 0.2895).

Conclusion:
The results of this study suggest that age does not influence rehabilitation outcomes in SCI adults as measured by SCIM III. Elderly patients with SCI should have provision of similar specialist rehabilitation services as younger patients.
Hyperglycemia impairs functional recovery after spinal cord injury

**Dr Kensuke Kubota**¹, Dr Kazu Kobayakawa², Dr Seiji Okada³, Dr Hiroaki Sakai¹, Dr Takeshi Maeda³, Dr Eiji Mori¹, Dr Itaru Yugué¹, Dr Osamu Kawano¹, Dr Tsuneaki Takao¹, Dr Muneaki Masuda¹, Dr Yuichiro Morishita¹, Dr Tetsuo Hayashi¹, Dr Akinobu Matsushita¹, Dr Takayoshi Ueta¹, Dr Keiichiro Shiba¹

¹Department of Orthopaedic Surgery, Spinal Injuries Center, Izuka, Japan, ²Emergency & Critical Care Center, Kyushu University Hospital, Fukuoka, Japan, ³Department of Advanced Medical Initiatives, Graduate School of Medical Sciences, Kyushu University, Fukuoka, Japan

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

**Introduction**

Spinal cord injury (SCI) is a devastating event for individuals and a major public health problem. It is necessary to identify any exacerbating factor in SCI to avoid deterioration of neurological function after SCI. Hyperglycemia is suggested to be associated with poor prognosis of several diseases such as myocardial infarction, liver dysfunction, and brain ischemia. However, the effect of hyperglycemia on the functional outcomes after SCI remains unclear. The objective of this study is to clarify the effects of hyperglycemia on the functional outcomes after SCI.

**Methods**

We retrospectively identified 768 SCI patients admitted within 24 hours after injury to the Spinal Injuries Center between June 2005 and May 2014. The blood glucose concentration was measured immediately after being transported to our hospital. We examined the relationships between the admission blood glucose concentration values and other functional/clinical measurements, including American Spinal Injury Association (ASIA) Impairment Scale grade.

**Results**

Pearson x2 analysis of data for 768 patients with SCI indicated that hyperglycemia on admission (glucose concentration ≥ 126 mg/dl) was a significant risk predictor of poor functional outcome. Moreover, a multiple linear regression analysis showed hyperglycemia at admission to be a powerful independent risk factor for a poor motor outcome, even after excluding patients with diabetes mellitus with chronic hyperglycemia.

**Conclusions**

Hyperglycemia during acute SCI may be a useful prognostic factor with a negative impact on motor function, highlighting the importance of achieving tight glycemic control after central nervous system injury.
Metabolic efficiency of functional electrical stimulation (FES) cycling

Dr Toshiki Matsunaga¹, Dr Kimio Saito¹, Dr Norimitsu Masutani², Dr Takashi Mizutani², Dr Ryota kimura², Dr Yosuke Iwamoto⁵, Dr Jumpei Iida², Dr Yasuhiro Takahashi², Mr Satoaki Chida¹, Mr Kazutoshi Hatakeyama¹, Mr Motoyuki Watanabe¹, Mr Yusuke Takahashi¹, Mr Junki Ishikawa¹, Mr Takehiro Iwami³, Dr Yoichi Shimada²

¹Department of Physical Medicine and Rehabilitation, Akita University Hospital, Akita, JAPAN, ²Department of Orthopedic Surgery, Akita University Graduate School of Medicine, Akita, JAPAN, ³Akita University Graduate School of Engineering Science, Akita, JAPAN

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

【Purpose】Functional electrical stimulation (FES) cycling is an exercise that allows persons with paralyzed leg due to spinal cord injury (SCI). Significant improvements in physical status in SCI persons by FES cycling were reported, however, the metabolic efficiency of FES-cycling is lower than that of normal cycling. The aim of this study was to compare the metabolic efficiency of FES and volitional cycling in able bodied individual.

【Methods】A-20-year able bodied male was volunteered in this study. We developed an original FES cycling ergometer system, with accurate control of cadence and stimulated exercise work-rate. Two types of test (10 minutes) were performed and compared: FES cycling and volitional cycling. Stimulated muscles for the FES cycling were both quadriceps and hamstrings. Stimulation frequency was 20Hz, and amplitude was 25mA. During cycling, pulmonary oxygen uptake was measured in real time and used to determine the oxygen cost of the exercise.

【Results】The mean metabolic efficiency of FES cycling was 11.6% and that of volitional cycling was 21.9%.

【Conclusion】The metabolic efficiency of FES cycling was a half of volitional cycling. The reasons of the discrepancy of metabolic efficiency between FES and voluntary cycling may be the numbers of activated muscle for cycling and the timing of stimulation. Further study should focus on to optimize the stimulation muscles and patterns.
Optimizing mobility outcomes across locomotor training modalities: Clinical reflection during development of the PRIME algorithm – A case series

Ms. Stephanie Cornell¹, Ms. Melissa Fielding¹, Ms. Jane Hsieh¹, Mrs. Stephanie Marrocco¹, Dr. Dalton Wolfe¹,²
¹Parkwood Institute, London, Canada, ²University of Western Ontario, London, Canada

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Therapeutic modalities for locomotor training are often studied in isolation, whereas practice is guided by therapist preference and resource availability/feasibility. The Parkwood Program for Rehabilitation Innovations in Movement Enhancement (PRIME) system is an algorithmic approach to the integrated, and optimal use of available modalities customized to individuals. Three case studies, presented here, have guided the refinement of the PRIME system.

Methods: 3 participants (2 non-trauma, 1 trauma, >4 months onset) previously plateaued (re: locomotor outcomes, n=2) were staged according to the Canadian SCI Standing and Walking Assessment Tool (C-SWAT). The stage was constantly reassessed and considered alongside goals and other therapeutic principles (e.g., facilitating kinematics, minimizing compensation) in order to select modalities. Participants underwent at least 8 months of outpatient therapy involving 1 or more of robotic or manual BWS treadmill / robotic or manual overground therapy.

Results: In all 3 cases, participants improved in their C-SWAT stage (i.e., progression to independent ambulation), walking speed, level of assistance and balance. Notably, transitions between modalities (e.g., Lokomat to exoskeleton) were especially critical in achieving improvements.

Conclusion: The algorithm embedded in the PRIME system supported clinical decision-making and associated progression to more functional ambulation. Therapy shifted from more supportive robotic modalities to the manual environments to minimize compensation of upper extremities, and optimize lower limb and trunk voluntary movement. The algorithm is being integrated within an IT solution including data management functions in order to support a practice-based research environment that promotes continued clinical reflection and practice improvement.
Swallowing Function in Cervical Spinal Cord Injury

Dr Hyun Tak Song¹, Dr Kang Hee Cho¹, Dr Kyu Ho Lee¹, Dr Kyo Jun Youn¹, Dr Min Soo Joen¹, Ms Mi Ok Youn¹
¹Chungnam National University Hospital/department Of Rehabilitation, Daejeon, South Korea

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Objective: To investigate the characteristics of swallowing function in cervical spinal cord injury (SCI) patients and to find the factors affecting the occurrence of penetration or aspiration, retrospectively.

Methods: A total of 36 cervical SCI patients, in which videofluoroscopic swallowing study (VFSS), fiberoptic endoscopic evaluation of swallowing (FEES) were conducted. The patients were divided into 2 groups (Penetration group; the patients with penetration or aspiration based on the results of Modified penetration aspiration scale (mPAS), Videofluoroscopic dysphagia scale (VDS), Non-penetration group; the patients without penetration or aspiration). The factors associated with dysphagia (age, presence of tracheostomy, history of spine surgery, surgical approach, neurologic level of injury, ASIA impairment scale, cognitive, pulmonary, motor function and performance in activities of daily living) were compared between 2 groups.

Results: The incidence of dysphagia was 33.3% in SCI patients. The abnormal findings of VDS were observed in almost all patients (97.2%). Most patients showed abnormal findings in the premature bolus loss (52.8%), pyriform sinus residue (61.1%), coating on the pharyngeal wall (88.9%). The follow-up study was performed in 15 patients. Among them, the total score in VDS was improved in 8 patients (53.3%). Sixteen of 36 cervical SCI patients (44.5%) were included in the penetration group. Penetration or aspiration were significantly increased in SCI patients with tracheostomy (p<0.05).

Conclusion: Dysphagia and abnormal findings in swallowing process after cervical SCI was common. Especially, presence of tracheostomy could be identified as the affecting factors for the occurrence of penetration or aspiration.
Virtual Intelligent Systems for Shoulder Rehabilitation for Persons Living with Spinal Cord Injury in India: A Preliminary Report

Dr Chitra Kataria¹, Mr Deepak Kumar², Ms Nishu Tyagi¹, Dr Neelesh Kumar²

¹Indian Spinal Injuries Centre, New Delhi, India, ²Central Institute of Scientific Organization, Chandigarh, India

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Shoulder rehabilitation is very important for people with spinal cord injury (SCI). Introduction of innovative Rehabilitation techniques might help to improve shoulder problems.

Objective: To evaluate the effectiveness and satisfaction using Virtual Intelligent System among people with SCI.

Methodology: 15 SCI patients of C5-C6 level AIS A-D were selected. A low cost virtual reality intelligent system with Kinetic camera, was used to strengthen shoulder movements followed by virtual games ‘Tracing’ and ‘Reaching’ for 30 minutes, 5 days/week for 3 weeks. Outcome Measures: Visual Analogue Scale for pain and fatigue, Suitability Evaluation Questionnaire (SEQ).

Result: All subjects showed significant improvement in ROM and Muscle strength. Minimal clinical differences in pain and fatigue scores were found to be statistically significant with a mean change in scores being 6.67 to 6.07 and 6.13 to 5.13 on the VAS respectively. On SEQ feedback, 94% clients reported that they enjoyed the Virtual Intelligent System. 80% responded that they were able to control system, information was clear and easy to understand. 20% experienced dizziness especially in standing. 95% clients responded it as useful and could be used in home therapy.

Conclusion: The low cost system that we have developed provides intelligent information which is of clinical value such as Range of Motion alongside providing a feedback to the patient about his performance. Thus, termed as being virtual and also intelligent, hence the name "Virtual Intelligent System". Quantified progress results motivate patients to complete the exercises crucial to their rehabilitation.
Assessment of Cognition after Spinal Cord Injury with the NIH Toolbox – Cognitive Battery

Dr. Matt Cohen¹, Professor Allen W. Heinemann⁴,⁵, Dr. James A Holdnack¹², Dr. Noelle A. Carozzi³, Dr. Alex Wong⁶, Professor Robert K Heaton⁷, Pamela A Kisala¹, Professor David S Tarsky¹⁸

¹Center On Assessment Research & Translation, University Of Delaware, Newark, United States, ²Pearson Assessments, San Antonio, USA, ³University of Michigan Medical School, Ann Arbor, USA, ⁴Rehabilitation Institute of Chicago, Chicago, USA, ⁵Feinberg School of Medicine, Northwestern University, Chicago, USA, ⁶Washington University, St. Louis, USA, ⁷University of California, San Diego, San Diego, USA, ⁸Kessler Foundation, West Orange, USA

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Individuals with spinal cord injury (SCI) may have cognitive limitations due to concomitant traumatic brain injury, disrupted sleep, chronic pain, medication side effects, and/or other factors. Previous investigations have been limited by ad hoc batteries of tests that reference different normative data sets and that inconsistently standardized across demographic factors. The aim of this investigation is to compare the cognitive profiles of a well-characterized sample of participants with SCI with control participants using cognitive tests that reference the same normative data and that are standardized using a consistent set of important demographic factors.

Methods: 156 community-dwelling individuals with SCI were recruited from three academic medical centers (Injury levels C1 through L4; AIS score distribution: 40%A, 15%B, 12%C, 21%D, 12% other/missing). Analyses were on demographically-adjusted subtest and composite scores from the NIH Toolbox – Cognitive Battery (NIHTB-CB).

Results: Individuals with SCI and control participants performed equivalently on the NIHTB-CB crystallized composite score, suggesting comparable premorbid cognitive functioning. Individuals with SCI produced lower scores than control participants on tests of processing speed, executive function, and episodic memory. The effect sizes were small (partial eta 0.02 – 0.05), but persisted even when statistically controlling for fine motor speed and dexterity.

Conclusions: Community-dwelling individuals with SCI are at elevated risk of having mild cognitive difficulties, particularly on tasks requiring fast processing speed and executive function. The effects of these limitations on independent living deserve further investigation. The minimum level of hand functioning needed to complete the NIHTB-CB also requires further investigation.
Autonomic function tests for Dysreflexia in Spinal Cord Injuries

Dr Ellen Merete Hagen¹, Dr Gordon T Ingle¹, Dr Valeria Iodice¹, Dr Ekawat Vichayanrat¹, Mrs Lydia Mason¹, Mrs Katharine Bleasdale-Barr¹, Mr Ian Skeavington¹, Dr Judith Navarro-Otano¹,²

¹Autonomic Unit, National Hospital for Neurology and Neurosurgery, Queen Square, London, UK, London, United Kingdom; ²Neurology Department, Hospital Clinic, Barcelona, Spain, Barcelona, Spain

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Spinal Cord injury (SCI) may interrupt autonomic pathways leading to disturbed cardiovascular homeostasis. Autonomic Dysreflexia (AD) is an increase in blood pressure >20 mmHg above baseline in patients with SCI above T6 in response to noxious or non-noxious stimuli below lesion level. This increase may accompanied by headache, flushing and sweating above lesion level, vasoconstriction below lesion level, or dysrhythmias, can occur at any time following SCI and can be lethal. AD is usually tested for in specialized autonomic units.

Methods: A retrospective study including patients with SCI referred between 2003 and 2015 for examination of possible AD with review of demographical data and AD tests; bladder pressure, bladder tapping, application of cold pad below the lesion level, Achilles heel pinch and provocation of leg spasms. Autonomic screening tests and 24-hour ambulatory blood pressure monitoring (AMBP) were performed in most cases.

Results: 46 patients with a diagnosis SCI were identified (29.2% women, mean age when tested 53.2 years). Level of injury was cervical (50.0%), thoracic (33.3%) and unknown (16.7%). AD was induced during bladder pressure (17.1%), bladder tapping (28.5%), and cold pad below level of injury (15.9%), Achilles heel pinch (11.9%) and provocation of leg spasms (40.9%). No major complications occurred during testing.

Conclusion: Bladder tapping and provocation of leg spasms most frequently induced AD which could persist for 48 hours. AD may lead to severe complications and avoidance of these tests is recommended. 24-hour AMBP applying autonomic protocols may be a safer way to detect AD.
Functional Outcome Of Patients With Spinal Cord Atrophy Secondary To Traumatic Myelopathy - From Paediatrics to Adulthood: Case Series

Dr Brenda Saria Yuliawiratman, Prof Dr Amaramalar Selvi Naicker, Assoc Prof Dr Rashidah Ismail Ohnmar Htwe

1National University of Malaysia, Kuala Lumpur, Malaysia

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Study design: Case series
Objective: To present two patients with paediatric onset traumatic spinal cord injury with resultant spinal cord atrophy and functional outcome and progress through adulthood.
Setting: Rehabilitation Unit, Department of Orthopaedics & Traumatology, UKM Medical Centre
Methods: Case series
Results: 1 patient with spastic quadriparesis secondary to suspected birth trauma (Patient 1) and 1 patient with spastic quadriparesis secondary to alleged fall at 10 years old (Patient 2) were included in this case series. Both presented to our centre during early adulthood due to functional deterioration. MRI of patient 1 revealed spinal cord atrophy from C3-C6 while MRI of patient 2 had non united odontoid fracture with severe SC stenosis and cord atrophy. Functionally at present (both patients after 10 years of follow-up), patient 1 is independent in her ADLs and ambulating independently although requiring frequent botulinum toxin injections for her spasticity, while patient 2 requires some assistance and set up in her ADLs, requires a walker to ambulate and is dependent on wheelchair for long distance ambulation. Reduced muscle power was more marked compared to presence of spasticity in patient 2. Both patients had developed kyphoscoliosis.
Conclusion: Spinal cord atrophy is a rare condition. MRI imaging of the spine is helpful to diagnose this condition. Both patients have cervical cord atrophy with differing functional outcomes and treatment approaches. Early recognition could prevent severe scoliosis. Long-term follow-up and therapy is required to prevent deterioration in function and condition.
Keywords: paediatrics, spinal cord injury, cord atrophy, functional outcome
Internationalization of the EMSCI ISNCSCI calculator - exemplarily illustrated by the Chinese translation

Mr Christian Schuld¹, Dr Steffen Franz¹, Mr Joachim Schweidler¹, Dr Huayi Xing², Dr Mouwang Zhou², Dr Norbert Weidner¹, EMSCI Study Group³, Dr Rüdiger Rupp¹, Dr Nan Liu²
¹Heidelberg University Hospital, Spinal Cord Injury Center, Heidelberg, Deutschland, ²Department of Rehabilitation Medicine, Peking University Third Hospital, Beijing, China, ³European Multicenter Study about Spinal Cord Injury,

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction:
ISNCSCI calculators have become powerful tools over the last years. They assist clinicians and researchers in data management and the up-to-date ISNCSCI classifications. Until now calculators are available in English language only. For an increased acceptance and dissemination a multilingual support is necessary. The aim of this work was to extend the ISNCSCI calculator (https://ais.emsci.org) of the European Multicenter Study on Human Spinal Cord Injury (EMSCI) to support multiple languages. The second most often spoken language Standard Chinese (“Mandarin”) was chosen for the first translation.

Methods:
The user interface and PDF export was internationalized by using the GNU gettext (https://gnu.org/software/gettext/) framework. All English terms used to create dynamical content are automatically collected and compiled to message catalogs, which can be edited by translators independently from the source code. Translated message catalogs are loaded during the start of the application allowing for language selection at runtime.

Results:
The main user interface of the online version is available in Chinese language including all written terms on the front side of the ISNCSCI worksheet, which forms the basis for the PDF export. The default language is set according to the user’s web browser settings. Additionally, links for manual language selection are provided in the user interface.

Conclusion:
The technical basis for a multilingual ISNCSCI calculator was established and exemplified in Chinese language. It is planned to introduce more languages in the future to increase the acceptance of the application and to contribute to a better understanding of ISNCSCI in general.
Emergency Response Lessons Learned from perspective of Spinal Injury Rehabilitation Centre, Nepal

Mr Stephen Muldoon2, Mrs Esha Thapa Dungana3, Miss Fiona Stephenson1, Dr Katrina Collins4
1Spinal Injury Rehabilitation Centre (SIRC), Nepal, 2Livability, UK, 3Spinal Injury Rehabilitation Centre (SIRC), Nepal, 4Collins Consultancy, UK

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: According to the Post Disaster Needs Assessment the earthquake of April 25th and May 12th 2015, claimed the lives of 8790 people and an estimated that 22300 were injured. Over half a million houses were destroyed and 770000 families were rendered homeless. On 25th April SIRC had 38 patients, by 25th Aug they had 87 inpatients and in total provided life saving rehabilitation services to 148 earthquake survivors.

Methodology: Comprehensive retrospective review of actions taken during the post-disaster period was conducted. Specific focus is given to strategic steps that included organisation of human, materials/logistics, financial and information resources that informed action planning and decision making regarding treatment and rehabilitation of SCI patients at SIRC.

Results: A number of interlocking and parallel processes emerged which contributed to SIRC’s multi disciplinary, multi sectoral response to individuals with SCI. These included;
1: Eagerness/openness to change/adaptation by SIRC Board/Management Committee
2: Strong local response and local capacity
3: Availability of technical and human resource capacity
4: Establishment of Step-down Rehabilitation, Discharge planning, Community outreach services
5: Coordination and Collaboration nationally/internationally
6: Policy and strategic participation and recognition at National level
7: Technical/Human resource development/support
8: Secured funding

Conclusion: Developments in policy and strategic response took place which strengthened the national position on rehabilitation and disability. Lessons have been considered relating to the WHO Health Systems Framework to guide future planning/preparedness processes when responding to individuals with rehabilitation needs in emergency situations, with special attention paid to community care and life long follow up.
Minimally Clinical Important Difference of a Clinical Impairment Measure Specific for Traumatic Tetraplegia: Multi-Centre Assessment of the GRASSP Version 1.0

Dr Sukhvinder Kalsi-Ryan1,4, Justin Wang1, Dr. Dorcas Beaton3,4, Dr. Armin Curt2, Dr Milos Popovic1,4, Professor Molly Verrier1,4, Dr. Michael Fehlings1,4

1 University Health Network, Toronto, Canada, 2 University Hospital, Balgrist, Zurich, Switzerland, 3 St. Michaels Hospital, Toronto, Canada, 4 University of Toronto, Toronto, Canada

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: GRASSP consists of 5 scores that characterize the upper limb. Reliability, validity, responsiveness and minimally detectable difference (MCID) are established. MCID is required to establish GRASSP use in efficacy and interventional studies. Objectives: 1) Establish MCID values for GRASSP and 2) summarize how GRASSP can be applied in clinical/interventional trials

Methods: Prospective longitudinal study for patients with acute traumatic cervical SCI was conducted. Serial testing consisted of GRASSP, International Standards for Neurological Classification for Spinal Cord Injury (ISNCSCI) and patient questionnaire acquiring patients perception of change over time were administered 0 to 10 days, 1, 3, 6, and 12 months post injury. Analysis: Validated anchor-based approach, SD approach and SEM were calculated for each subtest

Results: Sample: n=53; NLI ranging from C2 to T1 (AIS A=11, B=5, C=16, D=23) at baseline. MCID values for the group of individuals perceiving their upper limb impairment to be much better were: 16(10.9–21.1) for strength, 5(2.3–7.7) for sensation, 4(0.9-7.1) & 9(4.2-13.8) for prehension, values represent whole sample from 1 to 6 months post injury. Conclusion: MCID of GRASSP can be a useful property to establish efficacy of interventions as well as meaningfulness of change as related to patients. MCID remains to be an elusive psychometric property, the benefit of an available value/s contributes to the researchers understanding of the treatment effect. Recommendation: Application of GRASSP MCID values are for group-level analysis as opposed to assessing individuals. GRASSP MCID values provide a basis for sample size calculations and endpoint development for future investigations.
Reliability and Validity of the Activities-specific Balance Confidence Scale in Incomplete Spinal Cord Injury

Garima Shah¹,², Dr. Alison Oates³, Tarun Arora⁴, Dr. Joel Lanovaz⁴, Dr. Kristin Musselman¹,⁴,⁵

¹SCI Mobility Lab, Toronto Rehabilitation Institute-University Health Network, Toronto, Canada, ²Dept. of Neuroscience, University of Toronto, Toronto, Canada, ³College of Kinesiology, University of Saskatchewan, Saskatoon, Canada, ⁴College of Medicine, University of Saskatchewan, Saskatoon, Canada, ⁵Dept. of Physical Therapy, University of Toronto, Toronto, Canada

Introduction: The Activities-specific Balance Confidence (ABC) Scale is used to measure balance self-efficacy in individuals with incomplete spinal cord injury (iSCI); however, the scale’s psychometric properties in this population are unknown. This study assessed the test-retest reliability and validity of the ABC Scale in individuals with iSCI.

Methods: Twenty-two adults with chronic iSCI (18 males, 59.4±19.3 years old, 17 AIS-D, 5 AIS-C) completed the following clinical tests: ABC Scale, MiniBESTest, 10-meter walk test (10MWT), Spinal Cord Injury Functional Ambulation Profile (SCI-FAP), and measures of lower limb proprioception and cutaneous pressure. Center of pressure (COP) was recorded while standing on a force platform (OR6-7, AMTI). Another ABC Scale was completed 2-4 weeks later to evaluate test-retest reliability (intraclass correlation coefficient (ICC)). To evaluate convergent validity, ABC scores were correlated with clinical test scores and COP measures (e.g. velocity, area) (Pearson’s r). To evaluate discriminative validity, ABC scores of participants with iSCI and 22 age- and gender-matched able-bodied (AB) participants were compared (independent t-tests).

Results: Test-retest reliability was high (ICC=0.90, 95% CI=0.77-0.96). ABC scores were strongly correlated with MiniBESTest scores (r=0.60, p=0.004), 10MWT (self-selected and fast speeds, r=0.70-0.77, p<0.001), and SCI-FAP (carpet, obstacles, stairs and step tasks, r=-0.56-0.69, p<0.009). ABC scores did not correlate significantly with measures of sensory function or COP. Participants with iSCI scored significantly lower on the ABC Scale than their AB counterparts (64.45±19.99% and 93.52±7.66%, respectively, p=0.001).

Conclusions: In this small sample of individuals with iSCI, the ABC Scale was a valid and reliable measure of balance self-efficacy.
Reported outcome measures in degenerative cervical myelopathy: a systematic review

Mr Benjamin Davies¹, Miss Maire McHugh¹, Dr Ali Elgheriani², Mr Angelos Kolias¹, Miss Lindsay Tetreault², Prof Peter Hutchinson¹, Dr Michael Fehlings², Dr Mark Kotter¹

¹University Of Cambridge, Cambridge, United Kingdom, ²Toronto Western Hospital, Toronto, Canada

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Object. Degenerative cervical myelopathy [DCM] is a disabling and increasingly prevalent group of diseases. Heterogeneous reporting of trial outcomes limits effective inter-study comparison and optimisation of treatment. This is recognised in many fields of healthcare research. The present study aims to assess the heterogeneity of outcome reporting in DCM as the premise for the development of a standardised reporting set.

Methods. A systematic review of MEDLINE and EMBASE databases, registered with PROSPERO (CRD42015025497) was conducted in accordance with PRISMA guidelines. Full text articles in English, with >50 patients (prospective) or >200 patients (retrospective), reporting outcomes of DCM were eligible.

Results. 108 studies, assessing 23,876 patients, conducted world-wide, were identified. Reported outcome themes included function (reported by 97, 90% of studies), complications (reported by 56, 52% of studies), quality of life (reported by 31, 29% of studies), pain (reported by 29, 27% of studies) and imaging (reported by 59, 55% of studies). Only 7 (6%) studies considered all of domains in a single publication. All domains showed variability in reporting.

Conclusions. Significant heterogeneity exists in the reporting of outcomes in DCM. The development of a consensus minimum dataset will facilitate future research synthesis.
The analysis of the difference of the dynamic sitting balance and static standing balance.

Dr YASUHIRO TAKAHASHI, Dr TOSHIKI MATSUNAGA, Dr NAOHISA MIYAKOSHI, PT KAZUTOSHI HATAKEYAMA, Dr KIMIO SAITO, Dr YOICHI SHIMADA

Department of Orthopedic Surgery, Akita University Graduate School of Medicine, Akita, Japan

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

【Introduction】

In order to safely quantitatively measure the trunk balance, we previously reported that it has developed a balance measuring device by dynamic sitting.

【Purpose】The purpose of this analysis was to study of muscle strength through comparison of trunk balance measured using a sitting balance device and static standing balance measured using a standing body sway device.

【Subject】Healthy 40 males (mean age 44 years) and 49 females (mean age 47 years), who can be a normal walking, participated in this study.

【Method】We measured the trunk balance in a dynamic sitting balance device and the static standing balance in a standing postural sway device. Both were evaluated the total trajectory length of the center of pressure point. Muscle strength was measured grip strength, quadriceps muscle, iliopsoas muscle and the back strength. We examined the relationship between each of the balance ability and muscle strength.

【Result】Dynamic trunk balance and static standing balance did not correlate. Although static standing balance and each muscle was no significant correlation, it was a significant correlation to the dynamic trunk balance and back strength. Adverse events such as falling did not occur.

【Conclusion】There was no correlation between the dynamic trunk balance and static standing balance. It was considered because it reflects the dynamic balance ability, different from the static standing sway test that carried out as balance ability test usually. This device is very useful that can be safely and precisely measuring the dynamic balance and can be safely constructed against elderly people.
Use of outcome measures in spinal cord injury medicine. Results of an internet survey

Dr Giorgio Scivoletto, Dr Monica Torre, Dr Silvia Ottaviani, Dr Federica Tamburella, Dr Marco Molinari

1 Spinal Unit, IRCCS Fondazione S. Lucia, Rome, Italy

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction
Although nowadays there are several outcome measures assessing all area of interest in spinal cord injury, little is known about the frequency of their use. Aim of the study is to evaluate the frequency of use of assessment scales in spinal cord injury rehabilitation.

Methodology:
We selected a set of rating scales all validated for use in spinal cord injury (http://www.scireproject.com/outcome-measures) and prepared a survey via Internet, asking the participants, for the different areas of interest, what outcome measures they used. The survey was sent to 800 professionals involved in the care and research of spinal cord injuries. The areas of interest were: assistive technology, community reintegration, upper limb, lower limb and gait, spasticity, pain, neurologic status, sexual function, mental state, quality of life, secondary conditions, independence in activities of daily life, skin status, wheelchair mobility.

Results:
One hundred and forty one (17.5 %) professionals answered the survey. The areas of interest assessed by most of the participants were neurological status, upper limb, lower limb and gait and pain. For other areas, such as community reintegration, assistive technology, wheelchair mobility, the majority of respondents said they did not evaluate these areas. The most widely used rating scales were the Spinal Cord Independence Measure, the Functional Independence Measure and the International Standards for Neurological Classification of SCI.

Conclusions:
Despite the availability of several outcome scales, the practice of evaluating with standardized measures is still not widespread, if not for the areas of greatest interest.
Using the Spinal Cord Independence Measure Self Reported (SCIM-SR) to assess spinal cord injury (SCI) outpatients.

OT Maru Marquez\textsuperscript{1}, PT Tatiana Bianconi\textsuperscript{2}, Dr Giorgio Scivoletto\textsuperscript{3}

\textsuperscript{1}Centro Paraplegici Ostia, Ostia, Italy, \textsuperscript{2}Niguarda Ca' Granda Hospital Milano, Milan, Italy, \textsuperscript{3}IRCCS Santa Lucia Roma, Roma, Italy

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Background and aim
The SCIM-SR is the self reported version of the most commonly used outcome measure for SCI patients. Aim of the following study is to assess a cohort of outpatients with this measure to evaluate if, after discharge from rehabilitation hospital, there is a modification of the level of independence.

Patients and methods
We evaluated 101 SCI patients between 16 and 75 years. All patients scored their independence with the SCIM-SR 20 days before discharge (T0), at discharge (T1) and 2 months after discharge (T2). At discharge, patients have been evaluated also by SCIM III. Statistic: Paired Student’s T test and Pearson’s correlation.

Results
Pearson’s correlation showed good levels of correlations of the three SCIM-SR evaluations and between these evaluations and the SCIM III administered by professionals (between 0.70 and 0.94). The analysis of the SCIM-SR subscores along the three evaluations showed that patients continued to improve their level of independence, in particular in the domains of transfers and mobility and maintained the level of independence of the other domains that they reached at discharge.

Discussion
Our results demonstrated that the SCIM-SR is a valid outcome measure, especially to assess SCI patients after discharge, at home and in the community. Second, we showed that all the patients of the study reached good levels of independence during rehabilitation and that they were able to maintain and even increase these levels while at home.
Validation of the instrumental assessment of trunk control using inertial sensors in individuals with spinal cord injury

Dr Marco Romero

Instituto Mexicano Del Seguro Social, CIUDAD DE MÉXICO, Mexico

INTRODUCTION: Clinical assessment of trunk control is not enough sensitive to detect and/or describe a possible improvement. Hence, there is a need for objective and reliable assessment tools to demonstrate the efficacy of different interventions in clinical practice. GENERAL OBJECTIVE: To establish the validity and reliability of inertial sensors (IMUs) to assess trunk control in spinal cord injury (SCI) subjects. MATERIAL AND METHODS: A cross-cutting study was performed where 22 non SCI subjects and 37 SCI subjects who fulfilled inclusion criteria were recruited. After signature of informed consent, there was held a concurrent application of the trunk control test (TCT) and the instrumental assessment (using IMUs on the head and the trunk of subjects) with repeated measures three times of selected items, in an interleaved and random manner. Concurrent validity was assessed by measuring correlations between items of TCT and IMUs assessment. Test-retest reliability was measured by correlations of items with repeated measures. RESULTS: High validity and test-retest reliability was found in the areas of static equilibrium of TCT, measured both in the head and in the trunk. They also showed that the use of IMU is able to distinguish between healthy and SCI subjects, subjects that perform gait and those who do not. CONCLUSION: It was demonstrated that the IMU usage has high validity and reliability when measuring static control of the trunk; besides, it is capable of differentiating between healthy subjects and SCI subjects, as well as those who perform gait from those who do not.
Introduction
Pilocytic astrocytomas are well circumscribed tumours and are considered benign with malignant transformation to high grade gliomas only happening in less than 5% of cases. We discuss a case outlining the multiple ethical and management challenges, while treating a young adult in a tertiary spinal cord injury rehabilitation centre.

Method
A 21 year old male university student with a long history of a thoracic pilocytic astrocytoma partially excised at age of 7. He developed Hydrocephalus and thoracic scoliosis which required VP shunt and multiple instrumentations. In 2014 he developed worsening lower limb weakness and recurrence of the thoracic tumour at T1-T7. Revision was complicated with CSF leak, hematoma and wound infection requiring a flap. Patient was admitted to the unit for rehabilitation with T1 AIS A neurology.
Over four weeks the patient continued to deteriorate. MRI showed a growing tumour at C7 with a syrinx above and below the tumour. He underwent a palliative syringopleural shunt. Patient continued to have symptoms of nausea, fatigue, neuropathic pain and respiratory distress and progressed to C4 AIS A due to tumour progression to the brainstem and cerebellum.

Conclusion
Patient and carers struggled to accept irreversible deterioration in unexpectedly rapidly progressing tumour. On a rehabilitation unit it is extremely difficult to arrange involvement of various professionals, management of terminal symptoms, discussions about advanced care planning, end of life care decisions and safe discharge home with palliative care input in a short time. Neuro palliative care should be considered and prioritized at the earliest.

Ms Kristen Walden¹, Ms Lise Belanger², Mr Eduardo Echeverria¹, Ms Glenys Maclsaac¹, International ISNCSCI Algorithm Working Group, Dr Vanessa Noonan¹,²
¹Rick Hansen Institute, Vancouver, Canada, ²Department of Orthopedics, University of British Columbia, Vancouver, Canada

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction
Challenges in accurately classifying the level and severity of SCI have identified the need for computerized algorithms. The Rick Hansen Institute-ISNCSCI Algorithm (Algorithm) was developed in 2012 and is freely available. The objective of this study was to evaluate Algorithm utilization and impact in education, clinical care, and research.

Methods
The evaluation examined the utilization and impact of the Algorithm since its 2012 release. Utilization was measured by the number of website visits, global user representation, source-code downloads, and translation into other languages. Education impact was evaluated by examining feedback from the Algorithm website and from participants during ISNCSCI clinical training. Clinical impact was evaluated by number of electronic medical records (EMRs) using it. Research impact evaluation included impact on 2 studies hosted on RHI’s Global Research Platform.

Results
As of January 2016, utilization of the Algorithm included: website access from 149 countries (37,350 visits), 385 source-code downloads, and translation into Chinese. Impact included: 1) Education—Incorporation into ISNCSCI clinical training at 14 Canadian SCI centres and obtaining feedback. 2) Clinical—Algorithm inclusion requests for 4 EMRs. 3) Research—3 SCI registries [US, Canada and Australia] have incorporated the Algorithm to improve data quality. The Algorithm corrected classification for 16% of Rick Hansen SCI Registry ISNCSCI exams (1850/11357) and supported clinical trial eligibility screening for 382 patients.

Conclusions
The Algorithm is being used globally to support clinical care, education, and research. Evaluation is ongoing with a focus on clinical impact. Information obtained will be used to guide future development.
Developing and implementing a spinal cord injury cognitive behaviour therapy pain management programme from the clinician’s perspective.

Miss Dearbhla Burke¹, Dr Olive Lennon¹, Dr Maeve Nolan², Miss Sorcha Barry², Miss Fiona Maye², Dr Eimear Smith², Dr Brona Fullen¹,³

¹University College Dublin, Dublin, Ireland, ²The National Rehabilitation Hospital, Dublin, Ireland, ³The Centre for Translational Pain Research, University College Dublin, Dublin, Ireland

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Following spinal cord injury (SCI), neuropathic pain (NP) is common and largely refractory to current management strategies. Multi-disciplinary, cognitive behaviour therapy pain management programmes (CBT-PMP) can significantly improve mood, pain coping and life participation post SCI [1-3]. No study has investigated the development and running a SCI CBT-PMP from a clinician perspective. Hence this qualitative study explored perspectives of a multidisciplinary team of implementing a pilot CBT-PMP for NP post SCI.

Methods: Five clinicians (clinical psychologist, two physiotherapists, occupational therapist and a rehabilitation consultant) participated in a semi-structured audio-taped focus group. A question schedule was devised to explore their experience of developing a SCI CBT-PMP in the national SCI rehabilitation centre. Interviews were transcribed, coded and analysed using thematic analysis. Ethical approval was obtained.

Results: Five key themes emerged: i) The CBT-PMP provided a supportive environment created by peer support and the multidisciplinary team in which patients learned how to self-manage their pain ii) the complexity of chronic pain management in SCI, iii) operational barriers to implementation e.g. patient accommodation iv) lessons learned included ring-fenced time for staff, dedicated staff training in chronic pain management and increased application of programme material through community activities, v) an unexpected benefit to daily clinical practice from involvement in the programme cited by clinicians.

Conclusions: Implementing a new initiative such as a SCI CBT-PMP can benefit patients and staff but needs to be adequately resourced.
Does intrathecal baclofen have analgesic effects on neuropathic pain in patients with spinal cord injury?

MD PhD Hatice Kumru, MD, PhD Jesus Benito, MD, PhD Joan Vidal

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

OBJECTIVE: Previously it has been reported that a single bolus of intrathecal baclofen modulates pain thresholds and evoked acute pain in patients with spinal cord injury (SCI). Our hypothesis is that baclofen can have an analgesic effect in SCI with neuropathic pain.

METHODS: The SCI patients with a cervical or thoracic lesion, with spasticity and neuropathic pain were randomized to receive a single intrathecal baclofen (ITB) bolus of 50mcg or placebo (physiologic serum subcutaneously). Neuropathic pain symptoms of Inventory (NPSI), a brief questionnaire for pain (BQP) and numerical rating scale (NRS) were used for the assessment of neuropathic pain (NP). For spasticity we used the modified Ashworth scale (MAS) and the visual analog scale (VAS). Assessments were done at baseline and four hours after the bolus or placebo.

RESULTS: Eight patients received a bolus of ITB, and 5 patients placebo. Patients who received ITB reported a significant improvement in the NP as per NPSI, BQP and NRS (p <0.05), and spasticity scales (p <0.04), whereas patients in the placebo group did not report any significant changes in NP or spasticity.

CONCLUSION: A single intrathecal baclofen bolus has a significant analgesic effect in the NP in patients with SCI. Further studies are needed to understand the analgesic effect of baclofen applied orally or intrathecally by a pump for long-term continued dose.
Intranasal Administration of Nerve Growth Factor Protects Injured Neurons in Spinal Cord Injury: Pilot Study

Dr Alberto de Bellis, Dr Luigi Aloe
Maria Rosaria Maglione Foundation onlus, Naples/Morra De Sanctis, Italy; Institute of Cell Biology and Neurobiology, National Research Council, Rome, Italy, Naples/Morra De Sanctis, Italy

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction:
Nerve growth factor is known to play a critical protective role on a number of brain neurons in mammals, including humans. However, its role in the spinal cord is not still unclear. Indeed, NGF does not cross the blood-brain barrier if injected subcutaneously or intravenously, and another delivery method is therefore required. Hence the aim of this study was first to investigate whether purified NGF reaches spinal cord neurons and has any effect on the motor skills of rats with induced spinal cord injury and second to determine its effect on NGF concentrations and NGF-receptors in injured spinal cord neurons in adult rats when administered via the nasal cavity.

Methods:
Adult male Sprague-Dawley rats with intact and injured spinal cord (SCI T8-T10) received daily intranasal nerve growth factor administration in both nostrils for 1 day or for 3 consecutive weeks.

Results:
We found an increased content of NGF and enhanced expression of nerve growth factor receptors in the spinal cord 24 hours after a single intranasal administration of nerve growth factor in healthy rats, while daily treatment for 3 weeks in a model of spinal cord injury improved the deficits in locomotor behaviour and increased spinal content of both nerve growth factor and nerve growth factor receptors.

Conclusion:
These outcomes suggest that the intranasal nerve growth factor bypasses blood-brain barrier and affects spinal cord neurons in spinal cord injury. They also suggest exploiting the possible therapeutic role of intranasally delivered NGF for the neuroprotection of damaged spinal nerve cells.
Neurofeedback Treatment of Central Neuropathic Pain in Sub-acute Spinal Cord Injury: Pros and Cons

Mr Mohammed Jarjees¹,³, Dr Mariel Purcell², Mr Matthew Fraser², Dr Aleksandra Vuckovic¹

¹University of Glasgow, Glasgow, United Kingdom, ²Queen Elizabeth National Spinal Injuries Unit, Glasgow, United Kingdom, ³Technical College of Mosul, Foundation of Technical Education, Mosul, Iraq

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Methods: Eleven subacute patients, up to 6 months post-injury, with CNP present up to 3 months, tetra and paraplegic, complete and incomplete, pain >4 on Visual Numerical Scale (VNS) took part in study. Patients were divided into treatment (receiving neurofeedback and medications) and control (only medications with 2 months pain follow up). Neurofeedback training (Hassan et al, 2015 BMC Neurology, 15:200) consisted of increasing EEG alpha (9-12 Hz) and decreasing theta (4-8 Hz) and beta (20-30 Hz) band power over electrode location C4, up to 3 times a week for 30 min.

Results: In control group, involving 4 patients (age 41±15, 1M, 3F) pain (baseline 7/5/5/5 VNS) varied on average ±1 VNS during 2 months follow up. From seven patients in treatment group (age 43±15, 5M, 2F) 3 patients received 14/14/12 neurofeedback sessions, thereby reducing pain from 7/4/4 to 2/1/2 on VNS. One patient completed 8 sessions and did not respond to the therapy while 2 patients dropped out after 2 sessions.

Conclusion: Neurofeedback may help with CNP in sub-acute SCI but patients do not perceive it as a priority, due to multiple ongoing injury-related issues. This is in a strong contrast with views of patients with long-standing CNP (Hassan et al. 2015).
Participant perspectives of a cognitive behavioural therapy pain management programme post spinal cord injury.

Miss Dearbhla Burke¹, Dr Olive Lennon¹, Dr Maeve Nolan², Miss Sorcha Barry², Miss Fiona Maye², Dr Eimear Smith², Dr Brona Fullen²,³

¹University College Dublin, Dublin, Ireland, ²The National Rehabilitation Hospital, Dublin, Ireland, ³The Centre for Translational Pain Research, University College Dublin, Dublin, Ireland

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Growing evidence supports the use of multi-disciplinary cognitive behavioural therapy pain management programmes (CBT-PMP) for the management of pain post spinal cord injury (SCI). Limited studies have investigated the patient experience of this intervention. This study aims to explore patients’ perspectives following participation in a multi-disciplinary CBT-PMP for neuropathic pain (NP) post SCI, and the impact of the programme on their ability to manage their pain.

Methods: Six participants participated in semi-structured audio-taped telephone interviews. A question schedule was devised to explore their experience of the CBT-PMP and its impact on how they now managed their pain. Interviews were transcribed, coded and analysed using thematic analysis. Ethical approval was obtained.

Results: Four positive themes were identified relating to i) the positive impact of support (peer support and the multidisciplinary team), mindfulness, and physiotherapy exercise classes ii) an acceptance of pain due to changes in pain understanding, iii) self-efficacy in relation to pain management iv) wider benefits on mood, sleep and personal relationships. One negative theme identified logistical and transport related barriers to attendance at a centre-based programme of this nature with an online programme identified as a viable alternative by a number of participants.

Conclusions: The benefits of a dedicated CBT-PMP for people with SCI reflect the literature regarding CBT-PMPs in non-SCI populations. With positive effects of a CBT-PMP clearly established from participants’ perspectives but barriers to attendance potentially limiting greater uptake, an internet-delivered programme warrants consideration.
Prevalence and associated factors of pain in the Swiss spinal cord injury population

Dr Rachel Müller1, Dr Martin Brinkhof1,2, Dr Ursina Arnet1,2, Dr Timo Hinrichs4, Dr Gunther Landmann3, Dr Xavier Jordan5, Dr Markus Béchir6

1Swiss Paraplegic Research, Nottwil, Switzerland; 2Department of Health Sciences and Health Policy, University of Lucerne, Lucerne, Switzerland; 3Centre for Pain Medicine, Swiss Paraplegic Centre, Nottwil, Switzerland; 4Division of Sports and Exercise Medicine, Department of Sport, Exercise and Health, University of Basel, Nottwil, Switzerland; 5Clinique romande de réadaptation, Sion, Switzerland; 6Department of Intensive Care, Pain and operative Medicine, Swiss Paraplegic Centre, Nottwil, Switzerland

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Population-based information on pain prevalence and associated factors are missing for the Swiss SCI-community. The aims of the current study are to determine pain prevalence and identify factors associated with chronic pain in individuals with SCI living in Switzerland.

Methods: A cross-sectional study was conducted. Pain characteristics were assessed using an adapted version of the International SCI-Pain-Basic-Dataset, adding one item of the SCI-Secondary-Conditions-Scale to address chronic pain. Pain prevalence was calculated using stratification over demographic, SCI-related and socioeconomic characteristics; odds ratios (adjusted for non-response) for determinants of chronic pain severity were calculated using stereotype-logistic-regressions.

Results: Pain (in the past week) was reported by 67.4% and significant chronic pain by 34.1% of all participants (N=1549; 28.5% female). Most frequently reported pain type was musculoskeletal (71.1%). Back/spine was the most frequently reported pain location (54.6%). Contrasting the “significant” to the “none/mild” category of chronic pain, adjusted odds ratios were 1.54 (95%CI:1.18-2.01; p<0.01) for women (vs. men); 6.64 (95%CI:3.37-11.67; p<0.001) for the oldest age group 61+ (vs. youngest [16-30]); 3.41 (95%CI:2.07-5.62; p<0.001) in individuals reporting severe financial hardship (vs. no financial hardship). Individuals reporting specific SCI-related health conditions were 1.41-2.92 (p<0.05) times more likely to report chronic pain as “significant” rather than “none/mild” compared to their counterparts without the respective condition.

Conclusions: Pain is highly prevalent in the Swiss SCI-community. Considered at risk for chronic pain are women, older individuals and individuals with financial hardship and specific secondary health conditions. Longitudinal studies are necessary to identify predictors for the development of pain and its chronification.
Upper limb reinnervation in c6 tetraplegia: Italian case report

Dr Silvia Olivi, Dr Carlo Sacco, Ft Paola Paglierani, Dr Gaia Musumeci, Dr Guido Staffa, Dr. Jacopo Bonavita

Montecatone Rehabilitation Institute, Imola, Italy, Neursurgery, Lugo, Italy

INTRODUCTION:
The use of nerve transfers to restore upper limb function in tetraplegia has received little attention until recently. The aim of nerve transfer is to obtain the extension of the elbow, the opening and closing of the fingers, without denervate the traditionally used muscles for tendon transfers.

MATERIALS AND METHODS:
A 35-years-old man (C6 AIS B SCI in 2011) in 2014 was referred for surgical reconstruction of hand function. Upper limb function was classified as group 1 according to ICHST.

Preoperative EMG supplied by the prospective donor nerves (teres minor, brachialis, supinator) showed normal recruitment. No voluntary activity was detected in the nerve transfer target muscles. Three nerve transfers were performed on the right upper limb 37 months after injury: teres minor branch to the long head of triceps nerve branch, brachialis nerve branch to the AIN, supinator nerve branch to the PIN.

RESULTS:
After surgery the upper limb was immobilized for 2 weeks. A week later, the patient resumed use of a manual wheelchair and was discharged.

At 14 months postsurgery, the patient achieved M2 elbow extension, M4 thumb and finger flexion, and M3 thumb and finger extension. No functional deficit of shoulder external rotation, elbow flexion, or forearm supination was detected.

CONCLUSIONS:
These new approaches should be combined with traditional surgery, for restoring elbow extension, finger extension, thumb extension, pinch. Nerve transfers also provide options for patients not amenable to conventional tendon transfers, including IC group 0.
What does clinical practice for spinal cord injury pain look like in Canada? 
A national survey of healthcare providers

**Miss Stacey Guy**, Dr Isabelle Côté, Dr Cathy Craven, Dr. Eldon Loh

1 Lawon Health Research Institute, London, Canada, 2 Western University, London, Canada, 3 Centre interdisciplinaire de recherche en réadaptation et intégration sociale, Quebec City, Canada, 4 Toronto Rehabilitation Institute, Toronto, Canada, 5 Parkwood Institute, London, Canada

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

**Introduction:** Pain after spinal cord injury (SCI) has been identified as an area that can benefit from improved clinical practice. In 2013, we conducted a national survey of healthcare providers to inform the development of clinical practice guidelines and best practice implementation for SCI pain management.

**Methods:** A once-off survey of 52 closed and open-ended items was developed after review of the literature. This survey is available in English and French, and peer reviewed (N=5). Questions differed according to the respondents’ professions. The survey covered 15 domains ranging from use of clinical practice guidelines to preferred treatment options. A recruitment email for voluntary participation was sent to healthcare institutions (inpatient and outpatient) with providers who care for persons with SCI.

**Results:** 79 healthcare providers across Canada completed the survey. Most worked in an inpatient setting (N=60). Over the past 3 months chronic pain was a complaint for and treated in 70-100% of the patients seen (N= 28). More than half (54%) reported following a clinical practice guideline for pain that was not SCI specific. Among the reported facilitators of good pain treatment are interdisciplinary team composition, staff training and access to therapies. The majority of respondents (89%) involved other professions in the treatment of a patient most to all of the time.

**Conclusions:** To improve practice, the current state of practice needs to be documented. This survey provides a snapshot of clinical practice for persons with SCI in Canada, while acknowledging a larger sample size would be preferred.
An unusual cause of an autonomic dysreflexia in pediatric SCI patient: a case report

Miss Jayoung Kim
Asan Medical Center, Seoul, South Korea

Introduction: Autonomic dysreflexia is quite common complication in SCI patient. However, here we present a case of a patient who had an autonomic dysreflexia due to an unusual cause.

Methods: It was a case report.

Results: A patient was born with breech presentation. She had shoulder dystocia and meconium aspiration pneumonitis, therefore went on NICU care. When she was 6 months old, she had brain MRI and C-spine MRI due to quadriplegia. On C-spine MRI, myelomalacic change of C6-T2 level with fibrotic band at C7 level was found. When she was 14 years old, she had a symptom of hypertension with sweating with slight touch of abdomen. For the evaluation of the symptom, she was admitted to the department of rehabilitation.

Baseline blood pressure was 100/60. After palpation of abdomen, blood pressure was 139/61 and heart rate was 120. After 30 minutes, blood pressure was still 143/83, and there was no residual urine in bladder. After 1 hour, blood pressure was 93/62. Besides autonomic dysreflexia, she also had many problems; orthostatic hypotension, scoliosis, restrictive lung disease, neurogenic bladder, neurogenic bowel, osteoporosis, spasticity, and history of Lt. proximal tibia fracture.

Conclusions: It was the first case report which show that slight touch of abdomen could cause an autonomic dysreflexia.
Correlation between pain and mental disorders in a spinal cord injury (SCI) population

Dr Ioannis - Alexandros Tzanos¹, Dr Andreas Mavrogenis², Dr Evanthia Mitsiokapa², Dr Konstantina Gioti¹, Dr Dimitra Emmanouil¹, Dr Nikolaos Groumas¹, Dr Panagiotis Papaggelopoulos²
¹National Rehabilitation Centre, Ilion, Greece, ²Attikon Hospital, Haidari, Greece

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Pain has been identified as a common complication among those suffering from SCI, having a negative impact in their activities of daily life. The aim of this study was to determine the association between the intensity and type of pain on mental disorders among individuals with SCI.

Methods: One hundred sixty four SCI individuals with a history of SCI of different causes were studied in this survey. They were residents of urban, suburban and rural areas of the greek territory. Questionnaires were completed for each one in interview form and when needed, clinical examination was performed for data collection. The questionnaire included demographic and clinical characteristics. Patient Health Questionnaire-9 (PHQ-9) was used for determination of emotional status. Statistical analysis of the findings was performed with t-test and ANOVA. Participants were divided in four categories regarding pain (no pain, nociceptive pain, neuropathic pain, both types of pain). Intensity of pain was measured with 0-10 pain scale.

Results: The coexistence of nociceptive and neuropathic pain is associated with statistically significant risk for mental disorders (p<0.0005) compared to those without pain and those suffering with just one type of pain. High intensity of pain has statistically significant correlation with depression (p=0.0005).

Conclusion: Pain is an important predictor for mental disorders in people with SCI.
Introduction: The present study concerned positive (facilitators) or negative (barriers) contributors to living with chronic pain after a spinal cord injury (SCI). Commonly endorsed themes based on qualitative interviews were rated in a large online survey. The study aimed to define subgroups based on facilitator and barrier factor scores, and to characterize the subgroups with respect to pain-related variables.

Methods: People with moderate to severe chronic pain after SCI (n=483) participated in the study. Analyses included two-step cluster analyses and one-way ANOVAs with Tukey post hoc tests.

Results: Three significantly different subgroups emerged: Group 1 (50.1%) had more intense pain (7.15±1.56), more pain with neuropathic characteristics, greater pain impact, affective distress, and lower life control than the other subgroups. They utilized multiple ways to cope with pain in addition to medication, considered information about pain and its management critical but were not able to communicate adequately about their pain. Group 2 (28.8%) had high moderate pain (6.45±1.59), moderate pain impact, affective distress, and life control. They utilized multiple ways to cope and carry on despite pain, and used less medication due to concerns about side-effects and addiction. Group 3 (21.1%) had low pain interference, difficulty dealing with pain, affective distress, and neuropathic pain characteristics. Despite a moderately high pain (5.91±1.64), they perceived information about pain and its treatments, and ability to communicate with their providers as less important.

Conclusions: Individual perspectives on pain and management are important factors that should be considered in the design of individually tailored treatment approaches.
Post-traumatic syringomyelia in paediatric onset spinal cord injury

Dr Richa Kulshrestha1, Mr Jan Kuiper1, Mr Naveen Kumar1

1Robert Jones and Agnes Hunt Orthopaedic Hospital NHS Trust, Crewe, United Kingdom

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Background: Post-traumatic syringomyelia (PTS) is a well-known serious complication in adults, however evidence for epidemiology and outcomes of PTS in children is limited.

Aim: To describe epidemiological, natural history and outcome of management of PTS in children treated in a single specialist spinal rehabilitation unit.

Method: Retrospective review of 51 children with traumatic spinal cord injury (SCI) who were injured for over 10 years was performed.

Results: 6/51 (12%) children developed syringomyelia in a follow up period of 27 years (19-34 years). There were 2 males and 4 females. The mean age of injury was 16.7 (range 13-17 years). The level of initial spine injury was cervical and thoracic in equal numbers. Patients developed syringomyelia after a mean period of 16.4 years (2-27 years) after injury. Patients presented with clinical features such as weakness, pain over back of shoulder or at the fracture site, sweating, hot and cold insensitivity in hands, worsening of spasms, sensory deterioration or loss of trunk balance at the time of annual assessment. Radiologically syrinx extended to more than 3 vertebral segments in three patients and over 18 segments in one patient. Three patients were surgically repaired and rest were managed conservatively.

Conclusion: In our review 12% patients developed symptomatic syringomyelia in long term follow up period. This incidence is higher than reported in adult onset injuries. The onset of syrinx is variable and can be delayed for over ten years after injury as in adults. No other significant risk factors were identified in our review.
Gait rehabilitation after Incomplete Spinal Cord Injury, when the outcome doesn’t match expectations

Dr Tomas Stuve De Barros¹, Dr Beatriz Condeça¹, Dr Gonçalo Pires¹, Dr Jorge Fortunato¹, Dr Carlos Pereira¹

¹Centro De Medicina De Reabilitação De Alcoitão, Lisboa, Portugal

Introduction

After a spinal cord injury (SCI) regaining the ability to walk comes at the top of most of the patient’s priorities list in terms of rehabilitation.

Methods

We report the case of a 40-year-old woman with a BMI of 40.1 kg/m2, otherwise healthy who in November 2013, due to back pain, lower limb paralysis and sphyneter dysfunction underwent a decompressive laminectomy at the D5-D6 level with drainage of infectious content. She was then diagnosed with infectious spondylodiscitis with S.aureus MSSA isolated. In March 2014, at admittance in our rehabilitation center she had an incomplete paraplegia AIS C NL D5, moving in a wheelchair. In order to achieve the rehabilitation goals, patient had 3 admissions last one in January 2016, when we considered the rehabilitation program fulfilled and compared the achieved results.

Results

We proposed a multidisciplinary intensive neuro-rehabilitation program, with muscular strengthening of the lower limbs and trunk. As the neuro-motor framework evolved into an incomplete paraplegia AIS D with NL D5, we considered functional potential to gait. However, the functional outcome was not as expected and patient was unable to perform gait.

Conclusions

The rehabilitation of obese patients with SCI represents a challenge and may have a different outcome than expected due to several factors which are commonly found in such patients. This case clearly exemplifies some of the difficulties commonly found in the rehabilitation of these patients and how they can affect the expected functional outcome.
Initial Clinical Trials of Human Embryonic Stem Cell-Derived Oligodendrocyte Progenitor Cells (AST-OPC1) in Patients with Subacute SCI

Dr Edward Wirth, Dr Richard Fessler, Dr Donald Leslie, Dr Gary Steinberg, Dr Shekar Kurpad, Dr Charles Liu, Dr Jane Lebkowski

1Asterias Biotherapeutics, Fremont, United States, 2Rush University, Chicago, United States, 3Shepherd Center, Atlanta, United States, 4Stanford University, Stanford, United States, 5Medical College of Wisconsin, Milwaukee, United States, 6University of Southern California, Los Angeles, United States

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: The initial clinical safety of AST-OPC1 was evaluated in a phase 1 trial that enrolled patients with neurologically complete T3-T11 thoracic SCI. Based on the favorable safety data from that study, a phase 1/2a trial was initiated to evaluate the safety and activity of escalating doses of AST-OPC1 in patients with sensorimotor complete C5-C7 cervical SCI.

Methods: In the phase 1 safety trial, five subjects received a low dose of 2 million AST-OPC1 cells between 7 and 14 days following their injury. The phase 1/2a cervical trial will enroll three sequential dose cohorts of subjects who will receive 2-, 10-, or 20-million AST-OPC1 cells between 14 and 30 days post-SCI. Subjects in both trials were/are followed for 1 year under the main study protocol and will be followed for an additional 14 years under a long-term follow up protocol.

Results: All subjects in the phase 1 trial have completed 4 years of follow up. The planned enrollment of 3 subjects in cohort 1 of the phase 1/2a cervical trial has been completed and enrollment of cohort 2 is in progress. In both studies, there have been no serious adverse events related to AST-OPC1, tacrolimus, or the injection procedure. No safety concerns have been noted on serial MRI scans through 4 years of follow up. There have been no unexpected changes in neurological function.

Conclusions: The data to date suggest that AST-OPC1 can be safely administered to patients in the subacute period after severe thoracic or cervical SCI.
Patient Oriented Discharge Summary (PODS): A new process for optimizing transitions from inpatient Spinal Cord Injury rehabilitation to the community

Mrs. Heather M Flett, Mrs Sandra Mills, Mrs. Melanie Alappat, Mr. Joshua Forbes, Mr. Anthony Simas, Ms. Shoshana Hahn-Goldberg

1 University Health Network - Toronto Rehabilitation Institute, Brain and Spinal Cord Rehabilitation Program, Toronto, Canada, 2 University of Toronto, Department of Physical Therapy, Toronto, Canada, 3 OpenLab, University Health Network, Toronto, Canada

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: People with spinal cord injury (SCI) identify the transition from rehabilitation to the community to be overwhelming. The objective of this project was to develop a patient-oriented discharge summary (PODS) process specifically for individuals with SCI transitioning from inpatient rehabilitation to the community in order to increase confidence and reduce anxiety.

Methods: Our 60-bed inpatient SCI rehabilitation program participated in multi-site pilot program to implement PODS. Our SCI-PODS team which included 2 consumers with SCI conducted focus groups and surveys to examine applicability of PODS to SCI population. An adapted SCI-PODS process was developed which included: 1) a teach-back meeting to facilitate problem-solving and support self-management; 2) an individualized written summary across all SCI domains. Patient and staff focus groups and surveys were used pre- and post-PODS implementation to compare confidence in self-management and understanding in 5 key areas.

Results: 8 patients participated in the SCI-PODS pilot. Compared to pre-PODS group, PODS participants reported a greater understanding of medications, self-care, symptoms, follow-up care, community contacts and confidence about discharge. Staff reported PODS was beneficial for consolidating patient learning and valuable reflective practice. Following the pilot, PODS was fully implemented as standard of care. 97% of patients (n=239) discharged between May 2015 – March 2016 have received SCI-PODS. 43 clinicians have participated in SCI-PODS meetings and reported high engagement and value to patients.

Conclusions: SCI-PODS enhanced patient understanding and confidence regarding community transition. The SCI-PODS process consolidates rehabilitation learning, identifies knowledge gaps and establishes an individualized transition plan.
Patient participation during rehabilitation after spinal cord injury

Dr Sanne Angel
Section For Nursing, Aarhus University, Aarhus, Denmark

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

This study investigates the patient’s ability and need for participation during rehabilitation after spinal cord injury. This built on the understanding of how the patients participation in rehabilitation as a mean to support control and self-determination and thereby achievement of a meaningful life worth living. The rehabilitation process of 12 persons the first two years after a traumatic spinal cord injury provided specific insight into patient participation. Ricoeur’s phenomenological-hermeneutic interpretation theory with a narrative approach revealed that the ability and need for participation changed through a six-phased process of regaining meaning after a spinal cord injury; having no will to participate, developing strength to participate, having a need for participation and the will to participate. Concurrently, the existential meaning of patient participation was uncovered. The conclusion was that the professional’s hard work of stimulating the patient to participate and then permit the patient to take part was decisive in relation to the patient’s existence and recovery.
Physical therapy after spinal cord injury: A systematic review of treatments focused on participation

Dr Natàlia Gómara-Toldrà¹, Dr Martha Sliwinski², Dr Marcel P Dijkers³

¹Blanquerna School of Health Science. Ramon Llull University, Barcelona, Spain, ²Columbia University Program in Physical Therapy, New York, USA, ³Icahn School of Medicine at Mount Sinai, New York, USA

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Over the last four decades, the focus of spinal cord injury (SCI) rehabilitation has shifted from medical management to issues that affect quality of life and community participation. Physical therapists (PTs) need to design and implement interventions that result in maximal participation to provide an individual with SCI an effective rehabilitation program.

Objective: The aim of this review is to assess the extent, content, and outcomes of physical therapy (PT) interventions focused on improving the participation of individuals with SCI.

Methods: A search was conducted in Medline, Embase, CENTRAL, CINAHL, PEDro, and PsycINFO. We included studies, of all designs, focused on improving the participation of individuals with SCI using PT interventions. The primary author and a reviewer independently selected articles for inclusion, assessed article quality, and extracted the data.

Results: Five studies met the inclusion criteria. The interventions applied were 9- and 12-month body weightsupported treadmill training in two studies, a supervised 9-month exercise program, a 12-week home exercise program, and a 10-week multidisciplinary cognitive behavioral program for coping with chronic neuropathic pain. Four of five PT interventions positively impacted the individual’s perceived participation and satisfaction with participation.

Conclusion: The body of research by PTs on interventions to improve participation is limited. PTs must document the effects of interventions with a valid outcome tool to enable more research that examines participation. Expanding participation research will allow PTs to meet the needs of individuals with SCI and identify what interventions best facilitate integration into the community.
Comparing inspiratory movement of genioglossus in quadriplegic and able-bodied obstructive sleep apnoea patients

Ms Alice Hatt, Ms Elizabeth Brown, **Dr David Berlowitz**, Dr Fergal J. O’Donoghue, Ms Hailey Meaklim, Dr Alan Connelly, Professor Graeme Jackson, Dr Kate Sutherland, Professor Peter A. Cistulli, Dr Bon San Bonne Lee, Professor Lynne E. Bilston

1 Institute for Breathing and Sleep. Austin Health, Melbourne, Australia, 2 The Florey Institute of Neuroscience and Mental Health, Melbourne Brain Centre, Melbourne, Australia, 3 Faculty of Medicine Dentistry and Health Sciences, University of Melbourne, Parkville, Australia, 4 Neuroscience Research Australia, Randwick, Australia, 5 University of New South Wales, Randwick, Australia, 6 Department of Respiratory and Sleep Medicine, Royal North Shore Hospital and Sydney Medical School, University of Sydney, Sydney, Australia

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Obstructive sleep apnoea (OSA) is much more prevalent in quadriplegia. Anterior contraction of genioglossus (GG) precedes inspiration in healthy subjects to dilate the airway, however this pattern of dilation is known to be altered in able-bodied OSA patients. Magnetic resonance imaging (MRI) was used to compare GG movement during inspiration in patients with chronic quadriplegia and OSA (SCI-OSA), able-bodied OSA patients (AB-OSA), and controls without OSA (AB-CTRL). The upper airway of six SCI-OSA patients (2F, 50.0±10.9 years), six AB-OSA patients (2F, 53.0±10.9 years) and seven male AB-CTRL subjects (40.1±15.3 years) were studied using 3-T MRI. Anterior-posterior GG movement was assessed awake, at the beginning of inspiration in the sagittal plane using ‘tagged’ MRI. The maximal anterior displacement of five points in the posterior GG was assessed using Matlab and the harmonic phase method.

Anterior contraction of GG at the nasopharyngeal level was apparent in both the AB-CTRL and SCI-OSA groups (mean movements of 0.52±1.04mm and 0.85±1.47mm), but not evident in AB-OSA (-0.02±0.37mm). Similarly, anterior contraction of GG at the oropharyngeal level was observed in all AB-CTRL and SCI-OSA subjects (1.10±0.90mm and 1.90±1.59mm), while AB-OSA patients exhibited a variety of movement patterns ranging from exaggerated movement, to very little and/or counterproductive posterior movement (mean 0.48±0.87mm). GG movement was significantly greater in the SCI-OSA group than the AB-OSA group at this level (t=1.92, p=0.042).

Our results suggest that there are differences in the dilation of the airway in quadriplegic and able-bodied OSA patients potentially indicative of a different mechanism of disease.
Ketogenic diet results in early improvements in functional and histological outcomes after spinal cord injury in rats

Dr. Huayi Xing, Dr. Jie Liu, Professor Mouwang Zhou, Dr. Nan Liu, Ms. Gaoyan La, Ms. Mengyuan Wang, Ms. Yao Lu

1Department of Rehabilitation, Peking University Third Hospital, Beijing, China, 2International Collaboration on Repair Discoveries (ICORD), Vancouver, Canada

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Previously, both positive and negative results have been reported regarding the ketogenic diet (KD) as a treatment of spinal cord injury (SCI). A possible reason of this controversy may lie in the amount of KD. In the present study, we aimed to investigate whether a calorically restricted KD regimen can keep a higher blood ketone level, and to determine whether this KD regimen can improve functional and histological outcomes.

Methods: Immediately after C5 hemi-contusion injury, 34 Sprague-Dawley rats were fed with either standard diet (SD, ad libitum) or a restricted ketogenic diet (KD, 2.5g/100g body weight/day), corresponding to a 15% reduction of normal caloric intake. Body weight, blood β-hydroxybutyrate concentration and forelimb function were evaluated for 8 weeks, followed by quantitative assessment of spinal cord tissue sparing.

Results: Blood β-hydroxybutyrate concentration in KD group remained above 1.50 mmol/l during the 8 weeks without decrease (maximal level 2.89 mmol/l). The blood β-hydroxybutyrate concentration in SD group was around 0.70 mmol/l. Increased usage of the affected forepaw in KD group was observed at as early as 2 weeks post-injury. This improved forelimb function remained stable. Histologically, the spinal cord of KD group displayed more gray matter sparing. The average body weight of KD group was slightly lower than SD group, but the difference was not statistically significant.

Conclusions: Our restricted KD regimen resulted in a sustained blood ketone level with significant neuroprotection and improvement in function, indicating that maintained ketone levels may be an important factor for the therapeutic effect of KD treatment.
Optimising Compliance with CPAP Therapy for Obstructive Sleep Apnoea in Tetraplegic Patients: Experience gained from the COSAQ project at the NSIC

Mrs Susan Cross1,2, Mr Thomas Barnes1
1NSIC Stoke Mandeville, Aylesbury, United Kingdom, 2COSAQ Collaborative, Melbourne, Australia

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Background:
Obstructive Sleep Apnoea (OSA) is common after cervical spinal cord injury (tetraplegia). Continuous Positive Airways Pressure (CPAP) overnight is the recognised treatment for OSA. In the general population compliance with therapy can be challenging and people with tetraplegia face additional challenges arising from reduced hand function limiting their ability to adjust the CPAP mask.

Method:
The COSAQ project investigated the use of CPAP to treat OSA in newly injured tetraplegics (neurological level T1 or above, ASIA A,B,C or D). CPAP usage by 35 participants at the NSIC Stoke Mandeville was reviewed. Data was collected regarding ability to tolerate CPAP for 4 hours during a 3 night initial assessment and CPAP machine-recorded usage data was reviewed to assess on-going compliance. Multiple CPAP mask interfaces were available for clinical research use.

Results:
This poster presents a qualitative review of the clinical practice and lessons learnt during the COSAQ trial. Best results for 4 hours CPAP tolerance were obtained by using a nasal pillows mask with or without a chin-strap for the first night (31 of 35 participants chose nasal pillows). Optimal on-going compliance required frequent visits from the CPAP physiotherapist, particularly during the first 2 weeks on CPAP; the opportunity to try a different mask; and an on-going education program for the nursing staff assisting the patients at night.

Conclusion:
Experience gained from the COSAQ project has enabled us to develop a care pathway for patients undergoing CPAP therapy for OSA on the rehabilitation wards in this spinal unit.
Spinal cord injury resulting from scoliosis, the inverted paradigm – outcomes in rehabilitation

Miss Maria Pais Carvalho, Ms Virginia Reis, Ms Irina Peixoto, Mr Jorge Caldas

Centro Hospitalar Tondela-viseu, Viseu, Portugal, Centro de Medicina de Reabilitação de Alcoitão, Cascais - Lisboa, Portugal

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction:
Neurofibromatosis type-1 (NF1) is a gene-related hamartomatous disorder of neural crest derivation, characterized by the development of Schwann cell tumors and pigmentation abnormalities. Thoracic scoliosis is the most common skeletal deformity found in NF1, occurring in 10% of patients. Usually, it’s severe with sharply angulated curves. Although rarely, it may cause spinal cord lesion, when dystrophic changes occur.

Methods: Clinical and radiographical case review.

Results: A 12-year-old boy with NF1 was admitted at a Rehabilitation Department, after underwent a scoliosis corrective surgery to treat a spinal cord impingement due to rib intracanal dislocation. At admission he presented incomplete paraplegia with an American Spinal Injury Association impairment scale (AIS) grade C, neurologic level T1, with severe motor deficit at the lower limbs, which restrained gait. He had no sensibility or sphincterian impairment and was dependent at all most daily life activities (DLAs). After submitted to an integrated rehabilitation treatment he improved to an incomplete paraplegia AIS D neurologic level T1 and was able to walk with a gait device. He got independent at DLAs and returned to school after discharge.

Conclusions:
In children, scoliosis is a frequent complication of spinal cord injury, but the other way around – spinal cord injury due to dystrophic vertebral deformity – is a rare finding. In literature, there are a few case reports, but all address the operative subject. Regarding severe scoliosis in NF1, a holist rehabilitation approach is crucial after spinal surgery, in order to maximize patient’s functional independence, social and professional integration.
Survival of respirator-dependent patients after discharge from acute care and rehabilitation

Jana Habermann¹, Johanna Elsas¹, Dr Peter Felleiter³
¹Swiss Paraplegic Centre Nottwil, Nottwil, Switzerland

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Currently, 37% of the patients treated in Swiss intensive care units are ventilated. A small fraction of these patients remains dependent of invasive ventilation. After discharge from acute care and rehabilitation these patients may return home or they have to be cared for at nursing homes. We examined retrospectively the survival of patients dependent on invasive ventilation after their discharge from the Swiss Paraplegic Centre Nottwil.

From the data bases of our hospital we identified all patients dependent on invasive ventilation that were discharged from 01.04.2005 to 01.04.2016 from our rehabilitation centre. We extracted the demographic data, diagnoses, discharge dates and discharge locations of these patients. Patients transferred to another hospital or suffering from ALS were excluded. The current status of all included patients was obtained using telephone interviews.

We identified 92 patients requiring invasive ventilation. 15 patients had to be excluded. 41 patients (age 22-84 years, avg. 58y.) were transferred to nursing homes. 37 patients (11-80 years, avg. 42y.) returned to their homes. Kaplan-Meyer survival curves for both groups have been calculated.

The survival curves for mortality differ between the two groups. It remains unclear whether both groups are comparable, the age distribution seems to be different. Nevertheless, mortality in the group of patients transferred to a nursing home differs already during the first year after discharge. At the end of the observation period of 52 months, mortality is doubled in this group. For a differentiated analysis of the underlying causes a prospective study would be necessary.
Effects of overground gait training, using the robotic-exoskeleton Ekso™ and assessment of gait parameters using the GAITRite® system. A pilot study.

Mrs Margareta Arnell, Mr Peter Svensson, Mrs Helene Nilsson, Mrs Gunilla Elmgren Frykberg

1Spinal Cord Rehabilitation Unit, Uppsala University Hospital, Uppsala, Sweden, 2Dep of Neuroscience/Rehabilitation Medicine, Uppsala University, Uppsala, Sweden

Introduction: Ekso™ is a mobile exoskeleton, intended for rehabilitation and mobility of individuals with neurological disorders. The aim of this pilot study was to use the GAITRite® system to describe effects of robotic gait training with Ekso™ on spatiotemporal gait parameters in two persons with spinal cord injuries (SCI) and gait disorders.

Method: Two participants with American Spinal Injury Association Impairment Scale (AIS) D and neurological level of injury C2 and C3, were recruited from the Rehabilitation Medicine outpatient unit at Uppsala University Hospital. The participants had 20 and 21 treatment sessions, respectively, with overground gait training using the Ekso™ robot during a period of 8 weeks. The walking time varied from 21.28 to 50.55 minutes, on average 1527 steps and from 18.15 to 37.53 minutes, on average 1398 steps, respectively. The participants were assessed before and after the intervention with the GAITRite® system, a portable gait analysis system. Velocity, cadence, step length and double limb support were analyzed with descriptive statistics.

Results: Preliminary results indicate that both participants improved slightly, one in gait speed and both in step length. More results of gait-function outside Ekso™ will be presented.

Conclusion: Further studies are warranted to examine the effects of treatment with the Ekso™ robot. The GAITRite® system appears to be suitable as one of the tools for analysis of gait parameters.
Powered exoskeletons - how are they implemented into the SCI therapy of German SCI centers?

Mrs Ulla Bergner¹
¹BG Klinikum Murnau, Murnau, Germany

Background: In the last years more and more information was published about powered exoskeleton systems. Studies demonstrated feasibility and effectiveness of these systems. This study was started in order to determine how powered exoskeleton systems are implemented today in the physiotherapy treatment settings of German SCI centers.

Methods: In April 2016 a questionnaire was mailed to 24 German SCI acute care and rehab centers. The questions presented covered all areas of clinical usage and therapy approaches.

Results: Twenty questionnaires were returned and could be included in this survey. Eleven centers (55%) currently do not have such a device. Three centers just acquired such a system and are in the process of setting it up. Two hospitals utilize the system for one year and four centers use a powered exoskeletons longer than 2 years. In this 6 hospitals an average of 8 patients were treated per year.

Conclusion: At this moment implementation of powered exoskeletons into therapy has started in German SCI centers. Still only few patients benefit from this treatment option, only scarce information concerning treatment concepts and indications is available. But it is clearly visible that powered exoskeletons will be part of SCI therapy in an increasing number of German SCI centers. It will be exciting to observe the future developments.
Respiratory techniques in autotherapy in spinal cord injury patients

MSc. Tereza Hlavackova¹, MSc. Barbora Fratalova¹
¹University Hospital Motol, Spinal Cord Unit, Prague 5, Czech Republic

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction
Respiratory dysfunction is one of the most common complications of spinal cord injury (SCI) in acute as well as in chronic phase. In the acute phase, 60% of patients with injuries from C5 to C8 experience respiratory problems, like atelectasis, pneumonia and ventilatory failure. Patients in chronic stadium have impaired vital capacity of lungs, poor or moderate cough strength and dyspnea. Limitation in respiratory functions has a major influence on the quality of their life.

Methods
Respiratory complications are frequent problems for our patients in hospital as well as home. We decided to prepare a brochure which helps to train respiratory function effectively through autotherapy.

Results
This brochure contains 30 pages of text and images. The individual chapters describe the techniques of respiratory physiotherapy which include manual techniques of chest soft tissues, contact breathing and active breathing exercises. Using of respiratory trainers is also mentioned and sleep apnea described. The next section gives specific advice to exercise during infection and the most used rest positions are recommended. The text and photographs present the exact performance of exercise.

Conclusions
It is important to understand these potential complications and what patients can do to help prevent them from developing. This brochure was written due to the above respiratory complications in patients with SCI and is useful in the acute stage during infection as well as autotherapy for prevention.
Robotic assisted gait training for the improvement in gait, strength and spasticity in Spinal Cord Injury: Systematic Review

MD Ana Valeria Aguirre-Güemez1, Eng, MSc, PhD student Isaac Pérez-San Pablo2, MD, MSc, PhD student Jimena Quinzaños-Fresnedo3, MD, MSc Saúl Renán Hernández-León4, MD Ramiro Pérez-Zavala1, MD Aida Barrera-Ortíz1

1Spinal cord injury service, National Institute of Rehabilitation, Mexico City, Mexico, 2Analysis of human movement service, National Institute of Rehabilitation, Mexico city, Mexico, 3Neurological Rehabilitation Division, National Institute of Rehabilitation, Mexico city, Mexico, 4Unit of methodological support on research, National Institute of Rehabilitation, Mexico city, Mexico

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

One of the main concerns for patients with SCI, their families and physicians is whether the individual will be able to walk. The Lokomat is a robotic gait orthosis that has been used to train gait in spinal cord injury, but there is no clear evidence of its effectiveness and safety. A systematic review (SR) in Cochrane Injuries Group Specialized Register, PubMed, MEDLINE, EMBASE, CINAHL, ISIWeb of Science (SCIEXPANDED), from 1990 to present was carried out. Three authors independently categorized and identified trials, the Cochrane Handbook for Systematic Reviews of Interventions was used to assess risk of bias, and RevMan Software was used for the analysis.

286 studies were identified, 267 eliminated, the remaining 15 randomized controlled trials (RCT) and 5 SR were included. Six studies had available data for meta-analysis (222 participants). The analysis demonstrated a beneficial effect of Lokomat, clinically minimal for lower limbs force and significant for independence and gait functionality. There was insufficient evidence to support improvement of speed.

The inconclusive results of our analysis may be due to the heterogeneity of the studies, small samples and lack of quality. For these reasons, there is great need to realize larger sample multicentre RCT, evaluating different locomotor training approaches, with different subgroups, to find out if there is a sub-population benefiting the most.
Robotic assisted training in combination with functional electrical stimulation to improve lower limb function after spinal cord injury

Mrs Ines Bersch¹, Mrs Sabrina Koch¹, Mrs Elisabeth Sandner¹, Mrs Anne Katrin Brust¹, Mrs Angela Frotzler¹
¹Swiss Paraplegic Centre, Nottwil, Switzerland

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Background:
Functional electrical stimulation (FES) is applied after spinal cord injury (SCI) for neuromodulation. Robotic assisted training with FES can be used to increase motor function and power output of the lower limbs.

Objective:
The aim was to investigate the difference in increase of FES-induced and voluntary power output of the lower limb.

Method:
Data of SCI inpatients who trained limb mobilization using a stationary robotic system were retrospectively analyzed. Training sessions consisted of FES-induced and voluntary lower limb movements in flexion and extension. Primary outcomes were differences in power output during FES-induced as well as voluntary flexion and extension between the first and the last training. Secondary outcome was the sum score of voluntary muscle function of seven leg muscles.

Results:
22 SCI patients (AIS A to D, median age 59.22 years, median lesion duration 77 days) completed a median of 13 training sessions. There was a significant increase in median power-output from 2.14 to 3.38 N for FES-induced extension (p=0.020) and from 1.13 to 3.01 N for voluntary extension (p=0.001). In contrast to FES-induced flexion (p=0.058), voluntary flexion (p=0.001) increased significantly from 0.88 to 1.89 N. No significant correlations were found between FES-induced and voluntary movements for flexion (r=0.243, p=0.275) and extension (r=0.382, p=0.079). The median muscle sum score increased from 17 to 22 points over time.

Conclusion:
Robotic assisted training with FES seems to support the recruitment of further motor units during recovery, that results in increased motor function and power output of the legs.
Volume or intensity? - What matters more for respiratory muscle training in individuals with spinal cord injury?

BSc Mirjam Pfister\textsuperscript{1,2,3}, MSc Anja M. Raab\textsuperscript{1}, Dr. Claudio Perret\textsuperscript{2}, Dr. Joerg Krebs\textsuperscript{1}, Prof. Maria T.E. Hopman\textsuperscript{4}, \textbf{Dr Gabi Mueller}\textsuperscript{1}

\textsuperscript{2}Clinical Trial Unit, Swiss Paraplegic Center, Nottwil, Switzerland, \textsuperscript{3}Institute of Sports Medicine, Swiss Paraplegic Center, Nottwil, Switzerland, \textsuperscript{4}Department of Health Sciences and Technology, Institute of Human Movement Sciences and Sport, Swiss Federal Institute of Technology, Zurich, Switzerland

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction
Respiratory muscle training can improve respiratory muscle strength in individuals with spinal cord injury (SCI). However, the question concerning the most effective training-volume and -intensity still remains. The objective of this investigation was to assess the influence of respiratory muscle training-volume and -intensity as well as lesion specific factors such as para- or tetraplegia and injury completeness on improvements in in- and expiratory muscle strength.

Methods
Retrospective analysis of respiratory muscle strength measurements before and after a respiratory muscle training program. Men and women, ≥ 18 years of age with AIS A-D SCI from C4 to T12, who had performed a minimum of 10 individual respiratory muscle training sessions in an inpatient group-setting from 2010-2015, were included. Two linear regression equations were calculated for changes in in- and expiratory muscle strength due to respiratory muscle training. Independent factors were training-volume and -intensity as well as level and completeness of the lesion.

Results
71 patients performed inspiratory and 35 patients expiratory muscle training. Improvements in inspiratory muscle strength were dependent on training intensity and on the lesion level, whereas improvements in expiratory muscle strength were dependent on training intensity, completeness and the relative improvement in inspiratory muscle strength. Training volume did not have any significant effect on improvements in respiratory muscle strength.

Conclusions
The higher the intensity of a respiratory muscle training, the higher the improvements in respiratory muscle strength. Therefore, regular measurement of respiratory muscle strength and a progressive increase in training resistance is of high clinical importance.
Exoskeleton Training and Physical Activity after Spinal Cord Injury. A Case Series

Dr Ashraf Gorgey¹, Mr. Rodney Wade¹, Mrs Lynette Villadelgado¹, Dr Refka Khalil¹, Dr. Timothy Lavis¹
¹Hunter Holmes Mcguire Va Medical Center, Richmond, United States, ²Virginia Commonwealth University, Richmond, USA

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: The American College of Sports Medicine recommends 30 minutes per day of exercise training to reduce cardio-metabolic risk factors in the general population. The purpose of the current case series is to determine whether exoskeleton training (Ekso) can improve level of physical activity in persons with spinal cord injury.

Methods: Four men with chronic complete and incomplete SCI participated in a clinical rehabilitation program. The program involves exoskeleton (Ekso) walking with an assistive device (walker or crutches) once weekly for an hour for 8-12 weeks. Walking time and speed, stand-up time, ratio of walking to stand-up time and number of steps were determined over period. Whole body oxygen uptake during 6-minutes walking test as well as cardiovascular response were determined.

Results: Following 8 weeks of training (n=3), walking time, stand-up time, number of steps and ratio of walking to stand-up time increased from 12 to 22 minutes, 33.5 to 59 minutes, 151 to 662 steps and from 30% to 66%, respectively. Following 12 weeks of training (n=1), the same parameters increased from 7 to 54 minutes, 17 to 57 minutes, 242 to 2065 steps and from 41% to 95%, respectively. Oxygen uptake increased by almost 100% compared to resting condition. The average blood pressures and heart rates were 85/55 mmHg and 100 bpm (resting) and 86/58 mmHg and 89 bpm (recovery) following training.

Conclusions: Exoskeleton training improves parameters of physical activity in persons with spinal cord injury despite the length and the frequency of training.
Clinical manifestations of autonomic dysfunction in active patients with spinal cord injury

Mr Jorgen Vibjerg¹, Mrs Ellen Merete Hagen², Mr Helge Kasch¹³

¹Spinal Cord Unit Of Western Denmark, Viborg, Denmark, ²Autonomic Unit National Hospital for Neurology and Neurosurgery, University College London Hospital, London, Great Britan, ³Institute of Clinical Medicine, Aarhus University, Aarhus, Denmark

We present three patients with spinal cord injury (SCI) who all experienced activity triggered drop in blood pressure and heart rate, due to autonomic dysfunction caused by the injury.

Case 1: A 23 year old man with an incomplete SCI at C3 was rehabilitated to high function level AIS D. He experienced dizziness and nausea after physical activity, and abstained from training with high intensity. He was monitored with non-invasive continuous blood pressure measurement, while walking and running on a treadmill. He got pale and nauseous, BP dropped from 141/65 to 65/32.

Case 2: A 29 year old man with a complete traumatic SCI in C6 was seen 6 years post injury. He attended high level disability sport, and experienced nausea and dizziness associated with exercise. He was fitted with non-invasive BP measurement while cycling. When he reached 70 watts he stopped, and BP dropped to 77/50.

Case 3: A 43 year old man admitted for rehabilitation of a complete traumatic SCI at TH3 AIS D. He experienced during cardio pulmonary load, an increasingly severe tiredness and dizziness. He was monitored with non-invasive BP measurement while performing arm crank cycling. BP dropped throughout the experiment until he stopped due to severe tiredness, dizziness and a drop in BP. BP was normalized after 4-5 minutes.

These three cases illustrates exercise induced hypotension and post exercise hypotension. It is important to be diagnosed and prevent the phenomenon when making a god and qualified exercise program for high level spinal cord injured patients.
Experiences in four years of HAL exoskeleton SCI rehabilitation

Dr Dennis Grasmücke, Dr Oliver Cruciger, Dr Mustafa Citak, Mr Malte Ohlmeyer, Dr Renate Ch. Meindl, Prof Thomas A. Schildhauer, Dr Mirko Aach

Berufsgenossenschaftliches Universitätsklinikum Bergmannsheil Bochum, Bochum, Germany

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Title: Experiences in four years of HAL exoskeleton SCI rehabilitation

Introduction: In 2012 the neurologic controlled exoskeleton Hybrid assistive limb (HAL) was introduced in our SCI unit. Until now 20 acute and 40 chronic injured SCI patients (AIS A-D) have been treated following a 12 weeks daily body weight supported treadmill training wearing HAL exoskeleton. Here we report the feasibility, safety, neurological and functional results.

Methods: The 10-Meter-Walk-Test (10-mWT) including the Walking-Index-for-Spinal-Cord-Injury II (WISCI-II), 6-Minutes-Walk-Test (6minWT) and the Timed-Up-And-Go-Test (TUG-Test) assessed functional gait without using the exoskeleton. The ASIA Impairment Scale (AIS) and the lower extremity motor score (LEMS) were documented prior to training and after the intervention.

Results: All patients improved in their functional abilities. The acute patients reduced the time in the 10-MWT from 57.54±42.06 s at baseline to 21.38±25.35 s after 12 weeks of HAL training (p≤0.001). In the chronic injured cohort the 10MWT time was significant decreasing in main walking time from 54.12±35.46 s at baseline to 24.34±22.15 s at posttraining assessment (p≤0.001). Furthermore acute and chronic subjects could significantly improve in 6-minWT and TUG-Test. The acute cohort showed a significant improvement in the WISCI-II Score. The LEMS showed a statistically significant difference from 21.48±10.5 (before training) to 24.71±10.21 (last follow up) in chronic SCI patients and from 31±10.13 (before training) to 35.5±10.8 (last follow up) in acute SCI patients.

Conclusions: HAL training in acute and chronic SCI is safe and feasible. Functional and partial neurological improvements could be shown in acute and chronic SCI patients.
Infertility in Spinal Cord Injury (SCI) and Assisted Reproductive Techniques: Literature Review

Dr Aram Mashoof Fard1, Dr Chalil Vinod1, Dr Surendra Bandi1
1Salisbury Nhs Foundation Trust, Salisbury, United Kingdom

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: Most men with spinal cord injury suffer from infertility. Assisted Reproductive Techniques are there to support these patients who wish to father children.

Objective: How successful are assisted reproductive techniques in retrieving sperm and leading to pregnancy in patients with SCI.

Method: A comprehensive search was conducted of major biomedical databases (MEDLINE and EMBASE). Search strategies were specifically adopted to accommodate the appropriate MeSH headings and free text search terms.

Results: Sperm can be easily obtained non-surgically in 87% of patient with SCI. Penile Vibratory Stimulation (PVS) has been successful in 86% of patients with a T10 or rostral injury level. Electroejaculation (EEJ) has been successful in most cases of failed PVS. Although these techniques have been efficient in retrieving semen, quality is usually low. Despite abnormalities, sperm from men with SCI can successfully induce pregnancy. Reproductive outcomes for SCI male factor infertility are similar to outcomes for general male factor infertility. The SCI patients had lower fertilisation rates but similar pregnancy and live birth rates compared with non-SCI group. These rates did not differ significantly when PVS group compared with EEJ group. The sperm forward motility has been reported to be significantly greater when sperm was retrieved surgically by percutaneous vassal sperm aspiration than in the PVS group (P<0.01).

Conclusion: Prospective randomised controlled studies are needed to review the outcome of sperm retrieval and insemination techniques to help us advise the most appropriate treatment, and get a better quality sperm, fertilisation, pregnancy and live birth rate.
Spinal Cord Injury: Freezing sperm

Dr Aram Mashoof Fard, Dr Chalil Vinod, Mr Surendra Bandi
Salisbury NHS Foundation Trust, Salisbury, United Kingdom

Introduction: The deterioration of semen quality occurs very early after spinal cord injury (SCI). Thus cryopreservation of semen early after injury has been recommended. However, currently, there is a lack of enough data concerning the effects of long-term cryopreservation on the quality of the spermatozoa from SCI men.

Objective: Quality of spermatozoa from men with SCI before and after long-term cryopreservation.

Method: Literature review: Major biomedical databases (MEDLINE and EMBASE) were searched comprehensively. Identified articles and their references were reviewed.

Results: A study published in 2015 reported that cryopreservation resulted in a significant (P<0.0001) decrease in total sperm motility and viability. There were no significant differences between the semen parameters of samples collected early (up to 3 weeks) after SCI and later (median 11 years). A prospective study in 2010 reported that cryopreservation was associated with an increase in DNA fragmentation and decrease in mitochondrial activity of sperm from patient with SCI. Although some studies do not recommend freezing sperm in SCI patients, the pregnancy rates using frozen sperm, presented in a study in 2013, were encouraging (between 50% to 75%). Therefore it was recommended that this technique to be used in very specific situations.

Conclusion: Long-term cryopreservation of semen from SCI men results in essentially immotile sperm with minimal viability. Thus, routine long-term cryo-banking of semen harvested early after SCI cannot be recommended. Further structured studies are required to look at how the techniques and processes of sperm preservation and storage can be improved in this group of patients.
The reliability of measuring wound undermining in people with spinal cord injury

Mr Mohit Arora¹², Dr Lisa Harvey¹², Dr Harvinder Chhabra³, Ms Rajesh Sherawat³, Dr Joanne Glinsky¹², Dr Ian Cameron¹²

¹Sydney Medical School Northern, The University of Sydney, Sydney, Australia, ²John Walsh Centre for Rehabilitation Research, Kolling Institute of Medical Research, Royal North Shore Hospital, Northern Sydney Local Health District, Sydney, Australia, ³Department of Spine Service, Indian Spinal Injuries Centre, India

Introduction: An important feature of a pressure ulcer is the extent to which it is undermined. However, little attention has been directed at the measurement of undermining. The purpose of this study was to determine the reliability of measuring wound undermining in people with SCI.

Methods: Thirty people with SCI and a pressure ulcer with wound undermining were recruited from Indian Spinal Injuries Centre, India. Wound undermining was measured using the four cardinal points from a clock face namely 12'O clock, 3'O clock, 6'O clock and 9'O clock. Inter-rater reliability was tested by comparing the wound undermining scores from two different assessors. Intra-rater reliability was tested by comparing the wound undermining scores from the same assessor on two different days.

Results: The median (IQR) extent of wound undermining was 3.2 cm (1.0 to 7.1). The intraclass correlation coefficients (95% CI) for inter-rater and intra-rater reliability were 0.996 (0.992 to 0.999) and 0.998 (0.996 to 0.999), respectively. Repeat measurements by the same and different assessor were within 0.3 cm of each other, 80% and 83% of the time, respectively.

Conclusion: Wound undermining can be reliably measured and could be more widely incorporated into clinical practice to reflect the real size of a pressure ulcer.
A low-cost model of care to help people in low-income countries manage pressure ulcers at home: a randomised controlled trial

Mr Mohit Arora,1,2,3 Dr Lisa A Harvey1,2, Dr Alison J Hayes4, Dr Harvinder S Chhabra3, Dr Joanne V Glinsky1,2, Dr Ian D Cameron1,2, Ms Lucija Lavrencic5, Dr Narkeesh Arumugam6, Mr Sohrab Hossain7, Ms. Parneet K Bedi6

1Sydney Medical School Northern, The University of Sydney, Sydney, Australia, 2John Walsh Centre for Rehabilitation Research, Kolling Institute of Medical Research, Royal North Shore Hospital, Northern Sydney Local Health District, Sydney, Australia, 3Department of Spine Service, Indian Spinal Injuries Centre, India, 4School of Public Health, The University of Sydney, Sydney, Australia, 5Spinal Cord Injury Unit, Royal North Shore Hospital, Sydney, Australia, 6Department of Physiotherapy, Punjabi University, Patiala, India, 7Centre for Rehabilitation of the Paralysed, Bangladesh

Introduction: Pressure ulcers are very common in low-income countries and people are commonly left to manage their pressure ulcers at home. The aim of this study was to determine whether a low-cost model of care involving weekly telephone contact with patients was effective for helping these individuals manage their pressure ulcers.

Methods: A 12-week multicenter, prospective, assessor-blinded, parallel randomised controlled trial was conducted. Participants were included if they sustained a spinal cord injury more than 3 months prior and had at least one pressure ulcer. Participants were randomly allocated (1:1) to usual care (Control group) or to usual care with weekly telephone contact (Intervention group). The weekly telephone contact was with a trained healthcare professional for 15 to 30 minutes a week. The healthcare professional provided ongoing advice and support. Specifically, this included reinforcing self-help strategies for managing pressure ulcers, minimising psychological stress and enhancing engagement with life important. The primary outcome was the size of the pressure ulcer at 12 weeks. Some of the secondary outcomes included Pressure Ulcer Scale of Healing, Depth, Braden Scale, Undermining Distance and satisfaction with healthcare service delivery.

Results: One hundred and twenty participants were randomised from 3 centers. The mean between-group difference for size of pressure ulcer at 12 weeks was 1.1 cm² (95% CI -0.8 to 4.3).

Conclusion: Pressure ulcers remain a major problem in low-income countries. Weekly telephone contact does not help heal pressure ulcers although people value the regular contact and support with a health professional.
Spasticity is a common complication seen after spinal cord injury (SCI). Botulinum toxin injection is one of the option for the management of focal, segmental spasticity in SCI. The aim of this study is to give the characteristics and the results of the SCI patients treated with botulinum toxin A (BoNT-A) injections for the management of spasticity in a rehabilitation setting.

Materials and Method: We reviewed all the files of the patients who had undergone BoNT-A treatment for the management of spasticity between March 2015 and March 2016. Totally 120 patients with spasticity due to various etiologies were treated with BoNT-A and 18 (15%) of them were having SCI.

Results: Ten (56%) female and 8 (44%) male SCI patients with a mean age of 44.2 years (18-69) were enrolled. Fifteen (83.3%) of them were paraplegic. Eleven patients were using oral baclofen, and 3 patients were using diazepam where 5 patients were not on any antispastic medication. One patient had a baclofen pump. Gastrocinemus, soleus and hip adductor muscles were the most common sites of injection. Modified Ashworth Scale was used for the measurement of spasticity. All the patients had at least one point decrease in MAS scores in the evaluation done at 2 weeks after injection. BoNT-A was tolerated very well and no side effects were recorded.

Conclusion: Chemodenervation with Bont-A is one of the treatment option for the management of spasticity in SCI patients which can be combined with the other treatment options.
Recurrence Following Surgical Closure of Pressure Ulcers

Ms Rachael Von Graevenitz, Dr Pradeep Thumbikat, Dr Kidangalil Mathew, Dr Ramaswamy Hariharan

Sheffield Teaching Hospitals, Sheffield, United Kingdom

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction - Surgical closure remains a valuable technique in the management of full thickness PU, resulting in early healing of PU with reduced scarring that allows individuals to resume normal activity sooner. However there is a small but significant risk of complications including wound failure and recurrence of PU.

Method - A review of consecutive pressure ulcers in SCI patients surgically managed over a two year period at a supra regional spinal injuries centre was undertaken. Patient and wound characteristics, surgical technique, early complications, length of hospital stay and delayed complications were determined from a review of hospital notes and outreach nursing records. A detailed analysis of reasons for wound failure where that occurred was undertaken.

Results - 92 pressure ulcer closures were carried out. 3 patients experienced wound breakdown within the first month requiring further surgery. 5 patients experienced a delayed breakdown (within the first year) in the community. Reasons for delayed failure were varied. The majority of wounds were closed by direct closure following staged debridement.

Conclusion - Surgical closure of PU is effective in facilitating early healing of PU, even in those with complex and persistent PU that has failed conservative management. The incidence of complications is low and attributable to wound and patient characteristics including compliance. Associated behavioural and psychological difficulties increase the likelihood of wound failure.
Spasticity Secondary to Neural Stem Cell Transplantation Combined with Treadmill Training in Chronic Phase Spinal Cord Injury Model Mice

Dr Syoichi Tashiro¹, Dr Soraya Nishimura², Dr Akio Iwanami², Dr Meigen Liu¹, Dr Hideyuki Okano³, Dr Masaya Nakamura²


Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

[Introduction] As we have demonstrated, combination therapy with treadmill training (TMT) and neural stem/progenitor cell (NS/PCs) transplantation induces significant locomotor recovery even in chronic phase SCI. However, the profiling of the motor recovery has not yet clarified. The purpose of this study is to determine the effect of the combination therapy on the spasticity and other locomotor indices.

[Methods] In 70 adult C57/BL6J mice, severe contusive SCI was induced at T9 level using an IH-impactor. Animals were randomly separated into 4 groups: 1) NS/PCs with TMT (TP-TMT); 2) NS/PCs without training (TP); 3) PBS with TMT (TMT); and 4) PBS without training (Control). NS/PCs or PBS was injected at 49 days post injury (DPI). Partial body-weight supported bipedal-gait TMT was performed from 42 to 105 DPI. Locomotor function was assessed with BMS and Digigait® footprint analysis. Spasticity was assessed with strain-gauge testing. Spinal inhibitory capacity was immunohistologically assessed with GAD65+ cells number within lumbar enlargement at 133 DPI.

[Results] Gait analysis revealed the gait speed as well as BMS scoring was significantly faster in the combination therapy group. On the other hand, spasticity was significantly ameliorated both in TP-TMT and TMT groups.

[Conclusion] Whereas total locomotor function was recovered by the combination therapy, locomotor inhibitory capacity and spasticity seems influenced more by the treadmill training. In the order to establish the approach toward the treatment of chronic SCI by regenerative medicine, it is important to clarify the effect of each therapy combined one by one.
Catheter related adverse events in intrathecal baclofen therapy (ITB) since introduction of the Ascenda catheter

Dr. Evelyne Linden¹, Dr. Nathalie Draulans¹, Prof. Tom Theys², Prof. Bart Nuttin², Dr. Carlotte Kiekens¹

¹University Hospitals Leuven, dept. Physical Medicine and Rehabilitation, Pellenberg, Belgium, ²University Hospitals Leuven, dept. Neurosurgery, Leuven, Belgium

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction
Adverse events, related to ITB are mostly catheter related. Borrini and Draulans both calculated the risk for serious adverse events at 0.011/month, respectively 50% and 70% catheter related. Since the introduction of a new catheter (Ascenda, Medronic) in 2011, these data should be revised.

Methods
All patients who received the new catheter (Ascenda, Medronic), first implants and revisions, at the University Hospitals Leuven were prospectively included in a database from November 2011 until March 2016. Besides demographics and diagnosis, information on surgical reinterventions, catheter revisions and adverse events was collected.

Results
One hundred seventeen Ascenda catheters were implanted in 107 patients (63 male, 44 female) of which 26 patients suffered from spinal cord injury (SCI), 33 cerebral palsy, 29 multiple sclerosis and 19 miscellaneous. The SCI group consists of 17 tetraplegic (11 AIS A/B, 6 AIS C/D) and 9 paraplegic patients (8 AIS A/B, 1 AIS C). These 117 catheters stand for 206 pump-years, during which 15 surgical revisions of which 8 catheter revisions in 6 patients were performed. This results in a catheter related reintervention risk of 0.003 per month.

Conclusion
This is the first report on the altered risk of catheter related complications in ITB therapy, with a new type of catheter. Although it is too early to perform major statistical analysis on these data, it seems that the catheter related risk has decreased significantly. This affects the risk-benefit ratio for patients and has serious implications for the calculations of cost-effectiveness of ITB-therapy.
Comparison of body composition and metabolic profile in chronic spinal cord injury patients depending on the severity of spasticity

Pf Il-Young Jung¹, Pf Hye-Ri Kim², Pf Seong Min Chun³, Pf Ja-Ho Leigh¹, Dr Young-Ah Choi¹, Pf Hyung-Ik Shin¹
¹Seoul National University Hospital, Seoul, South Korea, ²Department of Rehabilitation Medicine, National Rehabilitation Center, Seoul, South Korea, ³Department of Rehabilitation Medicine, Kyungpook national university hospital, , South Korea

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction: To investigate the effects of spasticity on anthropometric dimensions, body composition, and metabolic profiles in patients with chronic motor complete spinal cord injury (SCI).

Methods: Fifty-six participants were divided into two groups (no or mild spasticity group, 29; severe spasticity group, 27) based on the assessment of the extensor muscles according to the modified Ashworth scale (MAS). Anthropometric dimensions (waist circumference; WC, waist-to-height ratio; WtHR), body composition (body fat percent; BFP, bone mineral density; BMD), and metabolic profiles (leptin, total cholesterol, low density lipoprotein; LDL, high density lipoprotein; HDL, triglyceride; TG, fasting blood sugar; FBS, and glycosylated hemoglobin; HbA1c) were compared between two groups with different degree of spasticity.

Results: Patients with no or mild spasticity showed a larger WC and WtHR than patients with severe spasticity (p=0.033, p=0.006, respectively). The levels of leptin and BFP in the no or mild spasticity group were significantly higher than those in the severe spasticity group (p<0.001, p=0.002, respectively). However, no difference in BMD and the levels of total cholesterol, LDL, HDL, TG, FBS and HbA1c were observed between these groups.

Conclusions: The results of the study suggest that spasticity may in fact have a beneficial effect on body composition and metabolism in individuals with chronic motor complete SCI.
Complications in the Surgical and Non-Surgical Treatment of Type-II Odontoid Fractures: A Single Center Case Series

Dr Michael Haak1, Dr Ryan Martyn1, Dr. Michael Rutter1, Dr Benjamin Wagner 2

Geisinger Health System, Danville, United States

This is a review of the complications of treatment of Type-II Odontoid Fractures at a single institution from 2006-2015. Complications of both surgical and non-surgical care are outlined.

Methods: Single center sequential case review of Type-II Odontoid Fractures identified 116 patients with traumatic fractures; 46 patients were treated surgically and 70 were treated non-surgically. Complications were listed for each case from electronic medical record review during the inpatient stay and from outpatient clinical notes after discharge.

Results: Significant mortality within the first year was noted in both groups. Over the 9 year treatment period the all cause mortality for the surgical group was 26%; all cause mortality for the non-surgical group was 61%. Short term complications were mainly in the surgical group and included perioperative death, neurological worsening, infection, and others.

Conclusions: Significant complications of treatment of Type-II Odontoid Fractures occur in both surgically and non-surgically treated patients. Surgical patients had most of the early complications; significant mortality in both groups suggests odontoid fractures may be a significant marker of health fragility.
Spinal Cord Damage Due To Surgical Positioning Of The Neck: A Pediatric Case Report

Professor, MD Belgin Erhan, MD Rahşan Kemerdere, Associate Prof; MD Berrin Gündüz, Prof, MD Osman Kızılkılıç, Prof, MD Murat Hancı

1 Okmeydanı Training Hospital PMR Clinic, Istanbul, Turkey, 2 İstanbul Aydın University, Faculty of Health Sciences, 3 İstanbul University Cerrahpaşa Medical Faculty, Department of Neurosurgery, Istanbul, Turkey, 4 İstanbul University Cerrahpaşa Medical Faculty, Department of Radiodiagnostic, Istanbul, Turkey, 5 İstanbul PMR Training Hospital, İstanbul, Turkey

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Objective: Here we present a pediatric case of spinal cord injury together with infarction in the cervical region which occurred after tracheal reconstructive surgery under general anesthesia.

Case report: 14-year-old male was consulted for acute tetraplegia which developed 12 hours after surgery for the treatment of tracheal stenosis. His medical history revealed respiratory arrest due to pulmonary emboli which developed three months ago because of prolonged immobilization for left metatarsal fracture. Cardiopulmonary resuscitation and defibrillation was performed for 30 minutes and he was followed in the intensive care unit for the following two months. After his discharge, tracheal resection and reconstruction was performed due to tracheal stenosis which developed owing to previous intubation. His neurological status before surgery was normal. No anesthetic or surgical complications were reported during the operation. But tetraplegia developed twelve hours after surgery with loss of pain and temperature, light touch sensations below the level of C4. Deep sensations (position and vibration sense) were preserved. Anal tone was absent and plantar responses were mute. Spinal MRI revealed hyperintense expansile lesion between C2 and C7 levels on T2 weighted images. Lesion characteristics were in favor of a cervical hyperextension or hyperflexion injury, although the patient’s clinical status was consistent with vascular compromise of the spinal cord.

Conclusions: Surgical positioning of the neck can be a predisposing factor for dual pathology of spinal cord; direct cord damage and infarction. Postoperative treatment measures are not effective indicating that preventive measures should be taken peroperatively to avoid this irreversible complication.
INTRODUCTION
The purpose of the present study was to reveal the effectiveness of late decompression surgery for cervical spinal cord injury (CSCI) with severe cord compression.

METHODS
Consecutive CSCI without bone injury patients who admitted to our institute were eligible for this study. Patients were divided into four groups according to compression rate (CR), and method of treatment; surgical group (S+) and non-surgical group (S−). Over 40% of compression was defined as C+ and under 40% as C−. Functional recovery was evaluated by modified Frankel Grading (FG), ASIA impairment scale (AIS), Barthel Index (BI) and Spinal Cord Independence Measure (SCIM).

RESULTS
Seventy-eight patients were enrolled. Thirty-two patients were categorized C+ with a mean CR of 52.2 (±8.9)%, of these twenty patients underwent surgery. Forty-six patients were categorized C− with a mean CR of 20.9 (±10.1)%, of these eleven patients underwent surgery. ≥2 grade AIS improvement was observed in 30.0% of patients with surgical treatment although it was not in any patient without surgery in C+ group (OR=11.21, 95%CI: 0.57, 219.50). In C− group, ≥2 grade AIS improvement was observed in 18.2% of patients with surgery and in 11.4% without any surgery (OR=1.72, 95%CI: 0.27, 10.99). SCIM improvement rate at discharge were 60.1 (±26.9)% in C+S+, 20.0 (±28.3)% in C+S−, 51.6 (±28.5)% in C−S+ and 43.1 (±33.2)% in C−S−.

CONCLUSION
These results indicated that decompression surgery could be one of the options for the patients with severe cord compression. In contrast, because of acquisition of good functional outcome by rehabilitation, decompression surgery were not always necessary for CSCI without severe cord compression.
Ultrasound-Guided Cervical Nerve Root Block

Dr. Ryota Kimura¹, Dr. Naohisa Miyakoshi¹, Dr Toshiki Matsunaga², Dr. Yoichi Shimada¹
¹Department of Orthopedic Surgery, Akita University Graduate School of Medicine, Akita, Japan, ²Division of Rehabilitation, Akita University Hospital, Akita, Japan

Poster Viewing with refreshments. 1, Exhibition/Poster/Catering Area, September 14, 2016, 10:35 AM - 11:35 AM

Introduction
Cervical nerve root block (CNRB) is implemented for the treatment of painful radiculopathy, including spinal cord injury. Usually, these blocks are administrated under fluoroscopy associating with radiation exposure and some complications. We conducted ultrasound (US)-guided CNRB for 12 patients. The objective is to report its detailed procedure and validity.

Materials and Methods
Totally 21 cervical nerve roots (C5-8) were blocked. The patients in spine position were examined using linear probe 18 MHz, and the each root level was identified from the distinctive shape of C7 transverse process and interscalen level. Using a 23-gauge short needle, 1.0% mepivacaine and dexamethasone were injected under the US visualization. Pain and numbness were evaluated using Numeric Rating Scale (NRS, 0-10) before and after the procedure.

Results
US guidance identified all of the target roots correctly. Mean NRS before blocks (6.0; range 2-10) significantly improved after the procedure (3.3; range 1-8) (p<0.005). No complication occurred.

Discussion
Although the fluoroscopic CNRB provides anatomical precision and efficacy, it is associated with radiation exposure and difficulty of performing during outpatient visit or at bed side. Meanwhile, US-guided peripheral nerve block has become clinically common. We applied this technique for CNRB to decrease risks of radiological guidance. Using current technique, we can see each nerve root in a few seconds and the needle on real-time, preventing complication such as irradiation, vessels centesis, pneumothorax, sympathetic / vagus nerve block, and so on.

Conclusion
US-guided CNRB is a safe and effective method alternative to fluoroscopic procedure.
The Eksoskeleton - First clinical experiences with spinal cord injury patients and measurement of their energy expenditure in the Netherlands

Mrs. MD Willemijn Faber¹, Miss, PhD Janneke Nachtegaal¹, Miss Maaike Eken¹, mister, PhD Han Houdijk¹

¹Rehabilitation Centre Heliomare, Wijk aan Zee, Netherlands

Introduction: An innovative therapy in rehabilitation of patients with spinal cord injury (SCI) is the use of exoskeletons. Exoskeleton training could improve walking and may counteract the impacts of immobility and diminished weight bearing. Apart from limited evidence on the effectiveness of exoskeleton training, knowledge on energy expenditure and muscle activation during walking in exoskeletons is limited as well. Objectives are describing energy expenditure and muscle activity for walking with and without Eksoskeleton. Furthermore share our first experiences on the feasibility within our clinical setting.

Methods: measure energy expenditure and muscle activity in 10 able bodied persons and in 10 patients by three trials 1. Ekso walking with full support 2. Ekso walking with partial support 3. walking without Ekso. Oxygen uptake (VO₂) and heart rate (HR) were monitored. Muscle activity was measured using surface electromyography. Time to put on the eksoskeleton and effective therapy time was also measured. Patients included had incomplete SCI up to level C7.

Results: energy expenditure was highest during Ekso walking with partial support, followed by full support and without Ekso. Muscle activity of the calf muscles was lower during walking in Ekso whereas the hamstrings and rectus femoris showed higher activity compared to walking without Ekso especially during terminal stance. Time to put on the suit decreased from 45 minutes to 10 minutes. Also the effective therapy time increased.

Conclusions: Ekso walking induces high physical strain and a different coordination pattern compared to walking without Ekso. Ekso seems feasible during rehabilitation.

Dr Serdar Kesikburun¹, Prof. Bilge Yılmaz¹
¹Gülhane Military Medical Academy, Turkish Armed Forces Rehabilitation Center, Ankara, Turkey

Introduction: Repetitive Transcranial Magnetic Stimulation (rTMS) is a non-invasive brain stimulation technique that could modulate the excitability of the motor cortex area and affect descending corticospinal pathways. High frequency rTMS can decrease the corticospinal inhibition and enhance the motor recovery. The study is aimed to investigate the effect of high frequency rTMS on lower extremity motor recovery and gait parameters in patients with chronic motor incomplete traumatic spinal cord injury (SCI).

Methods: A sham-controlled double-blind randomized study was undertaken. 10 patients (30.3±11.3 years) with chronic (>1 year) motor incomplete traumatic SCI were randomized into active rTMS group (n=5) or sham rTMS group (n=5). Active rTMS (20 Hz, a total of 1600 stimuli) or sham rTMS were applied in the motor cortex area of lower extremities during 3 weeks (15 sessions). In addition to rTMS sessions, patients underwent a rehabilitation program including exercises for strengthening, walking and balance. Lower extremity motor score (LEMS), the temporal-spatial gait parameters measured by 3D gait analysis, Walking Index for SCI – II (WISCI-II) scale and 10 meters walking test were assessed at baseline and after the treatment.

Results: Active rTMS group showed significant improvement in LEMS score and walking speed after the treatment compared to baseline (p=0.041 and p=0.048, respectively), while sham rTMS group did not show significant changes (p>0.05). Comparison of the patients revealed no significant difference between the groups in any outcome measures (p>0.05).

Conclusion: rTMS treatment may have some benefit in motor recovery and gait parameters in chronic incomplete SCI.
Optimizing Neuromodulation to Enhance Stepping in Spinal Cord Injury

Professor Keith Tansey¹, Jason White², Professor Steve DeWeerth²

¹Methodist Rehab/U Mississippi Med Ctr/Jackson VA, Jackson, United States, ²Biomedical Engineering, Georgia Tech/Emory University, Atlanta, United States

Topical Papers 2, Forum (Parallel 3), September 14, 2016, 11:40 AM - 1:10 PM

Introduction: Following SCI, residual neural circuits for stepping can be augmented with external afferent stimulation according to recent anecdotal reports. We have now systematically determined how well that stimulation can be optimized to best enhance stepping in a patient cohort using spinal cord and peripheral nerve stimulation.

Methods: Twelve subjects with cervical or thoracic SCI of varying severity were studied in the Lokomat gait orthosis. Stimulation was provided as transcutaneous spinal cord stimulation (TSCS) or at either distal tibial or common peroneal nerve sites. Stimulation parameters that were varied included frequency (all 3 sites) and timing or duration during the gait cycle (peripheral sites). Real time forces recorded by the Lokomat guided the development of an input/output model in each subject such that stimulation parameters were eventually optimized to decrease assistance forces from the robot.

Results: Using our optimization protocol, stimulation parameters were found that improved subject generated stepping forces over random or no stimulation. At the peripheral nerve sites, we found that high frequency stimulation, delivered at the swing to stance transition, for more than 20% of the gait cycle duration improved stepping forces in most subjects. With TSCS, stimulation frequencies between 30 and 50 Hz augmented stepping the best. Further analysis revealed that stimulation frequencies below 25 Hz best augmented stance and between 25 and 50 Hz best augmented swing. There was some variability between subjects and for 1/3 of them, the best TSCS stimulation was 0 Hz.

Conclusion: Neuromodulation can be optimized to improve stepping after SCI.
Strength training for partially-paralysed muscles in people with recent spinal cord injury: a within-participant randomised controlled trial

Ms Elizabeth Bye1,2, Ms Anjali Gambhir3, Professor Lisa Harvey1, Ms Chitra Kataria3, Dr Joanne Glinsky1, Dr Jocelyn Bowden1, Ms Keira Tranter2, Ms Cynthia Lam4, Ms Jacqui White5, Ms Emily Gollan6, Mr Mohit Arora1, Ms Neha Malik3, Professor Simon Gandevia7

1 John Walsh Centre for Rehabilitation Research, University of Sydney, Sydney, Australia, 2 Spinal Injury Unit, Prince of Wales Hospital, Sydney, Australia, 3 Indian Spinal Injury Centre, Delhi, India, 4 Spinal Injury Unit, Royal North Shore Hospital, Sydney, Australia, 5 Spinal Injury Unit, Royal Rehab, Sydney, Australia, 6 Queensland Spinal Cord Injuries Service, Metro South Health, Brisbane, Australia, 7 Neuroscience Research Australia, Sydney, Australia

Topical Papers 2, Forum (Parallel 3), September 14, 2016, 11:40 AM - 1:10 PM

Introduction: Weakness secondary to partial paralysis is one of the most common and limiting impairments following SCI. Strength training programs are widely used to increase strength, however their effectiveness is unclear. Some initial work suggests that partially paralysed muscles may not be as responsive to strength training as generally assumed. Therefore, the aim of this trial was to determine the effects of a 12-week strength training program in partially-paralysed muscles, as compared to usual care.

Methods: An assessor-blind randomised controlled trial was conducted in five SCI units. Thirty people with recent SCI undergoing inpatient rehabilitation participated. One target muscle group on one side of the body was selected for each participant, and randomly allocated to the strength training group. The corresponding contralateral muscle was allocated to the control group. The primary outcome was strength. Secondary outcomes were spasticity and participants’ perception of function and strength.

Results: Training increased strength with a mean (95% CI) between-group difference of 4.3 Nm (1.9 to 6.8; pre-defined clinically meaningful treatment effect was 2.7 Nm). Participants perceived that both strength and function had improved (mean between-group difference (95%CI) of 2.2/10 points (1.3 to 3.0) and 2.1 (1.2 to 3.0), respectively. Strength training did not have any adverse effects on spasticity (mean between-group difference (95%CI) of 0/5 points (-0.25 to 0.32). No participants dropped out and compliance was excellent.

Conclusion: This is one of the first clinical trials to confirm the benefits of strength training for partially-paralysed muscles in people with recent SCI.
Prognosis of functional recovery after traumatic spinal cord injury: role of neurophysiology

MD Markus Hupp¹, MD Chiara Pavese¹, MD Martin Schubert¹

¹Neurology, Spinal Cord Injury Center, University of Zürich, Balgrist University Hospital, Zurich, Switzerland

Topical Papers 2, Forum (Parallel 3), September 14, 2016, 11:40 AM - 1:10 PM

M. Hupp*, C. Pavese*, M. Schubert, & EMSCI study Group

Introduction: An early and reliable prognostic assessment of neurological and functional recovery after spinal cord injury would be crucial to orient treatment strategies, to counsel patients and their families and to set rehabilitative goals. The International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) gives a prognostic indication thanks to the well validated and standardized examination protocols. Aim of our study is to investigate the additional benefit provided by the combination of neurophysiological data with the neurological classification with ISNCSCI in the definition of a reliable functional prognosis.

Methods: Data of patients affected by traumatic spinal cord injury derived from European Multicenter Study about Spinal Cord Injury were analyzed. As clinical predictors we considered gender, age and data derived from ISNCSCI. As neurophysiological predictors we analyzed motor evoked potentials to upper and lower extremities as well as somatosensory evoked potentials and nerve conduction velocity studies of the tibial and ulnar nerves. Functional recovery and independence in daily life activities were assessed through the Spinal Cord Independence Measure.

Results: Our study shows the additional benefit provided by the combination of neurophysiological measurement with the neurological classification with ISNCSCI in the prediction of functional recovery after spinal cord injury.

Conclusion: Our study may improve the early definition of functional prognosis after traumatic spinal cord injury and contribute to the optimization and standardization of clinical and neurophysiological protocols among different spinal cord injury centers.

*Authors with equal contribution
Describing and understanding functioning in Spinal Cord Injury - a graphical model approach

Dr Cristina Ehrmann-Bostan\textsuperscript{1,2}, Dr Birgit Prodinger\textsuperscript{1,2}, Prof. Dr. Gerold Stucki\textsuperscript{1,2}

\textsuperscript{1}Swiss Paraplegic Research, Nottwil, Switzerland, Nottwil, Switzerland, \textsuperscript{2}Department of Health Sciences and Health Policy, University of Lucerne, Lucerne, Switzerland, Lucerne, Switzerland

Topical Papers 2, Forum (Parallel 3), September 14, 2016, 11:40 AM - 1:10 PM

Introduction: Optimizing functioning is the primary outcome in rehabilitation of people with Spinal Cord Injury (SCI). However, epidemiological studies are needed to gain an in-depth understanding of how aspects of functioning, including the body, what a person wants to do interact and where to intervene for improving functioning. This study aimed to describe and understand functioning in people with SCI.

Methods: Data from 1549 participants in the Swiss Spinal Cord Injury Cohort Study Community Survey 2012 was used. Approximately 69% had paraplegia and 58% incomplete lesions. Forty-eight items operationalizing functioning as described in the International Classification of Functioning, Disability and Health and the WHOQOL-Bref question ‘Satisfaction with health’ were selected. The prevalence of relevant problem in each functioning area was calculated. Then, the association structures and areas of functioning that are most influential for optimizing health was estimated using graphical modelling.

Results: More than 70% persons reported problems related to sexual dysfunction, spasticity, chronic pain, tiredness and limitation in ascending the stairs, doing housework, sport. The main functioning areas identified as potential target for improving health included participation in sports, emotional functions, chronic pain, tiredness, washing upper body, sleep functions, bowel management, and autonomic dysreflexia. Variables related to mental health, transfer and everyday personal care were strongly associated when accounting for other functioning variables.

Conclusions: This study provides a first insight into the complex associations of various functioning aspects which, in turn, can serve as the foundation for generating hypotheses for testing in future studies.
Clinical Trials Update for 2016

Ms. Linda Jones, Professor Curt Armin

Craig H. Neilsen Foundation, Boulder, United States, University of Zurich, Zurich, Switzerland, Balgrist University Hospital, Zurich, Switzerland

Workshop 5: Clinical Trials Update for 2016. Linda Jones, Festsaal (Plenary), September 14, 2016, 11:40 AM - 1:10 PM

Overall Course Objective: Provide an update on selected current and upcoming clinical trials.

Learning Objectives and Outcomes:
1. Discuss translation of research programs from the pre-clinical to clinical stage.
2. Describe the current status of the highlighted clinical trials.
3. Assess the current challenges for clinical trials.

Awareness of current research is important for both researchers and clinicians. The intended outcome is to provide an update on current clinical research to foster communication between researchers and clinicians on advancements and challenges in clinical research.

Synopsis:
The clinical trials landscape is constantly evolving as trials of novel therapeutics are initiated and others progress to more advanced trial stages. In this Spinal Cord Partnership Endeavors (SCOPE) sponsored symposium updates on the latest clinical trials in biologics, drugs and implanted scaffolds will be provided. Presenters will briefly summarize the scientific rationale, pre-clinical data and provide clinical trial updates. Meeting content will consist of an introduction and overview of the evolution of the clinical trial landscape. Six clinical trials from the list below will be presented by a trial representative. Presenters will have ten minutes to present with two minutes for discussion. There will an additional 10 minutes for general questions and fostered discussion, focusing on current challenges in clinical trials.

Potential Trials to be presented (six trials total, ten minutes to present, two minutes for questions/discussion):
- Stem Cells, Inc. (Human Neural Stem Cells)- Armin Curt, MD/Stephen Huhn, MD
- Asterias Biotherapeutics (Human Embryonic Stem Cell Derived Neural Cells)- Ed Wirth, MD, PhD
- In Vivo Therapeutics (Neuro-Spinal Scaffold) – Kristen Neff, MS
- North American Clinical Trials Network (Riluzole) – Allan Martin, MD
- Vertex (Cethrin - recombinant Rho protein antagonist)- Marco Rizzo, MD, PhD
- Athersys (MultiStem-multipotent adult progenitor cells) – Sarah Bush, PhD
Identification of Cases of Non-traumatic Spinal Cord Disorder Using Administrative Databases: Rationale, Approaches and Challenges

Professor Susan Jaglal1, Prof Sara Guilcher3, Dr. Peter New3, Dr. Vanessa Noonan4, Dr. Chester Ho5, Prof Fin Biering-Sørensen2

1University of Toronto, Toronto, Canada, 2Clinic for Spinal Cord Injuries, Copenhagen/Hornbæk, Denmark, 3Caulfield Hospital, Alfred Health, Melbourne, Australia, 4Rick Hansen Institute, Vancouver, Canada, 5Hotchkiss Brain Institute, University of Calgary, Calgary, Canada

Workshop 6: Identification of Cases of Non-traumatic Spinal Cord Disorder Using Administrative Databases: Rationale, Approaches and Challenges. Susan Jaglal, Geheime Ratstube (Parallel 1), September 14, 2016, 11:40 AM - 1:10 PM

In a number of developed countries the incidence of non-traumatic spinal cord disorder (NTSCD) is reported to be greater than that for traumatic spinal cord injury (tSCI). Over the next twenty years, with the aging of the world’s population, it is expected that the higher incidence of non-traumatic spinal cord disorders compared to tSCI will become the norm in most countries. This will pose increased and unique demands on healthcare systems worldwide. To date, researchers and healthcare providers know little about the growth and demographics of non-traumatic spinal cord disorders. Unlike tSCI, NTSCDs represent a heterogeneous collection of conditions whose etiologies are not usually related. This poses a significant barrier when trying to identify cases systematically. Without such information, policy-makers and healthcare providers are unable to make informed decisions about the resources and treatments necessary to care for this population in a cost-effective, timely and evidence-based manner. An important first step is for the SCI community to obtain consensus on the administrative data diagnostic codes used to define NTSCDs.

At the end of this workshop participants will be able to:

i) Appreciate different definitions of NTSCD and implications for diagnostic coding
ii) Describe the rationale, approaches and challenges to identifying cases of non-traumatic spinal cord disorders using administrative databases
iii) Compare and contrast the Australian and Canadian experiences with determining incidence and prevalence of NTSCD
iv) Apply learnings to their own jurisdictions to determine incidence and prevalence of NTSCD

The 90 minute session will include short presentations from the panel and discussion with the workshop audience. Four 15 minute presentations (10 minute presentations and 5 minutes questions) will include:

i) A historical perspective of NTSCD research and the Australian experience with identifying NTSCD using administrative data (P New)
ii) Decisions, Decisions - Algorithms for identifying non-traumatic spinal cord disorders (S Jaglal, S Guilcher)
iii) Demographic and clinical characteristics of cases of NTSCD (V Noonan)
iv) Who are we missing? Comparing cases in administrative data with chart review (C Ho)

Panel Discussion Moderated by F Biering-Sørensen: Implications and Recommendations for the International SCI Dataset and ICD coding (30 minutes)
Numerous small scale pilot clinical research studies in chronic spinal cord injury (SCI) have been, and continue to be, conducted worldwide with promising results. Many of these studies have not been expanded to high-powered initiatives due to reasons that include limited financial resources for multicenter trials, competing studies in small patient populations and international privacy and regulatory requirements. These and other barriers in international collaborations were identified in a survey conducted following a workshop at ISCoS 2013.

A cohesive strategy involving key stakeholders is required to enable these high-powered studies to be undertaken internationally. The strategy should include a robust and objective process for project selection, funding, operationalization (including recruitment and data management), accountability and integrated knowledge translation consideration. This workshop will explore the process and identify the strategy for the development of an international network that facilitates collaborations in high-impact multicenter clinical trials. Such an international network may also lead to more interactions between researchers, clinicians and people with SCI internationally to collaborate in the implementation of best practices in the care of people with SCI.

Objectives
1. To identify potential partners for an international collaborative network
2. To identify requirements and process for multicenter collaborations (including process and criteria for project selection)
3. To identify infrastructure required for collaboration
4. To determine the initial steps for strategy development and execution plan for the international collaboration network

Format
• Invited speakers will address key developments toward the identified objectives (15 Min)
• Working session will engage participants in identifying potential solutions to meeting the specific objectives stated above (60 min)
• Summary and identification of next steps (15 min)

Who should attend?
Clinicians, researchers, trainees, consumers, industry, funding agencies and professional and consumer SCI organizations interested in advancing international collaboration in clinical research.
Agenda
Workshop Chair: Associate Prof. Doug J. Brown (Past President of ISCoS)

1) Introduction: Overview and Rationale for the Workshop
   Speaker: Dr. Doug J. Brown
2) Examples of Consumer-initiated Collaborations to Facilitate Clinical Trials
   Speaker: Dr. Kim Anderson-Erisman
3) Example of an ongoing international SCI collaboration: ISCoS Database ASCoN Pilot Project (IDAPP)
   Speaker: Dr. Harvinder S. Chhabra
Evidence-Based Physical Activity Guidelines for Adults with SCI: An International Consensus Project

Dr Kathleen A. Martin Ginis¹, Dr Jan W. van der Scheer², Dr Sonja de Groot³, Dr Sophie Jörgensen⁴

¹School of Health and Exercise Sciences, University of British Columbia, Kelowna, Canada, ²Peter Harrison Centre for Disability Sport, National Centre for Sports and Exercise Medicine – East Midlands, Loughborough University, Loughborough, UK, ³Reade, Centre for Rehabilitation and Rheumatology, Amsterdam; University of Groningen, University Medical Center Groningen, Centre for Human Movement Sciences, Amsterdam, The Netherlands, ⁴Department of Health Sciences, Lund University; Department of Neurology and Rehabilitation Medicine, Skåne University Hospital, Lund, Sweden

Workshop 8: Evidence-Based Physical Activity Guidelines for Adults with SCI: An International Consensus Project. Kathleen Martin Ginis, Prinz Eugen Saal (Parallel 4), September 14, 2016, 11:40 AM - 1:10 PM

Routine physical activity can improve fitness and well-being and reduce risk for developing numerous chronic health conditions. However, the vast majority of people with SCI are insufficiently active to reap these benefits. The availability of SCI-specific, evidence-based clinical practice guidelines is important to support the health and fitness-promoting efforts of scientists, clinicians, fitness programmers, and people with SCI themselves. This workshop provides an overview of an international project involving rigorous, transparent, systematic and stakeholder-engaged processes to formulate physical activity guidelines for adults with SCI.

Participants in this workshop will develop an understanding of:

• Internationally-accepted standards for formulating clinical practice guidelines
• How these standards were applied to develop the SCI physical activity guidelines
• Implications and next steps for implementing the guidelines
• Participants will also have an opportunity to provide formal feedback on the feasibility, acceptability, and clarity of the drafted guidelines.

Presenters and Presentations:

Kathleen A. Martin Ginis Ph.D., School of Health & Exercise Sciences, The University of British Columbia, Okanagan, Canada
How did we get here? Overview of the guideline development process and working draft of the guidelines (~15 min)

Jan W. van der Scheer Ph.D., Peter Harrison Centre for Disability Sport, National Centre for Sports and Exercise Medicine – East Midlands, Loughborough University, UK
The effects of exercise training on fitness and health among adults with SCI: A systematic review to inform guideline development (~15 min)

Sonja de Groot Ph.D., Reade, Centre for Rehabilitation and Rheumatology, Amsterdam; University of Groningen, University Medical Center Groningen, Centre for Human Movement Sciences, The Netherlands
Promoting physical activity, fitness and health in people with SCI: Lessons from the Netherlands and future directions (~15 min)

Sophie Jörgensen M.D., Department of Health Sciences, Lund University; Department of Neurology and Rehabilitation Medicine, Skåne University Hospital, Sweden
Promoting physical activity in older adults with long-term SCI: Clinical perspectives from Sweden (~15 min)

Kathleen A. Martin Ginis Ph.D. & Jan W. van der Scheer Ph.D.
Have your say: Discussion and evaluation of the drafted guidelines (~30 min)

Funding: Project supported by the Rick Hansen Institute.
Repairing the injured spinal cord: targeting glial scar matrix and endogenous repair processes to improve function

Professor Elisabeth Bradbury
King’s College London, Regeneration Group, Wolfson CARD, Guy’s Hospital Campus, London Bridge, London, United Kingdom

Plenary 2: ISRT Lecture: Repairing the injured spinal cord: targeting glial scar matrix and endogenous repair processes to improve function. Elisabeth Bradbury, Festsaal (Plenary), September 14, 2016, 2:20 PM - 3:05 PM

Despite the severe pathological and neurological deficits associated with spinal cord injury (SCI) some degree of spontaneous functional recovery is normally observed. Although this recovery is limited, it nevertheless reflects an innate capacity for repair. Accordingly, at the cellular level, the injured spinal cord does activate a number of regenerative repair responses, including axonal sprouting and dendritic remodelling (neuroplasticity), neurogenesis, and remyelination of spinal axons. An important goal is to understand the cellular and molecular mechanisms underlying endogenous repair processes after SCI. This may provide a route to modify and exploit these processes in order to improve functional outcome after SCI. I will present evidence that neuregulin-1 signalling is an important mediator of remyelination and spontaneous functional repair after SCI. I will also present evidence to show that the extracellular matrix plays a major role in limiting the potential for neuroplasticity after SCI. Chondroitinase gene therapy, which targets inhibitory scar matrix, is emerging as a promising candidate therapeutic, enhancing the potential for tissue remodelling and functional repair. These processes can be further enhanced using neurophysiology and rehabilitation to refine new connections. Strategies which target endogenous repair mechanisms may lead to novel approaches for improving functional outcome after SCI.
Inducing positive emotions in individuals with a spinal cord injury and chronic pain: the effects of positive psychology exercises

Dr Rachel Müller¹², Wolfgang Segerer¹, Andreas Hegi³, Prof Armin Gemperli¹², Dr Szilvia Geyh¹², Prof Mark Jensen⁴

¹Swiss Paraplegic Research, Nottwil, Switzerland, ²Department of Health Sciences and Health Policy, University of Lucerne, Lucerne, Switzerland, ³Swiss Paraplegic Centre, Nottwil, Switzerland, ⁴Department of Rehabilitation Medicine, University of Washington, Seattle, USA

Introduction: Chronic pain in SCI (80%) engenders negative emotions, that can, conversely, exacerbate pain and in turn negatively impact psychological, social and physical functioning. Positive emotions have been found to be analgesic. This study determines the efficacy of a tailored positive psychology intervention on well-being and pain in individuals with SCI and chronic pain.

Method: A phase-II, community-based, single-blinded, randomized-controlled, parallel-group trial including individuals with traumatic/non-traumatic SCI and chronic pain (i.e. pain intensity of ≥4 (0-10) at least half the days in the past month) were included. Participants in the intervention group were instructed to practice 4 personalized positive psychology exercises during 8 weeks. Participants in the control group were instructed to be mindful and write about life details. At baseline, mid-treatment, post-treatment, and 3 months follow-up, participants completed online well-being and pain-related questionnaires and rated intervention satisfaction.

Results: 108 participants completed follow-up (lost from baseline to follow-up 35%). At post-treatment participants in the intervention group reported 1) significantly less pain, and 2) having higher pain control, lower pain interference and pain catastrophizing, and 3) increased positive emotions, decreased negative emotions and being less depressed. Group differences at post-treatment were significant for pain intensity. Participants in the intervention continued to report increased well-being and pain control 3 months later.

Conclusions: Positive psychology exercises are brief, self-administered and easy to perform, require little time, have no financial cost and no negative side-effects, and can be effectively incorporated into daily living of individuals with SCI to increase positive emotions and reduce pain.
Development and preliminary psychometric testing of a modified version of the Caregiver Burden Inventory for caregivers of people with SCI

Mr Alessio Conti, Mrs Patrizia Maitan, Mrs Simona Frigerio, Dr Maria Vittoria Actis, Ms Silvia Mozzone, Mrs Lorenza Garrino, Mr Ercole Vellone

1A.O.U. Città della Salute e della Scienza Hospital, Turin, Italy, 2University of Rome "Tor Vergata", Rome, Italy, 3University of Turin, Turin, Italy

Introduction:
People with spinal cord injury (SCI) require a lot of care from their caregivers who experience high level of burden. So far, no study has developed a specific instrument to measure burden in this population. The aim of this study was twofold: 1) to modify the Caregiver Burden Inventory to be used for caregivers of people affected by SCI (named Caregiver Burden Inventory-SCI [CBI-SCI]); 2) to test the preliminary psychometric characteristics of the CBI-SCI.

Methods:
The CBI-SCI was developed after modification of the original CBI with a consensus of 3 experts in the field of SCI. Afterward, the 24 items of the CBI-SCI were administered to a sample of 55 caregivers of individuals with SCI discharged from a Spinal Cord Injury Unit located in Turin, Italy. Also, caregivers completed the CBI-SCI, the SF-36, and the Family Strain Questionnaire-SF. People with SCI completed the Modified Barthel Index. We tested CBI-SCI factorial and concurrent validity as well as reliability.

Results:
Caregivers had a mean age of 58.55 years (SD= 13.18) and were mostly females (87.3%). Exploratory factor analysis found a four-factor structure of the CBI-SCI. Correlations between the CBI-SCI scores and the other instruments for concurrent validity were all significant (p <0.05) and ranged between r= 0.414 to 0.687. Reliability was also supportive with a Cronbach’s alpha of 0.89.

Conclusions:
Our analyses show that the CBI-SCI has promising validity and reliability. Further studies on a more adequate sample size are needed before the CBI-SCI can be used extensively in clinical practice.
Women with Spinal Cord Injury in Bangladesh

Miss Anteena Aziz

Introduction:
The purpose of the study is to explore family & social attitudes towards women with spinal Cord Injury in Bangladesh and to discover the challenges that women with Spinal Cord Injury face in their family, conjugal life and community.

Methodology:
To conduct this study a qualitative methodology was selected to explore the lived experience of women who have experienced with spinal cord injury, thirty eight subjects were selected through convenience sampling from CRP, Mirpur, Dhaka, Bangladesh and also from home visits at Manikgong & Norshingdhi. Data was collected through face to face, semi-structured interview and was analyzed using a thematic coding system.

Result:
After reviewing the data from women with Spinal Cord Injury in Bangladesh, it is evident that family, social and physical barriers play a vital part in restricting their re-integration into mainstream education and paid work. In Bangladesh, women with disabilities are considered as economically unproductive and socially unacceptable. Problems arise in marriage & conjugal life due to culturally accepted superstition, folk believes and dowry system. As a result women with spinal cord injury are given lower priority in their own family & the community. It was found that this group of women experience both physical and emotional abuse.

Conclusion:
Bangladeshi women are confined by the unfair, unjust and undue freedom of male members of their families. There has been much talk about improving the downtrodden position of women, equal rights for women, and so on. But still there is far cry from anything like equality.
Quality of life, burden and satisfaction of caregivers of spinal cord injured patients during and 1.5 years after active rehabilitation.

MD Annemiek Backx, PhD Annemie Spooren, MD Helma Bongers, PhD Hanneke Bouwsema

1Adelante Rehabilitation Centre, Hoensbroek, Netherlands, 2Department of Healthcare, PHL University College Hasselt, Hasselt, Belgium, 3Adelante Centre of Expertise in Rehabilitation and Audiology, Adelante Rehabilitation Centre, Hoensbroek, Netherlands, 4Department of Rehabilitation Medicine, Maastricht University, Research School CAPHRI, Maastricht, The Netherlands

Topical Papers 3, Forum (Parallel 3), September 14, 2016, 4:15 PM - 5:45 PM

Introduction
Little is known about the course of burden, quality of life (QoL) and satisfaction with care in European caregivers of spinal cord injured (SCI) patients. The aim was to examine these issues in adult caregivers taking care of patients with recently acquired SCI.

Method
Longitudinal, prospective cohort study. Caregiver Strain index (CSI), Short Form-36 (SF-36) and Caregivers’ Satisfaction with (Stroke) Care Questionnaire (C-SASC) were administered at start active rehabilitation (T1), cessation of active rehabilitation (T2), 8 weeks follow-up (T3), 6 months (T4) and 18 months follow-up (T5, currently being assessed). Caregivers of 37 SCI-patients (AIS-A: 12/AIS-B: 1/AIS-C: 7/AIS-D: 17, 28.9% tetraplegic) were included.

Results
During rehabilitation 21 caregivers (54%) experienced high levels of burden (mean total CSI-score: 6.9±2.9), which significantly decreased during follow-up (mean total CSI-score T5: 4.5±3.5, p=0.015). Initial low scores on QoL improved significantly in the domains ‘social-role-functioning’ (score T1: 54.7 improved to T3: 76.0, p=0.003), ‘emotional-role-functioning’ (T1: 51.9, T4: 90.7, p=0.007), ‘mental health’ (T1: 57.3, T3: 71.8, p=0.028) and ‘vitality’ (T1: 49.1, T5: 68.7, p=0.033). Moderate to strong negative correlations were found between total CSI-score and ‘social-role-functioning’ (at T1-T2-T3-T4), ‘emotional-role-functioning’ (all time points), ‘mental health’ (T2-T3-T4-T5) and ‘vitality’ (all time points) with p-values<0.041. Overall satisfaction with care of caregivers was good (C-SASC: median 3, IQR[3,4]) and stable over time (p=0.31).

Conclusions
This study provides evidence for SCI-patient caregivers adapting to strain levels. Every clinician working with both SCI-patients and caregivers should be vigilant as to possible high burden and low QoL of caregivers during rehabilitation. Future plans include validation of these results internationally/transculturally.
Building local community capacity to improve Physical Activity and Participation for individuals living with SCI in the community

Professor Garry T Allison\textsuperscript{1}, Dr Bea IRD Oliveira\textsuperscript{1}, Professor Mary Galea\textsuperscript{3}, Professor Sarah A Dunlop\textsuperscript{2}
\textsuperscript{1}Curtin University, Perth, Australia, \textsuperscript{2}University of Western Australia, Perth, Australia, \textsuperscript{3}University of Melbourne, Melbourne, Australia

Topical Papers 3, Forum (Parallel 3), September 14, 2016, 4:15 PM - 5:45 PM

Few programs to improve Leisure Time Physical Activity (LTPA) in people with SCI are based on a framework of building local health community capacity for community dwelling individuals. This paper reports a large bi-National implementation study to promote local delivery of increased participation.

Methods: Spinal Cord Injury Participation and Activity – Community (SCIPA-Com) is a training framework for exercise professionals (gym staff) via short course or online training, linking local people with SCI with local community gyms for supervised PA programs twice a week (30-60 min, 8-12 weeks). A repeated assessment of health outcomes for 9 months was undertaken for previously active and non-active individuals for LTPA using a linear mixed methods compared LTPA between groups over time.

Results: Sixty-four community-dwelling participants with SCI completed customized programs. Compared with baseline, there were significant improvements in LTPA (26 min per day, 95\%CI: 16.6–35.4; P<0.001), functional goals (2, 95\%CI: 1.72–2.37; P<0.001), self-esteem (1.5, 95\%CI: 0.72–2.27; P<0.001) and overall quality of life (P<0.05). (Oliveira et al 2016). LTPA participation was greater among the active compared with the inactive group, although LTPA levels among the inactive improved and sustained.

Conclusions: SCIPA-Com delivers a local health implementation framework that translates practice into the local community. It is effective with sustained benefits for those with the greatest need (inactive individuals). This is a health translation model with empowering both the novice instructor and the client living within that community. It has significant implications for rural and remote delivery and can be easily adapted across varied settings.
EEG Predictors of Central Neuropathic Pain Following Spinal Cord Injury

Dr Aleksandra Vuckovic1, Mr Mohammed Jarjees1,2,3, Dr Mariel Purcell2, Mr Matthew Fraser2

1University of Glasgow, Glasgow, United Kingdom, 2Queen Elizabeth National Spinal Injuries Unit, Glasgow, United Kingdom, 3Technical College of Mosul, Foundation of Technical Education, Mosul, Iraq

Abstract: Central Neuropathic Pain (CNP) affects approximately 40% of SCI patients. It is related to changes in cortical activity, in particular in the area of the primary motor cortex, controlling movements. Compared to patients with no CNP, SCI patients with long standing CNP have the overactive cortex while they imagine to move either painful or non-painful limbs. It is still however a debate whether changes in the cortical activity measured by electroencephalography (EEG) are a cause or a consequence of CNP.

Methods: Thirty sub-acute SCI patients (24 M, 6 F; age: 45 ±15.2), within 6 months post-injury, free of nociceptive pain, level of injury C4-T12, incomplete or complete, participated in this study. They performed 60 repetitions of imagined movements of both legs, left and right hand while their brain activity was recorded with 48 channel EEG. Eleven patients (group A) had CNP symptoms at the time of EEG recording. Group B (9 patients) developed pain within 6 months from EEG recording, while Group C (10 patients) did not develop pain.

Results: Strongest EEG activity in groups B and C was found in the alpha (8-12 Hz) band but it was much stronger in group B. Group A had strongest activity shifted towards theta (4-8 Hz) band, as seen in people with long standing CNP.

Conclusions: Changes in EEG due to CNP might have two phases, one preceding physical symptoms of pain and other following pain. Machine learning algorithms should be developed for automatic prediction of CNP based on EEG.
Active Rehabilitation - 40 years of community peer-based programs for persons with Spinal Cord Injury in over 20 countries: Key Elements, Opportunities and Challenges

Dr Marika Augutis\textsuperscript{1,2}, Dr Anne M Lannem\textsuperscript{3}, Dr Anestis Divanoglou\textsuperscript{4}, Dr Katarzyna Trok\textsuperscript{1}, Associate Professor Tomasz Tasiemski\textsuperscript{5}

\textsuperscript{1}Karolinska Institutet, Stockholm, Sweden, \textsuperscript{2}Västernorrland County Council, Sundsvall, Sweden, \textsuperscript{3}Research department at Sunnaas Rehabilitation Hospital, Sunnaas, Norway, \textsuperscript{4}Physiotherapy Program, CQ University, Australia, \textsuperscript{5}University School of Physical Education, Poland

Workshop 10: Active Rehabilitation - 40 years of community peer-based programs for persons with Spinal Cord Injury in 19 countries: Key Elements, Opportunities and Challenges. Marika Augutis, Geheime Ratstube (Parallel 1), September 14, 2016, 4:15 PM - 5:45 PM

The Active Rehabilitation (AR) approach started in Sweden in 1976 and is now present in over 20 countries around the world. Although the AR approach is used internationally, it has received little to no attention in the literature. The primary objective of this workshop is to describe the key elements of the AR approach, explore the role it has played in different countries, and discuss opportunities and challenges. The overall purpose of the AR approach is to empower people with spinal cord injury (SCI) to reclaim their lives through activities that focus on opportunities rather than barriers. The primary delivery method of this approach is community peer-based training camps. While the specific objective for each camp may differ, the overall purpose of the AR approach is to increase the level of autonomy for people with SCI. The approach has distinct differences from in-patient care and rehabilitation, as it relies largely on trained peer mentors. It provides a plethora of learning opportunities through demonstrations and intensive practice of important skills; involvement in recreational and sporting activities; and knowledge-sharing on important topics about living with SCI. In some countries, the AR approach is now widely recognized as an important adjunct to medical care and rehabilitation. In most countries, AR activities are organized by stand-alone or networks of non-profit organizations (usually non-governmental) and recruit participants through word of mouth. Activities are usually supported by volunteer peer mentors and non-disabled members. The workshop will consist of short lectures, case presentations, and open discussion. Theoretical and empirical data will be presented.

First, we will offer a brief overview of the history of AR followed by a presentation of the key elements of the approach. Next, representatives from Belarus, Ukraine, Greece, Norway, Asia and Africa will discuss the status and unique characteristics of AR in their context. Last, we will open a discussion on challenges and opportunities in regards to research, funding, and integration of the approach into the health care system. The workshop is planned and done together with the following organizations: RG Aktiv Rehabilitering Sweden, Sunnaas Rehabilitation Hospital and Sunnaas Foundation Norway, Republican Association of Wheelchair Users Belarus, Alli Opsi Greece, Reabilitatia Invalidiv Ukraine, Fundacja Aktywnej Rehabilitacji (FAR) Poland.

Program:

History and Key elements of AR in Sweden
Jalle Jungnell, Martin Bretz (RG Active Rehabilitation, Sweden).

Expansion to other countries - Katarzyna Trok and Jalle Jungnell (Active Rehabilitation, Sweden)

AR around the world today
Ukraine- Oksana Fedorovych (Active Rehabilitation organization, Ukraine)
Belarus- Evgeny Shevko, Denis Vasilevich (Republican Association of Wheelchair Users
Norway- Marianne Holt Dybwad, Pia Wedege (Sunnaas Foundation and Sunnaas Rehabilitation Hospital)
Greece-Katerina Michalaki (Alli Opsi)
Implementation of AR in low & middle income countries - Tomasz Tasiemski (Poznan University of Physical Education, Poland)
Challenges, Opportunities, and future directions. Summary and questions
Anestis Divanoglou, Tomasz Tasiemski, Martin Bretz
Challenges and Approaches for Measuring Upper and Lower Extremity Spinal Cord Injury Outcomes

**Professor Curt Armin**, **Professor John Steeves**, **Ms. Linda Jones**, **Dr. Marc Bolliger**

University of Zurich, Zurich, Switzerland, Balgrist University Hospital, Zurich, Switzerland, University of British Columbia, Vancouver, Canada, Craig H. Neilsen Foundation, Encino, United States

Workshop 11: Challenges and Approaches for Measuring Upper and Lower Extremity Spinal Cord Injury Outcomes. Linda Jones, Rittersaal (Parallel 2), September 14, 2016, 4:15 PM - 5:45 PM

Educational Objectives:
1. Discuss issues related to outcome assessment in the upper extremity and lower extremities.
2. Consider the challenges in measurement assessment.
3. Present novel approaches to linearize measurement of impairment and function in spinal cord injury.

The intended outcome is an appreciation of measurement challenges and recommendations that may guide clinicians and researchers in the choice of assessment tools.

Synopsis:
There are numerous potential therapeutics for spinal cord injury (SCI) in the pipeline that may show promise and proceed to later phase trials. Planning for the eventual success of trials in the early phases of development provides an opportunity to optimize clinical trial design and outcome assessment. Critical aspects of an appropriately designed clinical protocols are the ability to maximize recruitment the choice of appropriate outcome measures. The Spinal Cord Outcomes Partnership Endeavor (SCOPE) in partnership with the Craig H. Neilsen Foundation convened two workshops in 2015: the first focusing on assessment in the upper extremity, the second on the lower extremity. Recruitment is challenging for SCI trials and significant numbers of participants will be required for late phase (pivotal) trials. Strategies for inclusive protocols (the ability to recruit multiple levels and severities of injury) while applying a single primary endpoint reflecting volitional performance, will enhance clinical recruitment and optimize endpoint assessment leading to more efficient clinical trials. The proposed workshop will summarize issues related to assessment in the upper and lower extremities, their similarities and differences, and results and recommendations from the workshops. General concepts in measurement and outcome assessment and applications in SCI will be discussed in addition to proposing a novel tool addressing challenges in SCI outcomes.

Preliminary Agenda:
1) Introduction - Jane Hsieh (5 min)
2) Challenges with outcomes and measurement and potential solutions to address these challenges - John Steeves (30 min)
3) Strengths, challenges and recommendations in the measurement of upper extremity function - Linda Jones (20 min)
4) Strengths, challenges and recommendations in the measurement of lower extremity function – Marc Bolliger (20 min)
5) Discussion and audience participation (15 minutes)
Moving from DXA to pQCT: feasibility and economic considerations and technical recommendations for the SCI community

Dr Tomas Cervinka1, Dr. B. Catharine Craven1,2,3
1Neural and Therapeutics Team, University Health Network, Toronto, Canada, 2Brain and Spinal Cord Rehabilitation Program, University Health Network, Toronto, Canada, 3Division of Physiatry, Department of Medicine, University of Toronto, Toronto, Canada

Workshop 12: Moving from DXA to pQCT: feasibility and economic considerations and technical recommendations for the SCI community. Tomas Cervinka, Prinz Eugen Saal (Parallel 4), September 14, 2016, 4:15 PM - 5:45 PM

The current lack of consensus regarding standardized dual energy x-ray absorptiometry (DXA) and peripheral quantitative computed tomography (pQCT) acquisition and analysis protocols remains a barrier to routine clinical implementation of bone health services for patients with spinal cord injury or disease (SCI/D). The proposed workshop will present data regarding feasibility and economic considerations of routine bone health assessment (DXA vs pQCT) in high and low resource settings. Workshop facilitators will present recommendations regarding standards for pQCT- and high resolution pQCT (HRpQCT)- acquisition and analysis for diagnosis of osteoporosis, assigning fracture risk and monitoring the effectiveness of osteoporosis therapy among patients with SCI/D. The need for consensus regarding areal and volumetric bone mineral density and bone quality outcomes to advance the field will be emphasized.

Learning Objectives:
1) To highlight the importance of peripheral imaging in assessment of bone health and fracture risk among individuals with SCI/D
2) To review the time required and associated direct medical costs for DXA and pQCT pre-screening, transfer, positioning, scan acquisition, and analysis by the technologist and reporting physician.
3) To identify technical limitations of DXA, pQCT and HRpQCT for assessment for patients with SCI/D
4) To provide a succinct review of pQCT/HRpQCT acquisition and analysis protocols in studies among patients with SCI/D based on a recent systematic review.
5) To propose the most appropriate acquisition and analysis protocols, for diagnosis of sublesional osteoporosis, lower extremity fracture risk prediction, or monitoring of treatment effectiveness among individuals with SCI/D.
6) To review the key constructs presented through case based discussion

This workshop will provide participants with specific recommendations regarding the implementation of routine DXA and pQCT outcomes for individuals with SCI/D in clinical settings.

Presenters:
B. Catharine Craven, MD, University Health Network – Toronto Rehabilitation Institute, Associate Professor Department of Medicine, Division of PM&R, University of Toronto
Tomas Cervinka, PhD, Postdoctoral Fellow, University Health Network - Toronto Rehabilitation Institute

Funding Acknowledgement:
Spinal Cord Injury - Ontario (Fellowship Salary Support Award of Dr. Cervinka)
Appropriateness of current outcome measures for management of spinal cord injuries and scope for improvement

Dr Amiram Catz, Dr Andrei Krassioukov, Dr Fin Biering-Sørensen, Dr Harvinder Chhabra, Dr James W Middleton, Prof Jean Jacques Wyndaele, Dr Marcel WM Post, Dr Patrick Kluger, Dr Said Sadiqi, Dr Susan Charlifue, Prof Shinsuke Katoh, Prof Wagi El Masri, Dr Kedar Phadke, Dr Michael Haak, Prof MJ Mulcahey

1 Indian Spinal Injuries Centre, New Delhi, India, 2 Department IV, Spinal Rehabilitation, Loewenstein Rehabilitation Hospital, Raanana, Israel, 3 International Collaboration on Repair Discoveries (ICORD), Division of Physical Medicine and Rehabilitation, Faculty of Medicine, University of British Columbia, Vancouver, Canada, 4 Clinic for Spinal Cord Injuries, Rigshospitalet, University of Copenhagen, Denmark, 5 State Spinal Cord Injury Service, NSW Agency for Clinical Innovation, Sydney, 6 University Hospital Antwerp and University Antwerp, Bredabaan, Antwerp, Belgium, 7 Center for Rehabilitation, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands; Brain Center Rudolf Magnus and Center of Excellence in Rehabilitation Medicine, University Medical Center Utrecht and De Hoogstraat, The Netherlands, 8 Spine Surgeon (retired), Germany, 9 University Medical Center Utrecht, Utrecht, The Netherlands, 10 Craig Hospital, Englewood, USA, 11 Department of Orthopaedics, The RJ & AH Orthopaedic Hospital, Oswestry, UK, 12 Department of Orthopaedic Surgery, Geisinger Health System, Danville, USA, 13 Jefferson School of Health Professionals, Thomas Jefferson University, Philadelphia, United States

Workshop 9: Appropriateness of current outcome measures for management of spinal cord injuries and scope for improvement. Harvinder Chhabra, Festsaal (Plenary), September 14, 2016, 4:15 PM - 5:45 PM

As the survival rate, quality of life (QOL) and life expectancy of spine trauma victims has increased over the years, measuring functional and health outcomes after TSCI is becoming relevant both for patients and the spine trauma care team. This is also equally important for testing the efficacy of experimental interventions arising from new insights regarding the natural history of SCI. However, the existing outcome measures for SCI are either not used universally or have certain limitations for efficacy assessments.

This workshop would examine outcome measures currently in use and document unmet needs, if any, with a view to refine them or develop alternative outcome tools.

Methodology: Spine Trauma Study Group conducted a survey amongst ISCoS members to document the appropriate outcome measures to be used for parameters critical for SCI management like radiological outcome, neurological & functional recovery, pain scores, bladder & bowel assessment, upper extremity function, ambulation, autonomic dysfunction, depression, QOL assessment and community participation. The survey responders were also asked to document any unmet needs of the current outcome measures for each parameter. Till date we have received and analyzed 64 responses to the survey.

We plan to present findings of the survey and conduct an in-depth panel discussion on adequacy of outcome measures for respective parameters in the workshop. Concurrently, shortcomings of these outcome measure and means to overcome them would also be discussed. This would provide knowledge regarding the most appropriate and accurate clinical end-points for determining efficacy of an intervention for management of SCI.

AGENDA
1615-1622 Outcome measures for neurological & functional recovery. Fin Biering-Soerensen
1622-1629 Outcome measures for pain. James Middleton
1629-1636 Outcome measures for bladder & bowel. JJ Wyndaele
1636-1643 Outcome measures for other autonomic functions. Andrei Krassioukov
1643-1650 Outcome measures for upper extremity function & ambulation. Marcel Post
1650-1657 Outcome measures for QOL, depression, community participation. Susan Charlifue
1657-1704 Development of international patient-reported and clinician-reported outcome measures for spine trauma patients. Marcel Post
Advanced Outcomes and Novel Insights from Wearable Sensors

Professor Roger Gassert

Rehabilitation Engineering Lab, Institute of Robotics and Intelligent Systems, Department of Health Sciences and Technology, ETH Zurich, Zurich, Switzerland

Plenary 3: RHI Lecture: Advanced Outcomes and Novel Insights from Wearable Sensors. Roger Gassert, Festsaal (Plenary), September 15, 2016, 9:00 AM - 9:45 AM

Following spinal cord injury, functional recovery and independence are commonly assessed with standardized clinical tests. Such tests are performed in standardized environments, and provide only a snapshot view of the functional abilities of patients. Little is known about the true performance of patients in activities of daily living, nor about how the prescribed therapy and overall activity level affect motor recovery and independence.

Five years ago we set out to develop a tool allowing to objectively assess and track patients' performance both in the clinical setting as well as in the home environment, in close collaboration with our clinical partners. We developed compact low-power sensor modules, capable of continuously recording data from state-of-the-art movement sensors for up to 48 hours, as well as an analysis framework allowing to monitor various activity-related parameters. These range from body posture and wheelchair propulsion to walking – including stair ascent and descent – gross upper-limb movements and energy expenditure. The algorithms have been validated in spinal cord injury and stroke populations, and are currently being employed in several longitudinal studies.

This talk will discuss the advantages and limitations of wearable sensor technologies in providing advanced clinical outcomes, and present the hardware and algorithms that have been developed and validated. It will conclude with an outlook on the recent ZurichMOVE initiative, which was launched with the aim of creating a novel wearable measurement tool combining clinical insights, precise and high-resolution movement analysis as well as long-term activity monitoring in a compact and easy-to-use instrument.
Does the frequency of intermittent self-catheterization impair the sleep quality?

Dr Gulsah Karatas¹, Dr Neslihan Bilge Metli¹, Dr Elif Yalçın¹, Dr Müfit Akyüz¹
¹Ankara Physical Treatment And Rehabilitation Hospital, Physical Treatment And Rehabilitation, Ankara, Turkey

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Intermittent Self Catheterization (ISC) has been widely used and is being preferred in the first place, however, increased frequency of catheterization (especially nocturnal catheterization) may be able to have an unfavorable effect on sleep quality (SQ). By this preliminary study we aimed to investigate whether the SQ is impaired due to the nocturnal catheterization.

Methods: Total 60 SCI patients were included (15 tetraplegia, 45 paraplegia) and divided according to the frequency of ISC. Pittsburgh Sleep Quality Index (PSQI) (> 5; poor SQ) and The Satisfaction With Life Scale (SWLS) (< 20 Dissatisfied) were used.

Results: Total patients¹ (41 men and 19 women) mean age was 33.8 ± 12.4. Median time from SCI was 23.5 (12-120) months. In the groups according to ISC; Group A (n= 25) consisted of patients with catheterization 4 times a day and Group B (n= 35) with 6 times a day. The mean values of PSQI scores for group A and B were 6.2 ± 3.8 and 6.1 ± 3.6, respectively. The mean values of SWLS scores for group A and B were 12.9 ± 6.4 and 15.7 ± 6.9. There was no significant difference in PSQI and SWLS scores between these two groups (P > 0.05).

Conclusion: Sleep disorders and decreased life satisfaction is frequently observed in SCI patients. However, we found that frequency of ISC is not decisive in SQ and life satisfaction. Even nocturnal ISC disturbs sleep process, it causes no impairment in SQ and no significant change in life satisfaction.
Immobilization of Persons at Accident site (IMPAC): In Delhi Setting

Mrs Rajesh Sharawat, Dr Gaurav Sachdev, Dr Vandana Phadke

1Indian Spinal Injuries Centre, New Delhi, India, 2Indian Spinal Injuries Centre, New Delhi, India, 3Indian Spinal Injuries Centre, New Delhi, India

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Background: Epidemiological studies of spinal cord injuries (SCI) in developed countries show 70% as ‘incomplete’ and rest as ‘complete’, which is reverse in emerging countries. Speculated reasons include the awareness regarding SCI and the mode of evacuation of accident victims from the accident site. The current study will help in identifying the lacunae with respect to these reasons. This will guide the type of infrastructure and training required for persons involved in evacuation of victims from accident site.

Methodology: Survey was conducted amongst the hospital casualty staff, ambulance staff and general public. The questions were framed to assess their knowledge about when and how to suspect SCI and evacuate person from accident site.

Results: The mean of total score as scored by casualty staff (n=46), ambulance staff (n=20) and general public (n=67) was 41.3%, 57.14% and 38.06% respectively. Only 10% of the ambulance staff knew that mild force can cause SCI. Almost three quarters of general public had no idea that SCI could occur without an incident of accident or SCI could worsen if not transferred properly.

Conclusion: The first handlers of accident victims lack knowledge about evacuation and immobilization of injured victims. Ambulance staff had recently undergone ATLS training and hence scored relatively better. The training and dissemination of knowledge may help in proper evacuation and subsequently change in epidemiological profile of SCI in the region.
Intramedullary spinal cord metastasis. A clinical and imaging study of eighteen patients

Professor Masahiko Watanabe, MD, PhD Hiroyuki Katoh
Tokai University School of Medicine, Isehara, Japan

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Intramedullary spinal cord metastasis (ISCM) is a rare complication of cancer. To investigate the clinical and imaging characteristics of ISCM, 18 cases of ISCM were retrospectively examined.

Methods: Data regarding the site of the primary neoplasm, the interval from the original diagnosis of cancer to the onset of neurological symptoms, duration of survival, MRI characteristics, and outcome after intervention were collected.

Results: The primary neoplasm was breast cancer in 7 cases, lung in 6 cases, and 5 others. In the 3 cases with lung cancer, myelopathy was the presenting symptom that led to diagnosis of cancer. In the other 15 patients, diagnosis of cancer preceded ISCM discovery by 5 months to 12 years. This duration was longer in breast cancer and shorter in lung cancer. The survival time was extremely poor, as 10 out of 14 patients whom we could follow died within 6 months of ISCM diagnosis. MRI characteristics that were useful for diagnosis were large high-signal-intensity areas on T2-weighted images and strong ring or inhomogeneous enhancement. Surgery was performed in 3 patients but total resection was not achieved. Out of the 14 patients that received radiotherapy, a reduction of tumor size was observed in 5 cases.

Conclusion: While ISCM of lung cancer and malignant lymphoma was mostly intramedullary, most metastatic lesions of breast cancer were widespread, being intra/extramedullary and often involving the cauda equina. We speculate that this difference is due to the route of metastasis to the spinal cord (via hematogenous metastasis or leptomeningeal dissemination).
The Short-term Effect of Suprapubic Extracorporeal Magnetic Innervation Therapy with Arm-Type Plate in Neurogenic Detrusor Overactive

Professor Jae-sik Kim¹, Professor Seon-jeong Oh¹, Professor Jin-young Lee³, Professor Yoon-Tae Kim¹
¹National Traffic Injury Hospital, Yangpyeung-gun, South Korea

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction; We applied suprapubic arm-type extracorporeal magnetic innervation plate to neurogenic overactive bladder (NDO) patients unresponsive to drug, and examined treatment short-term outcomes.

Methods; Study period was 2015. 9.~ 2016. 1. NDO patients were 20. Male and female were 12 patients and 8 patients. All patients had SCI. Antimuscarinics medications had been taken.

Overactive Bladder Symptom Score (OABSS) was used for symptoms improved objectively.

Results; 17 patients showed total score decrease. (Male; 10 patients (83%), Female; 7 patients (88%)). If magnetic power was 70%, we had the most effective results.

Conclusions; According to our study, the reduction of number of urgency and urge incontinence as well as frequency were examined. This therapy may be useful for patients who can’t sit or are hard to sit during treatment. Our study has limitations of small numbers of patients and evaluation of erectile dysfunction. We suggest more data need to be accumulated and analyzed in future.
Developing an electronic bladder diary in Greek, a work in progress

Dr Christina-Anastasia Rapidi\textsuperscript{1}, Dr Evgenios Diamantidis\textsuperscript{1}, Dr Athina-Maria Nella\textsuperscript{1}, Dr Antonios Kontaxakis\textsuperscript{1}, Dr Elias Karagiannakis\textsuperscript{1}, Dr Dimitra Kagiouli\textsuperscript{1}, Dr Sofia Foatki\textsuperscript{1}, Dr Avgerinos Bader

\textsuperscript{1}PRM Department, General Hospital of Athens “G. Gennimatas”, Athens, Greece

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: A paper-based bladder diary has limitations; it may be difficult and time-consuming to be interpreted if the patient has not filled it out correctly. Although there are a few handheld devices and some android and IOS applications for keeping a bladder diary, there is a need for creating an electronic diary in Greek. Patients with Spinal Cord Injury (SCI) are usually people who use internet and smart devices and are the ideal group for our study.

Method-Results: With the help of a software development company (Altec Software Development), we have designed a web application “Greek e-diary”. The entry logs and records for each patient can be accessed by the patient and the attending physician of our department. The “Greek e-diary” was designed on the basis of the International Continence Society bladder diary with a special column for intermittent catheterization and the possibility of determining the safe volume per bladder emptying and the ideal total volume per day by the physician according to the specific neurogenic bladder dysfunction of each patient. A brief questionnaire to evaluate the ease of use was used in a small number of patients (beta testing phase).

Conclusions: All persons with SCI commented positively the “Greek e-diary”, but all agree that a cross platform application would be even more preferable. The use of a digital bladder diary facilitates everyday practice evaluating treatment efficacy, long term follow-up of patients living in remote areas, or/and having difficult access to health care.
Development and validation of the Italian version of the intermittent self-
catheterization questionnaire (ISC-Q)

Dr Giorgio Scivoletto¹, Dr. Sauro Biscotto², Dr. Maurizio Cazzaniga³, Dr. Lucia Zanollo⁴, Dr. Giuliana Campus⁵, Dr. Astrid Bonaccorsi⁶, Dr. Jacopo Bonavita, Dr. Stefania Musco⁷, Prof. Giulio Del Popolo⁸

¹Spinal Unit, IRCCS Fondazione S. Lucia, Rome, Italy, ²Spinal Rehabilitation Lab, IRCCS Fondazione S. Lucia, Rome, Italy, ³Azienda Ospedaliera di Perugia, Perugia, Italy, ⁴Centro Riabilitativo Costa Masnaga Villa Beretta, Lecco, Italy, ⁵Ospedale Niguarda, Milano, Italy, ⁶Ospedale Marina, Cagliari, Italy, ⁷Azienda Ospedaliera Cannizzaro, Catania, Italy, ⁸Montecatone Rehabilitation Institute, Imola, Italy, ⁹Azienda Ospedaliera Careggi, Firenze, Italy

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

INTRODUCTION
ISC-Q is a questionnaire exploring four issues related to self-intermittent catheterization (ISC): ease of use, convenience, discreteness and psychological well-being. Aim of the study is to develop and validate the Italian version of ISC-Q.

MATERIAL AND METHODS
Two independent translations were performed and compared by an expert committee. A back translation to English was made by a linguistic expert, blinded to the original version. Patients were recruited from 19 centers in Italy. Questionnaires were sent to patients and examined anonymously. A subgroup repeated the test at 2 weeks distance and completed the Qualiveen to assess the convergent validity of ISC-Q.

Statistic
The internal consistency was determined from Cronbach’s α coefficient. Criterion validity was determined through the concurrent use of Qualiveen. Reliability was performed by Intraclass Correlation Coefficient and test-retest. The sensitivity was determined by the effect size-based estimate for small change (ES) and Minimal Detectable Change 95 (MDC95).

RESULTS
We enrolled 217 subjects (65.6% males, 34.4% females) using ISC to void their bladder. Mean age: 43 years. Mean duration of ISC: 3.3 years. Cronbach’s α ranged from 0.79 to 0.81. Pearson correlation between the different parts of ISC-Q and total score ranged from 0.24 to 0.78. ICC values were higher than 0.9. Convergent validity was faint to null. ES ranged from 3.8 to 6 points. MDC95 ranged from 4.1 to 12.1.

CONCLUSIONS
The Italian ISC-Q has the same psychometric characteristics of the original questionnaire. ISC-Q is a valid, reliable and sensitive patient related outcome, specifically focused on ISC.
Different types and dosages of intradetrusor Botulinum Toxin A in spinal cord patients: a single centre experience in 15-years follow-up.

Dr Giuseppe Lombardi¹, Dr Marco Postiglione², Dr Stefania Musco¹, Dr Giulio Del Popolo¹
¹Neurourology Dept, Careggi University Hospital, Florence, Italy, ²Spinal Cord Unit, Careggi University Hospital, Florence, Italy

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: we retrospectively report our results in patients with neurogenic detrusor overactivity (NDO) secondary to spinal cord lesion (SCL) treated with alternative types and dosages of botulinum Toxin A (BoNTA) with or without concomitant antimuscarinics over 15-year follow-up.

Methods: only adult SCL patients undergone first BoNTA from October 1999 to October 2001. Baseline 3-days bladder diary (BD) and urodynamics were pulled out.

Results: A total of 60 SCL patients, mean age of 38.5 years before first BoNTA injection, were included. Of those, 16 (26.6%) tetraplegic and 38 (63.3%) with complete SCL. According to our results, patients were subgrouped as following: “never failure” (NF) only patients who did not fail with BoNTA; “occasional failure” (OF), individuals who had at least one but not successive failure; “consecutive failure” (CF) subjects with continuing BoNTA ineffectiveness.

32/60 (53.4%) were defined as NF; 16 (26.6%) OF and 12 (20%) CF. No statistically significant differences were found between treatments. (p= 0.6295). Only 5 NF patients (15.6%) maintained continence up to 6-month without the use of antimuscarinics. In all cases of BoNTA ineffectiveness, the following re-injection was managed by the same toxin and dosage previously used. No variables from urodynamic, clinic and demographic baseline characteristics were found significantly predictive for long-term response.

Conclusions: the switch with different toxins (OnabNTA vs AbBoNTA and viceversa) did not represent a determinant factor for improving the clinical response. An appropriate patients’ counselling is mandatory considering the need of chronic antimuscarinics, the time duration of dryness and the risk of occasional BoNTA ineffectiveness.
Management of osteoporosis in spinal cord lesions

Dr Carolina Barbeiro¹, Dr Isabel Amorim¹, Dr Beatriz Condeça¹

¹Centro Medicina Reabilitação Alcoitão, Cascais, Portugal

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Osteoporosis is a known consequence of spinal cord injury and occurs in almost every spinal cord injury (SCI) patient, predominantly in the pelvis and the lower extremities. In general, there is no demineralization in supraspinal areas.

Methods: The aim of this study is to make a literature review about the new theories of pathogenesis of osteoporosis in SCI and therapeutic advances about this disease.

Results: Although unloading plays a role in the pathogenesis of osteoporosis after SCI, neuronal mechanisms should not be overlooked. Recent works suggest that bone remodelling is regulated by nerve-derived signals, such as vasoactive intestinal polypeptide, calcitonin gene-related peptide, pituitary adenylate cyclase activating peptides, neuropeptide Y and substance P, as well as classical neuromediators. Pharmacologic treatment for osteoporosis after SCI includes calcium, phosphate, vitamin D and bisphosphonates. Because bone resorption after SCI is very high, intravenous bisphosphonates and denosumab should be considered for the treatment of osteoporosis after SCI. Electrical stimulation reduces the loss of bone mineral density of the femur of patients with complete acute spinal cord injury, but not yet known whether these benefits persist in the long run. The ultrasound in the short term, is not effective for treating bone loss after spinal cord injury.

Conclusions: The pathogenesis of osteoporosis after SCI is a complex process. The use of anti-resorptive medications seems to be promising option, but studies are required to assess its effectiveness, namely reducing the incidence of fractures.
The relationship between bone mineral density and functional level in patients with spinal cord injury

Dr Ayşenur Bardak, Dr Ekin İlke Şen, Dr Sibel Balıkçı, Dr Özkan Araz, Dr Kadriye Öneş, Dr Nurdan Paker, Dr Derya Buğdaycı, Dr Fatma Nur Kesiktaş

Istanbul Physical Therapy and Rehabilitation Training and Research Hospital, Istanbul, Turkey

Objectives: The aim of this study is to determine the bone mineral density (BMD) and the frequency of fractures and to evaluate the relationship between BMD and functional level in patients with chronic spinal cord injury.

Methods: A total of 40 patients with spinal cord injury at the chronic period who referred to Spinal Cord Injury Unit were included in the study. The femur neck and total femur bone mineral density (BMD) of the patients that had been assessed by Dual-energy X-ray Absorptiometry were recorded, and the patients were questioned about previous fractures. Functional independence measure (FIM) motor scores were evaluated. The FIM motor scores and BMD were compared with nonparametric methods.

Results: The mean age of patients and time since injury were 45.0±14.9 years and 83.9±72.4 months, respectively. 62.5% of patients were male. 67.5% of patients had a traumatic etiology and 65% was evaluated as paraplegia. 52.5% of patients had a complete (ASIA A-B) injury. The mean of BMD at the femur neck and total femur were calculated as 0.848±0.145 and 0.822±0.147 g/cm² respectively. 47.5% of patients had osteopenia, and osteoporosis was detected in 30% of the patients. 12.5% of patients had (n=5) fracture. There was no statistically significant correlation between FIM motor scores and both of the femur neck BMD (r=0.027, p=0.871) and the total femur BMD (r=0.028, p=0.862) values.

Conclusion: These results suggest that, the evaluation of BMD independently from the functional status of the chronic period in the patients with spinal cord injury is important.
Heterotopic Ossification following Spinal Cord Injury – From Etiology to Therapy

Dr Mustafa Citak¹, Dr Malte Ohlmeier¹, Dr Dennis Grasmücke¹, Dr Eduardo Suero¹, Dr Astrid Gisevius¹, Prof Belgin Erhan²

¹BG-University Hospital Bergmannsheil, Bochum, Germany, ²İstanbul Fizik Tedavi Rehabilitasyon eğitim ve Araştırma Hastanesi, İstanbul, Turkey

Heterotopic ossification following spinal cord injury is a common complication with reported incidences in up to 50%. Despite the high incidence there is only little known about HO, especially for etiology, possible screening methods and treatment options. Our experiences with spinal cord injured patient treated initially in external specified or not-specified spinal cord centers shows that some of the patients have already a severe HO at the time of admission at our hospital. In those cases, the treatment with single-dose radiation therapy has its limitations. The only treatment choice is the surgical resection with the potential risk of intra-/or postoperative complications and the high risk of HO relapse. Therefore, the main goal of our hospital protocol is to early detect and treat HO before a severe HO occurs. We believe that the major problem is the fact that most of the physicians are not familiar with the diagnosis and treatment of heterotopic ossification, although early detection and adequate treatment of HO is crucial to avoid the progression of HO with development of joint ankylosis, which is an additional handicap for wheelchair-bounded patients. The goal of our workshop is to give an overview about the HO diagnosis. Our research team is working on this topic since 2011 and has already published several articles in this field. We would like to share our experiences with the workshop participants and would give among others a practical course of ultrasound examination. The workshop includes the following presentations:

1. Overview of research articles involving the etiology of heterotopic ossification in SCI
2. Screening examinations for early detection of heterotopic ossification in SCI
3. Ultrasound screening examination of HO in SCI – Practical demonstration by experienced radiologist
4. Treatment options of heterotopic ossification in SCI
The Effect of Acetic Acid in the Treatment of Heterotrophic Ossification in Acute Phase in Patients with Spinal Cord Injury

Miss Cathi Dugger¹, Miss Ashley Kim¹

¹Shepherd Center, Atlanta, United States

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: The incidence of HO in SCI is between 16% and 53%, depending on institutional reports. The use of acetic acid has been studied in non-SCI patients to assist in absorption of calcium deposit. There have been very limited studies using acetic acid in SCI patients to treat HO. Loss of range of motion caused by HO can impede function and decrease independence for persons with SCI.

Methodology: This case series included seven patients with cervical or thoracic level spinal cord injury. HO was confirmed by X-ray on all patients prior to starting treatment. All patients received 1.5mL of 2% acetic acid to treatment site via iontophoresis 3 times per week for 3 weeks. Iontophoresis unit parameters were set to 80mA/min for a 3 minute active delivery followed by 2 hours of passive absorption. Prior to and after intervention, ROM measurements were taken by a single physical therapist at the affected joint. Assistance level was monitored for a single patient-selected task for which HO affected performance.

Outcomes: On average, clients demonstrated a 17.69% improvement in range of motion. The minimum noted improvement was 6%, the maximum noted improvement was 31%. Varying functional tasks have improved with this treatment and have led to greater independence.

Conclusion: ROM was improved in the affected joints of all seven patients to varying degrees. Level of assistance with patient selected task was decreased in majority of patients, as well.
Bowel Problems in Spinal Cord Injured Patients: Results from a Patient Survey

Sofi Sigvardsson¹, Kristian Neovius², Maria Aberg Hakansson¹, Thomas Lundqvist¹

¹Wellspect Healthcare, Molndal, Sweden, ²Cyclo AB, Stockholm, Sweden

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

INTRODUCTION: Spinal cord injury can cause both neurogenic bowel and bladder. This study investigated the frequency of bowel problems and consequences on daily activities in a group of spinal cord injured patients with neurogenic bladder.

METHODS: An electronic survey was sent to 952 intermittent catheter users. The response rate was 28%, i.e. 262 patients replied, of which 83 (32%) had spinal cord injury of varying level and severity but with persistent neurogenic bladder and need for catheterization.

RESULTS: More than 80% of the spinal cord injured patients reported to have bowel problems. Women seemed to suffer from bowel problems more frequently than men with 36% reporting to have daily problems, 22% weekly and 26% occasionally. The corresponding proportions for men were 12%, 20% and 50%.

Almost every (90%) spinal cord injured patient with bowel problems reported that it affected their daily activities. The majority (61%) reported that bowel problems affect their daily activities sometimes, always or often. The main reasons for how the daily activities were affected were the need to plan around bowel patterns (23%), worrying about bowel accidents (22%), worrying that others could smell stool (15%), leaking stool without knowing it (10%) and being ashamed (10%).

CONCLUSIONS: Among the spinal cord injured patients in this survey, bowel problems were frequent and affected the patients’ daily activities. Effective bowel management has the potential to improve the life situation of these patients. Further studies are needed to investigate the potential difference of bowel issues between men and women.
Constant air flow pressure by electronic pump decreases explosion risk of catheter balloon in transanal irrigation system

**Professor Gabriele Bazzocchi**, M.D. Stefania Musco, M.D. Lorenza Maria Landi

1Montecatone Rehabilitation Institute, University Of Bologna, Italy, Imola (bo), Italy

Introduction: Transanal Irrigation (TAI) is a valuable therapy for neurogenic bowel dysfunction in spinal cord injured (SCI) patients. Today’s TAI devices have a catheter with a balloon which is inflated to maintain continence during infusion of water into the rectum. The aim of this study was to measure changes in pressure inside the rectal balloon when insufflation is attained by a manual pump (Navina Classic®) compared to an electronic pump (Navina Smart®) respectively.

Methods: Experiments were conducted with the inflation of air into the balloon and to a computerized pressure-recording system through a “T” connection. Data are mean±SD of experiments repeated with 5 different new catheters for each protocol.

Results: The maximum balloon pressure and diameter before explosion, at atmospheric pressure and 38 C° was 175±27 mmHg and 7.7 cm for the manual pump. No balloon burst occurred with the electronic pump, the maximum pressure was 118±7 mmHg and the diameter 6.2 cm.

The maximum balloon pressure before explosion when catheter was inflated by the manual pump inside a rigid tube of 4.6 cm, 5.4 cm and 6.2 cm diameter was 234±12, 207±10 and 202±9 mmHg respectively. When inflated by the electronic pump, balloon explosion did not occur inside the 6.2 mm diameter tube.

Conclusions: These experiments show evidence of the safest way to inflate the catheter balloon in TAI in SCI patients. An electronic pump guarantees low and constant air flow which allows the balloon to reach the right size with lower pressure inside, permitting better adaptability.
Effects of botulinum toxin on constipation with obstructed defecation in motor incomplete spinal cord injury

Dr Margarita Valles¹, Dr Jesus Benito¹, Dr Joan Vidal¹, Dr Fermin Mearin¹

¹Institut Guttmann, Badalona (Barcelona), Spain

Introduction: The contraction of external anal sphincter (EAS) during defecatory manoeuvre (obstructed defecation) is one of the pathophysiology mechanism described for constipation in motor incomplete spinal cord injury (SCI) patients. The objective of this study is to evaluate the treatment with EAS infiltration with type A botulinum toxin. Patients and methods: Double-blind, randomized, controlled, comparative study of 16 patients (12 man/4 woman; median age 49 years) with SCI ASIA C or D more than one year since lesion affected of constipation with obstructed defecation in anorectal manometry. Nine patients received treatment and 7 received sham. EAS infiltration was performed with electromyographyc control, using a 100UI of botulinum toxin or 1ml of physiological serum. Clinical evaluation, total and segmentary colonic transit time and anorectal manometry/superficial electromyography were performed pre-infiltration and at 1, 3 and 6 months post-infiltration. Results: In the treatment group a clinical improvement of constipation was noted (subjective evaluation, Rome III criteria, Obstructed defecation scoring system, Neurogenic bowel score, abdominal pain) that was not observed in control group (p<0.05). In the anorectal manometry in the treatment group a decrease of voluntary contraction of EAS and anal canal pressure during straining were observed (p<0.05). At 1 month after infiltration two patients referred a worsening of fecal incontinence that was mild and transient. Conclusions: The EAS infiltration with botulinum toxin in patients with motor incomplete spinal cord injury with obstructed defecation produces an improvement of constipation with a decrease of anal canal pressure during straining.
Investigation of correlation between irrigation fluid volume and pressure in dummy colon produced by manual and electronic TAI system

Professor Gabriele Bazzocchi¹, Ph.D Erica Poletti¹, M.D. Stefania Musco¹

¹Montecatone Rehabilitation Institute, University Of Bologna, Italy, Imola (bo), Italy

Introduction: Spinal cord injured without anal sphincter control may use Transanal Irrigation (TAI) for bowel management. TAI devices have catheters to make the colon an air- and watertight organ. The aim of this study was to evaluate the pressure created by two different devices within an irrigation channel. One manual pump, Navina™ Classic and one electronic pump, Navina™ Smart (Wellspect Healthcare). Furthermore, to investigate correlation between irrigation fluid volume and pressure in the colon.

Method: Tubes were connected with a “T-connection” between water storage, rectal catheter and a computerized pressure-recording system. Pressure was measured when the catheter was outside and inside a dummy colon specimens (DCS), with an internal lumen of 1500 ml and 1000 ml respectively. Both DCS were infused with water (flow rate 500ml/min) until obtaining maximum pressure.

Result: During water flow through a catheter, in level with water storage, pressure was stable at 21±1 mmHg and 6±1 mmHg for Navina™ Classic and Navina™ Smart respectively (mean±SD of 3 experiments). When catheter was introduced into the DCS and infused with 300 ml water, maximum pressure was 106±2 mmHg and 90±3 mmHg for Navina™ Classic and Navina™ Smart respectively. Only 100 ml was used to reach maximum pressure in the DCS with reduced volume. The water flow was stopped for both devices when reaching maximum pressure.

Conclusion: These results are important for exploration of the TAI mechanism and safety. Also to understand its possible effect on colonic lumen by obstacles such as fecal impaction, stenosis, and other alterations.
Learning to take control..... the practical aspects of neurogenic bowel dysfunction

Ms Eva Wallace, Mrs Liz Croxon, Ms Kelley Lennon, Dr Eimear Smith, Dr Cara Mc Donagh

National Rehabilitation Hospital, Clonskeagh, Ireland

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Defecation for any individual is a very sensitive topic. Education regarding bowel function should always be dealt with in a scientific manner in partnership with the individual with neurogenic bowel dysfunction. Bowel care is a complex process, often a taboo subject. We all learn differently, by visual, auditory or kinaesthetic methods. It is difficult to obtain a dynamic visual explanation tool for the teaching the practical aspects of bowel care in a condensed and user-friendly manner.

To meet these needs we aim to develop an animation training video on the following: Insertion of suppositories, Digital Rectal Stimulation, Digital Removal of Faeces.

Animation shows a step by step approach, structuring the education required for individuals with a neurogenic bowel dysfunction, their family, carers or health care workers. It will be produced in a manner that supports the culture and diversity of individuals regardless of age or gender. By using visual media it will help to organise, process and retain information for the learner.

The animation training video is not a standalone teaching tool, but should be used in conjunction with other theoretical input. It will support training effectiveness, using the best evidence based practice in line with ‘Guidelines for Management of Neurogenic Bowel Dysfunction in Individuals with Central Neurological Conditions 2012’.

This animation video will augment the learning experience, by integrating technology and modernising our training for an enriched learning experience. Teaching individuals is a skill that takes practice, commitment and is essential for long term patient outcomes.
Adulthood and myelomeningocele: how to help these patients throughout the life course? An Italian experience of multidisciplinary care.

**Dr Sonia Cremascoli¹**, Dr Patrizia Pisano², Dr Viola Marta Custodi², Dr Paolo Gaetani², Dr Caterina Pistorini¹

¹*Salvatore Maugeri Foundation, Pavia, Italy, ²Policlinico San Matteo, Pavia, Italy*

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction
Myelomeningocele, or spina bifida, is a congenital malformation of the neural tube. It causes paralysis of the lower limbs and sphincters. The care of this neural tube defect is surgical. Preparation for adulthood is frequently neglected in childhood, and the consequences of growing up with spina bifida are poorly researched.

Methods
On January 2014, starting from the pre-existing multidisciplinary Spina Bifida Clinic for Children (SBCC) of Policlinico San Matteo in Pavia we created a new Clinic for Adults with Spina Bifida (CASB) to give to these patients a landmark after the age of majority. Our aim was to facilitate the continuity of care for these patients because near the adulthood they had no more reference figures for their needs. The CASB included: Neurosurgeons and Orthopedics from SBCC and the Physiatrist from the Spinal Unit of Salvatore Maugeri Foundation in Pavia.

Results
In 2014 we visited 22 patients who were near the adulthood in SBCC of Policlinico San Matteo. In 2015, 10 of them had a checkup in CASB and 4 of them have been hospitalized in Spinal Unit for complications due to Spina Bifida.

Conclusions
Our experience of creating a path for the continuity of care for patients with spina bifida has confirmed to us that this need is a real need. We will formulate tools that can further facilitate contacts between professionals and patients who have problems related to the growth and aging.
Asking health care professionals about patient participation – a questionnaire to facilitate formation of local participation practice

**Mrs Randi Steensgaard**, Mrs Dorte Dahl Hoffmann, Mr. Jens Thusgaard Hørlück, Mr. Erik Riiskjær

1 Spinal Cord Injury Centre Of Western Denmark, Regional Hospital Central Jutland, Viborg, Denmark, 2 DEFACTUM, Central Region Denmark, Aarhus, Denmark

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

**Introduction**
Patient participation is an important and rather difficult part of rehabilitation after spinal cord injury. Documented positive outcomes of patient participation are increased patient safety, more satisfied patients, economic benefits and better professional results. Research has shown that nurses and doctors wish to involve patients in treatment, but they need more knowledge and concrete tools to support the effort.

**Methods**
A project focusing on better patient participation was completed at the Spinal Cord Injury Centre of Western Denmark (SCICWD) and a survey was conducted to measure health professionals’ view on patient participation.
The survey was developed and validated by DEFACTUM with the purpose of producing indicators for patient participation: opinions about practice, specific possibilities for actions, and experienced barriers.

**Results**
67 (70%) completed the online survey. 83% responded, that patients’ participation in rehabilitation is part of the culture at SCICWD to a very high or a high extent. Asked more specific, only 65% found that the department succeed in converting patients’ experiences and needs into individual solutions. 33% responded that SCICWD regularly discuss what it means to involve patients. When asked which areas needed improvements, 66% pointed at increased focus on what individual patients find important and 61% on including relatives. 58% pointed at the time spent on registration as a barrier for involvement.

**Conclusion**
Working with patient participation is an ongoing process where health professionals should be provided with feedback to discuss the phenomenon. From a quality improvement perspective the questions must be detailed and concrete.
Clinical issues regarding rehabilitation medicine for spinal cord injury

Professor MD Shinji Kimura1, MD Nao Sanada1, MD Toru Harigai1, MD Norie Nomoto1, Professor MD Naoto Endo1

1Rehabilitation Center, Niigata University Medical And Dental Hospital, Niigata-shi, Japan

Purpose: The aim of this study was to use surveys to clarify the clinical issues of rehabilitation medicine for spinal cord injury.
Methods: A survey of 47 hospitals in Niigata Prefecture with a population of 2.3 million was performed in 2012 using a questionnaire for spinal cord injury (Frankel grades A, B, and C). The questionnaire included age, injury level, home or facilities at discharge, length of hospitalization, and reasons for difficulty upon discharge or transfer.
Results: Replies were received from all hospitals, including 30 in which the patients were actually treated (19 acute-care hospitals [ACH], 6 rehabilitation hospitals [RH], and 5 others). A total of 85 patients were treated at ACH and 45 patients were treated at RH. The injury level was the cervical spinal cord in 62 and thoracic spinal cord in 24 in ACH. Reasons for difficulty upon discharge or transfer from ACH were inadequate family support upon direct discharge to home and difficulty managing tracheostomy or tube feeding upon transfer to RH. Difficulty encountered upon discharge from RH was length of time required to modify home and house circumstances which occasionally resulted in patients exceeding their hospitalization limit.
Conclusion: Compared with the national incidence, there is a low incidence of spinal cord injury in Niigata Prefecture. Social services provision is necessary for a smooth transfer from medical hospitals to home or care facilities, such as short-stay facilities to provide medical treatment, and the number of nursing or care staff should be increased.
Dysphagia in acute cervical spinal cord injury: developing international expert consensus on identification and management using the Delphi process.

_Mrs Jackie McRae_, Dr Christina Smith, Dr Suzanne Beeke, Dr Anton Emmanuel

1 Division of Medicine, University College London, London, United Kingdom, 2 Division of Psychology and Language Sciences, University College London, London, United Kingdom

**Introduction**

The incidence of dysphagia after acute cervical spinal cord injury (CSCI) is reported to be 40%. Late identification has major cost implications. In the absence of published guidance, this study’s aim was to gain expert consensus on risk factors and management of dysphagia following acute CSCI.

**Method**

A two round electronic Delphi process was employed following recruitment of international expert panel of 27 professionals (speech language therapists, physiotherapists, doctors, nurses, dietitians) with acute CSCI patient experience. Statements were generated from literature and current opinion around nutritional, respiratory and swallow management across 7 domains. The first round required rating of 85 statements using a 5-point Likert scale. Statements not achieving 70% group consensus were reviewed for a second round. Panellists were provided with comparative group and individual results at the end of each round.

**Results**

The first round achieved 59% consensus with a 100% response rate on 85 statements. The second round achieved 48% consensus on the remaining 25 statements with a 96% response rate. This resulted in an overall consensus on 62 statements with the domains of screening and assessment domains achieving the least consensus.

**Conclusions**

Experts agreed risk factors and clinical management for CSCI patients with dysphagia and areas of contention were highlighted. A swallow screening tool and consensus guidelines will be developed to support early intervention (published separately). This abstract demonstrates the feasibility of a Delphi process to draw consensus in complex areas with multiple specialisms and need for multi-disciplinary education within these teams.
Evidence based SCI practice for Nurses in LMICs: Introduction of a SCI Nurse Training Course

Miss Fiona Stephenson
1
2Spinal Injury Rehabilitation Centre, Nepal, Salisbury, UK

Introduction: It is known that rehabilitation is a relatively new field of nursing in many low and middle income countries (LMIC). Spinal Cord Injury (SCI) nursing remains limited in many countries. A 5 day, evidence-based, SCI nursing course has been created following a global survey of nurses’ educational needs to provide care to patients who have sustained a SCI.

Methodology: A global survey was carried out to (1) ascertain training received (if any) by nurses caring for patients with a SCI, (2) what nurses would like to learn if a SCI nursing course existed, and (3) what style of training they preferred; such as ward-based, classroom, e-learning.

Results: Response suggests that nurses want a comprehensive SCI specific training package, that is available in a variety of settings including e-learning. An evidence-based 5 day SCI nurse training programme was developed, piloted and utilised in a LMIC spinal centre.

Conclusion: Nurses welcome a SCI specific nursing programme to enhance evidence-based practice. The course will be made available to use following sudden onset disasters, for example, to rapidly train nurses to care for SCI patients. This programme can be used with the e-learn SCI nursing modules, where internet is available.
Health System Strengthening following a Sudden Onset Disaster - Lessons from Nepal

Miss Fiona Stephenson¹, Mr Stephen Muldoon², Professor Stanley Ducharme³, Dr Christine Groves⁴, Ms Mandira Baniya⁵, Mr Pete Skelton⁶, Professor Apichana Kovinda⁷, Professor Nazirah Hasnan⁸

¹Spinal Injury Rehabilitation Centre (SIRC), Kavre, Nepal, ²Livability, UK, ³Boston University Medical Centre, Boston, USA, ⁴SIRC, Kavre, Nepal, ⁵SIRC, Kavre, Nepal, ⁶Handicap International, London, UK, ⁷Department of Rehabilitation Medicine, Chiangmai, Chiangmai, Thailand, ⁸Department of Rehabilitation, PPUM, Malaysia

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Following the devastating two earthquakes that shook Nepal in 2015, many lessons were learned in capacity building and providing care for the very vulnerable client group of patients with spinal cord injury (SCI). According to the Post Disaster Needs Assessment the earthquake claimed the lives of 8790 people and an estimated that 22,300 were injured. Over half a million houses were destroyed and 770,000 families were rendered homeless. Many of these people are still living a life of hardship through lack of food, shelter and livelihoods. A workshop at ISCoS would be an excellent forum to share this experience with healthcare professionals interested in disaster management.

Particular learning objectives for the audience and expected workshop outcomes will include:
To raise awareness of disaster planning
To highlight the importance of appropriate data collection
To increase knowledge of capacity building in an austere environment utilising the ‘five pillars’ as outlined in the IPSCI report
To enhance the collection of appropriate, ethical, timely research data following a sudden onset disaster
To ensure that appropriately skilled professionals are deployed following a sudden onset disaster
To raise awareness and share good practice of a successful response to a large surge of inpatients with SCI sustained in an austere environment
To highlight the importance of appropriate psychological support for staff and patients

Presentations will include:
Disaster Preparedness
Disaster Response by The Spinal Injury Rehabilitation Centre, Nepal
Getting the right volunteers
Protecting patients following an EQ
Providing for children following a sudden onset disaster
Collecting appropriate data ethically
Capacity Building; Leadership and governance, Service delivery, Human resources, Health technologies, Information systems, Financing
Psychological impact - staff and patients

The audience will be involved in a question and answer session, utilising an expert panel during and at the end of the workshop
How are general practitioners involved in long-term care for persons with spinal cord injury?

Dr Stefan Essig\textsuperscript{1,2}, MA Nadia Lustenberger\textsuperscript{2}, Dr Christoph Merlo\textsuperscript{1}, Dr Armin Gemperli\textsuperscript{2,3}  
\textsuperscript{1}Institute of Primary and Community Care Lucerne, Lucerne, Switzerland, \textsuperscript{2}Swiss Paraplegic Research, Nottwil, Switzerland, \textsuperscript{3}Department of Health Sciences and Health Policy, University of Lucerne, Lucerne, Switzerland

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Persons with spinal cord injury (SCI) need long-term care. In the general population of Switzerland, general practitioners (GPs) care for patients with chronic conditions. In SCI, specialized centers offer similar services including regular check-ups and counseling. The role of GPs is unclear, e.g., in preventing pressure ulcer, the most common secondary medical complication of persons with SCI. We therefore aimed to determine 1) their visits to GPs and 2) GPs involvement in the prevention of pressure ulcer.

Methods: Swiss Spinal Cord Injury Cohort Study (SwiSCI) is a nationwide cross-sectional survey to persons with SCI. It was conducted 2011-2013 and contains questions on the use of health care services. Interviews with GPs of persons with SCI about pressure ulcer were attempted in 2016.

Results: 492 participants >16 years (86.2% response) filled out the SwiSCI survey. 87.0\% (428/492) went at least once to their GP within the last year. The mean number of visits per year was 5.2 (median: 3; quartiles: 1-6). They went twice as often to the GP than the general population of Switzerland. So far, interviews with GPs of persons with SCI could not be performed; invited GPs denied participation because they did not feel to be involved in the prevention of pressure ulcer.

Conclusions: Persons with SCI go to their GP more often than the general population of Switzerland, but GPs do not seem to be involved in the prevention of pressure ulcers. The role of GPs in long-term care for persons with SCI remains unclear.
Informal Caregiving by Family Members of Persons with Spinal Cord Injury in Switzerland

Ms Jianan Huang\textsuperscript{1,2}, Prof. Dr. Sara Rubinelli\textsuperscript{1,2}, Ms Mirjam Brach\textsuperscript{1,2}, Prof. Dr. Armin Gemperli\textsuperscript{1,2}

\begin{flushleft}
\textsuperscript{1}Swiss Paraplegic Research, Nottwil, Switzerland, \textsuperscript{2}Department of Health Sciences and Health Policy, University of Lucerne, Lucerne, Switzerland
\end{flushleft}

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Over 50 percent of persons with spinal cord injury (SCI) in Switzerland receive assistance from family members. This study aims to portray aspects in life of caregiving family members of persons with SCI in Switzerland, in order to identify support measures to improve their caregiving situation.

Methods: The study is carried out with mixed-method approach on caregiving family members of persons with SCI, consisting of a national questionnaire survey followed by a qualitative investigation based on semi-structured interviews with caregivers. Participants are recruited through persons with SCI registered in an established database, who are asked to forward the questionnaire to their caregiving family members. Data of persons with SCI will be merged in from a previous study. Questionnaire is developed under review of health care providers for SCI (paraplegic centers in Switzerland, patient organization and academic organization). Pretesting was conducted with family members of SCI persons in paraplegic clinic. Caregiving in persons with SCI is contrasted with the general population with findings in the Swiss Health Survey and the Swiss Household Panel. Data analysis will focus on association between caregiver characteristics and utilization of professional care as well as public support means.

Results: Challenges of the study set-up and preliminary results of the ongoing questionnaire survey will be presented at the conference.

Conclusions: Subsequent contact with persons with SCI and his/her caregiver and a multi-language environment can result in high attrition. Given that only caregiving family members will be contacted, contrast to situation of non-caregiving family members is restricted.
**Metastatic Spinal Cord Compression (MSCC) Specialist Multidisciplinary Spinal Rehabilitation – Challenge or Opportunity -Developing a world class service**

**Mr Manish Desai**

1. London Spinal Cord Injury Centre, London, Stanmore, United Kingdom

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

**Introduction**

MSCC is estimated to affect approximately 3000 patients per annum in England. Historically these patients are managed at Neuro rehabilitation units, care of elderly wards, orthopaedic wards or smaller community rehabilitation centres, though their needs are same as traumatic spinal cord injury patients. Even though recommended by NICE and national Spinal Commissioning (CRG), currently most of these patients do not have access to spinal cord injuries (SCI) centres due to various reasons.

**Methods (New Service)**

In collaboration with London Cancer Network, and MSCC surgical pathway, we developed a specialist service and an Integrated Care Pathway (ICP) focusing on goal orientated short stay (6-8 weeks) rehabilitation programme. One bed secured at regional Spinal Injury Unit.

**Results**

20 patients/84 referrals were admitted. Male:Female ratio was 17:3, Average age 56 years. 5/20 Multiple Myeloma, 6/20 Ca Prostate and Ca Breast, Sarcoma two each. Average length of stay was 6.7 weeks, average SCIM on admission 35 and on discharge 58. 90% reported excellent benefit on PROMs. 85% patients were discharged home. 15% were repatriated to oncology units.

**Conclusions**

1. Irrespective of significant barriers in the provision of specialist rehabilitation a multidisciplinary approach with simple, structured, fast track rehabilitation programme improved overall functional outcome and satisfaction of this group of patients. Common complications could be prevented by patient and carer education.
2. "Specialist Rehabilitation without taking precious time away from their loved ones." "Adding Life to Years"
3. Challenges - Disease progression, Limited survival, fatigue, rapid loss of gains made during rehabilitation, meeting patients' expectations to achieve more function/independence
Introduction: The impact of a spinal cord injury on the post discharge life of the affected individual is profound. Devising an appropriate and timely discharge plan for these patients is therefore crucial but complex. If patients are discharged when they are not ready, they may be readmitted soon with secondary health conditions. The aim of this study was to determine the perception of patients with spinal cord injury (SCI) on their readiness for discharge following institutionalised rehabilitation. Method: A quantitative, descriptive and cross-sectional design was used with thirteen participants. Public and private Spinal cord injury rehabilitation centres and Hospitals in the Tshwane Health District, Gauteng, South Africa. The Readiness for Discharge Scale was used to measure and quantify the patients' perception of readiness for discharge. Correlations between demographic variables and the RHDS scale were also investigated. Results: The overall percentage of readiness for discharge of participants was 72.97%. In the respective subscales the scores were personal status (59.67%), coping ability (76.54%), knowledge (81.54%) and expected support (82.69%). RHDS percentage was significantly and positively correlated with coping ability r(13)=0.943, P<0.001; personal status r(13)=0.944, P<0.001; and knowledge r(13)=0.938, P<0.001. Conclusion: People with SCI in the Tshwane District perceived themselves as being ready for discharge following rehabilitation. Key Words: perception, readiness for discharge, spinal cord injury, rehabilitation
Pilot Study to Explore the Use of Video Consultation for Outpatient Follow up of Spinal Cord Injury (SCI) patients

Miss Jan Lee¹, Dr Catherine Hynes¹, Mr Pradeep Thumbikat¹
¹Princess Royal Spinal Injuries Unit, Sheffield, UK, Sheffield, United Kingdom

Introduction:
Telehealth is the use of technology to help provide health services. It is increasingly used to eliminate barriers to accessing healthcare, particularly in managing chronic health conditions. Princess Royal Spinal Injuries Unit (PRSIU), Sheffield, UK serves an outpatient (OP) population of approximately 3000 from a large geographic region. Non-attendance rate at OP clinic is 15.33%. This study aims to explore whether video consultation (VC) is an acceptable alternative to standard consultation (SC) follow up, in order to improve non-attendance rate.

Methods:
All patients attending OP Clinic at PRSIU during a one week period were included (N=32). Semi structured questionnaires were used to obtain following data:
- Patient demographics
- Travel details
- Barriers to accessing clinic
- Use of technology
- Attitudes towards VC and SC

Results:
Average age was 53.1 years old (range 25-88), mostly male (n=23). 25% had complete SCI and the rest had incomplete SCI or spina bifida. Median distance travelled was 38.3 miles -furthest was 229 miles with 6 hours travel. Increasing distances travelled and younger patients (below 70 years old) were associated with increasing satisfaction and confidence using VC. Overall 62.5% of patients would be satisfied using VC and one third would prefer VC rather than SC secondary to distance, cost and time spent travelling.

Conclusion:
VC as an alternative method for OP follow up could be beneficial for some patients. Further studies to work out feasibility and service provider perspectives would be useful prior to development of an app to provide VC.
PRAXIS 2016: Bridging the Gaps from Spinal Cord Injury Research to Improved Outcomes

Dr. Graham H Creasey1, Dr. Kim D Anderson2,3, Dr. Dennis Choi4, Ms. Penny Clarke-Richardson5, Dr. B Catharine Craven6,7, Dr. James D Guest2,3, Dr. Naomi Kleitman8, Dr. Brian Kwon9,10, Dr. Lisa McKerracher11, Dr. P Hunter Peckham12,13, Dr. John D Steeves10, Ms. Dorothy Strachan14, Mr. Mike Tomlinson14, Dr. Catherine Truchon15, Mr. Barry White5, Dr. Phalgun B Joshi5

1Department of Neurosurgery, Stanford University, Stanford, USA, 2Miami Project to Cure Paralysis, Miami, USA, 3Miller School of Medicine, Miami, USA, 4Department of Neurology and Neurosciences Institute, SUNY Stony Brook, Stony Brook, USA, 5Rick Hansen Institute, Vancouver, Canada, 6Brain and Spinal Cord Rehab Program, Toronto Rehabilitation Institute, Toronto, Canada, 7Dept. of Medicine, University of Toronto, Toronto, Canada, 8Craig H. Neilson Foundation, Encino, USA, 9Department of Orthopaedics, University of British Columbia, Vancouver, Canada, 10International Collaboration on Repair Discoveries (ICORD), University of British Columbia and Vancouver Coastal Health, Vancouver, Canada, 11BioAxone BioSciences, Cambridge, USA, 12Case Western Reserve University, Cleveland, USA, 13MetroHealth Rehabilitation Institute, MetroHealth Medical Centre, Cleveland, USA, 14Strachan-Tomlinson, Ottawa, Canada, 15Institut National d’Excellence en Santé et Services Sociaux (INESSS), Quebec, Canada

Introduction: The translation of research into improved outcomes for people with spinal cord injury (SCI) is challenging. Many factors including funding and regulation can hinder moving a discovery from basic to clinical research. Even when significant efficacy and safety have been demonstrated in clinical trials, innovations may not become clinically available or commercially viable, and existing knowledge of good practice is not widely or consistently applied.

Methods: An international conference organized by the Rick Hansen Institute was held in Vancouver, Canada in April 2016 to address two "valleys of death" in translation of SCI research and knowledge: Bench to Bedside and Bedside to Worldwide. Diverse stakeholders in the SCI community, including consumers, researchers, clinicians, funding agencies, policy makers, regulators and industry representatives met to learn from past attempts to disseminate and implement medical devices, drugs, cellular therapies and rehabilitation practices, and to propose strategies to promote more rapid and effective translation.

Results: The participants identified many areas for action, including more collaboration between consumers, researchers, industry and funders in setting high priority realistic goals, earlier consideration of regulatory requirements in preclinical and clinical research, new cost-effectiveness measures for reimbursement, injury-specific SCI rehabilitation, new business models, and fostering awareness of the many factors influencing dissemination of innovations.

Conclusions: An action committee is identifying priorities and coordinating implementation of the meeting results which will be disseminated in conference presentations and peer-reviewed publications. The goal is collaborative action by all relevant stakeholders to provide greater value to people with SCI.
Preferences for on-line self-management among Canadians with spinal cord injury

Mr. Eric Wan\textsuperscript{1}, Dr Sonya Allin\textsuperscript{1,2}, Dr Sarah Munce\textsuperscript{1,2}, Mr John Shepherd\textsuperscript{1}, Ms Lindsay Sleeth\textsuperscript{3}, Dr Dalton Wolfe\textsuperscript{3}, Dr Susan Jaglal\textsuperscript{1,2}

\textsuperscript{1}University of Toronto, Toronto, Canada, \textsuperscript{2}Toronto Rehabilitation Institute-University Health Network, Toronto, Canada, \textsuperscript{3}Lawson Health Research Institute, London, Canada

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Self-management programs hold potential to help people with spinal cord injury (SCI) manage their health and prevent secondary complications. Prior research has indicated acceptability of a self-management program if it is delivered online by peers with SCI and is targeted to SCI specific needs. The purpose of this study is to describe preferences for online health coaching by peer mentors on topics related to self-management after SCI.

Methods: We conducted a qualitative study using focus groups with individuals with SCI from across Canada with a broad range of experiences related to self-management. Two investigators conducted one-hour focus groups with participants using a semi-structured interview guide. Participants were also shown screen shots of two of the proposed self-management modules (exercise and bowel care).

Results: To date, we have conducted 4 focus groups including 16 individuals with SCI. Participants indicated a strong preference to discuss management experiences online with peers as opposed to health care professionals (HCPs). Expertise of peers was based on the duration of peers’ experience with SCI. However, when discussing management of bowel health, some participants were more likely to describe roles for HCPs in online conversations. Other participants expressed reluctance to share this sensitive information online with experts.

Conclusions: Participants provided a range of preferences for an online self-management tool. The role of experts in self-management varied with the management topic described along with requirements for privacy protection. This research will guide the development of an online self-management application, which may include exercise and bowel management modules.
Processes and outcomes of care: towards strengthening health systems for acute survivors of traumatic spinal cord injury in South Africa

Mr Conran Joseph¹, Professor Lena Nilsson Wikmar¹, Professor Julie Phillips⁴, Dr Kerstin Wahman¹,³, Dr Claes Hultling¹,⁵, Professor Åke Seiger¹,²

¹Karolinska Institutet, Stockholm, Sweden, ²Stockholmssjukhem, Stockholm, Sweden, ³Rehab Station Stockholm, Stockholm, Sweden, ⁴University of the Western Cape, Cape Town, South Africa, ⁵Spinalis Foundation, Stockholm, Sweden

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: A specialist systems approach had been advocated for the management of spinal cord injuries (SCI’s); however the adopted of such an approach is rather slow in developing contexts. The objective of this study was to provide an evidence-based foundation for strengthening health systems by investigating processes affecting outcomes in two international contexts – Sweden following a systems and South Africa a general approach. Included subjects were the same as those included in a one-year prospective, population-based incidence study.

Methods: All acutely-injured individuals with ASIA Impairment Scale A-D, surviving seven days, were included. The cohort sizes were 145 and 45 for South Africa and Sweden, respectively. Process of care variables included transfer (time) to a specialised unit, whether spinal surgery was performed, time to spinal surgery, length of hospital stay, and referral for rehabilitation. Outcomes of care included in-hospital mortality, neurological recovery and secondary medical complications, for example pressure ulcers. Inferential statistics were used.

Results: In South Africa, more persons had intermediate admissions (p<0.01) prior to being admitted to level 1 trauma units, fewer with vertebral injuries received spinal surgery (p<0.001), and spinal surgeries were significantly delayed (p<0.001), compared with Sweden. Concerning outcomes, more in-hospital mortalities were observed in South Africa, 10 out of 145, compared with only one in Sweden. Significantly more secondary complications occurred in South Africa, especially pressure ulcers (p<0.001).

Conclusion: Recommended processes affecting health outcomes differ between contexts. The evidence derived from this prospective, population-based study could be used for the promotion of systems of care.
Retrospective Cohort Study investigating Long Term Outcomes in Cauda Equina Syndrome (CES). Is there a need for Inpatient Multidisciplinary Rehabilitation?

Mr Manish Desai1, Dr Shruthikaa Ramanathan1, Dr Meenakshi Nayar1
1London Spinal Cord Injury Centre, London, UK, Stanmore, United Kingdom

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

INTRODUCTION:
CES is an uncommon but potentially devastating condition resulting in problems with continence, sexuality, psychological dysfunction, neuropathic pain, mobility limitations, and adjustment.

CES should be rehabilitated by specialist healthcare staff in spinal cord injury centres to have the best chance of optimal management of persisting deficits and returning to the highest level of functioning, even if the neurological recovery is incomplete.

OBJECTIVE:
The primary purpose of this study was to determine the outcomes of the CES patients treated at our specialist centre.
Secondarily, this study will serve as a basis for further comparative studies aiming at a better management of this condition by offering structured short term rehabilitation.

METHODS:
Retrospective cohort study of 26 patients by reviewing the MDT records of patients.

RESULTS:
Age - 20 to 75 years
54% had inpatient rehabilitation.
80% had degenerative disc disease
The long term sequelae of bowel, bladder, sexual dysfunction and neuropathic pain were 80%, 73%, 65%, 69% respectively.

CONCLUSION:
The study did not reflect patient reported outcomes, SCIM, importance of education, learning techniques to manage bowel and bladder dysfunction, and learn coping strategies.

This study identified a need for development of short-stay specially tailored in patient rehabilitation programme which would have a significant impact on creating an environment of better education, understanding the diagnosis and prognosis and effective ways of self managing long term sequelae, similar to the literature.

OUTCOME AND SERVICE DEVELOPMENT:
We have developed an Integrated care pathway (ICP) supporting 3 weeks rehabilitation at our specialist centre with specific goals to achieve.
Tele-rehabilitation: Enabling the Remote Delivery of Home care rehabilitation for Newly Spinal Cord Injured Individuals in India

Miss Nishu Tyagi¹, Dr Chitra Kataria¹

¹Indian Spinal Injuries Centre, Delhi, India

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Background: Since, 2002-2010 Indian Spinal Injuries Centre (ISIC) has reported an incidence of 53.95% Spinal Cord Injury (SCI) cases from rural areas. For this reason, health care services for SCI in remote areas are of extreme importance

Objective: To evaluate the feasibility & acceptance of tele-rehabilitation (TR) program among people with SCI in India

Methodology: 30 (C5-C6) SCIs were recruited during their initial rehabilitation stay and participated in pre discharge teletraining session. After 3 weeks of Post discharge, ‘Spinal Outreach Service Health Questionnaire (SOS-HQ)’ was administered. They received a video conferencing based intervention for 40 minutes targeted client centered protocol, twice a week for six weeks in a supervision of caregivers. Virtual Lectures on Bedsfores Preventive and Hygiene Care was given in every 10 days till six weeks. Participants were followed for six weeks, to monitor days of hospitalization, post complications on SOS-HQ and their feedback on ‘Tele-rehabilitation Satisfaction Survey’ (TSS).

Result: Mean annual hospital days were 4.00 whereas 10% participants reported problem of spasms and pain in leg. On TSS, 70% clients completely agreed on this kind of rehabilitation, being same as in-person method, preventing post discharge complications and saving expenses. 63.15% completely agreed that all areas of functional independence were considered, 52.63% agreed that technology did not interfere with the intervention, 82% completely agreed to use TR in their routine post discharge care.

Conclusion: TR may enhance continuity of home care and reduce post discharge complications in newly injured SCI individuals with potential time and cost-savings.

Professor Abderrazak HAJIOUI¹, Professor Maryam FOURTASSI²
¹Clinical Neuroscience laboratory, Department of Physical Medicine and Rehabilitation, Faculty of Medicine And Pharmacy, University Mohammed Benabdellah Fez, Fez, Morocco, ²Physical and Rehabilitation Medicine department, Faculty of Medicine and Pharmacy- University Mohammed I, Oujda, Morocco

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction
The management of disability in Morocco has become a constitutional right, since the new constitution of 2011. The adoption by WHO of the global disability action plan 2014-2021 has motivated policy makers to develop for the first time in the history of Morocco the national health and disability action plan 2015-2021. The aim of this work is to present progress and remarkable improvement in the health and disability policy in Morocco through the outline of this action plan.

Material and Methods
We have consulted the Moroccan action plan on health and disability 2015-2021 and all the official documents of the Ministry of Health in Morocco.

Results
The National Action Plan on Health and Disability 2015-2021, aims to ensure access for people with disabilities, especially those with spinal cord injury, to promotional health services, preventive, of care and rehabilitation based on the law approach, proximity and quality. It was prepared on the basis of a participatory approach in partnership with various institutional partners, civil society and international organizations. The Ministry of Health has allocated a budget of 747 million dirhams in the plan, which focuses on six strategic areas.

Conclusion
The adoption of the Moroccan Government of a national action plan on health and disability is a fundamental and historic step in improving the management of SCI and disability in Morocco.
What are the research priorities for patients with Degenerative Cervical Myelopathy?

Mr Benjamin Davies¹, Dr Mark Kotter¹

¹University Of Cambridge, Cambridge, United Kingdom

Introduction
Cervical Spondylotic Myelopathy [CSM] is a common cause of spinal dysfunction and despite optimal therapy, many live with significant disabilities. Misalignment of patient and clinician objectives is felt to contribute to research wastage. In North America, in 2010, 85% of biomedical research was felt to have yielded no actual or potential clinical benefit. (1) Our objective therefore was to assess the research priorities of patients with degenerative cervical myelopathy to meet the needs of our patients.

Method
CSM patients, registered with the non-profit organisation myelopathy.org, were invited to complete an online survey, to rank the 7 functional domains of spinal cord injury in order of priority. First choice domains were weighted with 7 points and the least preferred option with 1. Average scores were calculated. Patient demographics and current disability (mJOA) was also noted.

Results
106 patients (M=31, F=75), average age 55±11 years completed the survey. Priorities in rank order were elimination of pain (5.6), recovery of walking (5.3), arm/hand (5.2), upper body strength/balance (3.4), bladder/bowel function (3.3), normal sensation (3.2) and sexual function (2.2). Age, sex and prior surgery did not influence priorities. Patients with severe myelopathy (mJOA<12) prioritised recovery of hand function over pain.

Conclusions
Alleviation of pain, and improvements in mobility and hand function emerge as key priorities for patients and should be a focus for researchers and outcome measures in clinical trials for CSM.

A telephone-based version of the spinal cord injury–secondary conditions scale: a reliability and validity study

Mr Mohit Arora1,2, Dr Lisa Harvey1,2, Ms Lucija Lavrencic3, Dr Joce Bowden1,2, Dr Lianne Nier3, Dr Joanne Glinsky1,2, Dr Alison Hayes4, Dr Ian Cameron1,2

1Sydney Medical School Northern, The University of Sydney, Sydney, Australia, 2John Walsh Centre for Rehabilitation Research, Kolling Institute of Medical Research, Royal North Shore Hospital, Northern Sydney Local Health District, Sydney, Australia, 3Spinal Cord Injury Unit, Royal North Shore Hospital, Sydney, Australia, 4School of Public Health, The University of Sydney, Sydney, Australia

Introduction: The Spinal Cord Injury Secondary Conditions Scale (SCI–SCS) was first published in 2007 and is an adaptation of the generic Seekins Secondary Conditions Questionnaire for people with injury related disabilities. The scale to date has received little attention although it may provide a useful way of screening patients over the telephone for complications. The purpose of this study was to determine the reliability and validity of the telephone-based version of the SCI–SCS.

Methods: Forty people with SCI were recruited from the Royal North Shore Hospital, Australia. Inter-rater reliability was tested by comparing the telephone-based version of the SCI–SCS administered on two different days by two different telephone assessors. Validity was tested by comparing the telephone-based version of the SCI–SCS with the paper-based version of the SCI–SCS.

Results: The intraclass correlation coefficient (95% CI) reflecting the agreement between the telephone-based version of the SCI–SCS administered on two different days by two different assessors was 0.96 (0.93–0.98). The corresponding value reflecting agreement between the telephone-based assessment and the paper-based assessment was 0.90 (0.83–0.95).

Conclusion: The telephone-based version of the SCI–SCS is a simple and a quick questionnaire to administer that has both inter-rater reliability and validity. It may be a useful way to screen patients for complications especially in low and middle-income countries where patients cannot always be regularly followed up at face-to-face clinics.
Assessing LTPA participation and barriers among community dwelling SCI in non-western culture

Dr Maziah Mat Rosly, Mr Hadi Mat Rosly, Professor Glen M Davis OAM, Associate Professor Nazirah Hasnan, Professor Ruby Husain

University Of Malaya, Kuala Lumpur, Malaysia, International Islamic University, Kuala Lumpur, Malaysia, University of Sydney, Sydney, Australia

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Individuals with SCI face challenges in engaging in Leisure-Time Physical Activity (LTPA) that are beneficial for their health. Description of PA levels in SCI are often limited to developed countries and research focus on PA in non-Western cultures is needed.

Methods: A community-dwelling SCI population was recruited from University of Malaya Medical Centre’s registration list. Seventy participants from a total of 188 participants in the databases were surveyed. Interviews were conducted using a modified Physical Activity Scale for Individuals with Physical Disabilities (PASIPD), followed by the Barriers to Exercise Scale (BTES). Fisher’s Exact Test was used to analyse the data within the contingency table.

Results: Collective data from the survey demonstrated that the majority of individuals came from a lower socioeconomic bracket, (70% with a monthly household income of less than RM2500; 27% less than RM1000). Of the surveyed respondents, 80% reported non-participation in moderate, and 85% in vigorous LTPA. LTPA engagement was not associated with their AIS grade or different ethnicities within Malaysia. Instead, moderate and strenuous sports were significantly associated with age and years since injury (p<0.05). The top three barriers to exercise in this SE Asian urban SCI population were costly exercise equipment (55%), pain while exercising (37%) and no access to facilities (36%).

Conclusion: This study of urbanised non-Western individuals with SCI highlighted a lack of public or financial resources and internalised foci of their physical limitations preventing greater engagement in LPTA. Future research should investigate more versatile, innovative and culturally-appropriate approaches to improve LTPA.
Burden among caregivers of adults with spinal cord injury

Dr Lawrence Vogel¹²³, Dr Susan Ryerson Espino¹³, Dr Erin Kelly¹³⁴, Dr Azadeh Ghaffari⁵, Professor Gerald Harris¹³, Dr Michael Richardson⁷, Dr David Chen⁶, Dr Ray Lee⁷, Ms Titilope Akinlose¹³

¹Shriners Hospitals For Children, Chicago, United States, ²Rush University, Chicago, United States, ³Marquette University, Milwaukee, United States, ⁴American Academy of Pediatrics, Elk Grove Village, United States, ⁵Hines Veteran Administration, Hines, United States, ⁶Rehabilitation Institute of Chicago, Chicago, United States, ⁷Schwab Rehabilitation Hospital, Chicago, United States

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: A better understanding of the relationships between caregiver’s quality of life (QOL) and caregiver burden and QOL of adults with spinal cord injury (SCI) will help improve outcomes of adults with SCI.

Methods: Cross-sectional mixed methods (qualitative and quantitative) study of 22 dyads from four USA rehabilitation hospitals. Average age of injury was 21 years (17-37), current age between 26-53 years of age (M=37.11); 77% had tetraplegia; 59% were injured in transportation incidents. Caregivers were an average of 50 years old (22-77); were mostly Caucasian (59%), female (77%), high school educated or higher (82%); and were a spouse or significant other (36%), parent (50%), sibling (9%), or other relative (5%) to the adult with SCI.

Results: Overall, caregivers appeared healthy and satisfied in their roles. However, quantitative measures indicated that twelve caregivers (55%) appeared to have challenges related to at least one area of concern (QOL, amount of leisure time, physical health, mental health, or social support) and were related to higher caregiver burden scores (Mann Whitney U Test p<.01). Qualitatively, caregivers shared a variety of unmet needs related to physical and emotional stamina, a need for better self-care and social integration.

Conclusion: These data suggest the need to raise awareness of the importance of caregiver burden and launch initiatives to bolster caregiver quality of life, such as compensating caregivers and supporting respite and supplemental caregiving initiatives.

Support: Department of Defense (Grant #SC130279)
Design of a peer support study in spinal cord injury rehabilitation in the Netherlands

**MSc Elsemieke Visse**, PhD Christel van Leeuwen, Frans Penninx, Andries Riedstra, Eveline Vollbracht, PhD Janneke Stolwijk, Prof. dr Marcel Post

1 Brain Center Rudolf Magnus and Center of Excellence in Rehabilitation Medicine, University Medical Center Utrecht and De Hoogstraat Rehabilitation, Utrecht, The Netherlands, Utrecht, Netherlands, 2 University of Groningen, University Medical Center Groningen, Center for Rehabilitation, Groningen, The Netherlands, Groningen, Netherlands, 3 Dwarslaesie Organisatie Nederland, Utrecht, The Netherlands, Utrecht, Netherlands, 4 Amsterdam Rehabilitation Research Center, Reade, Amsterdam, The Netherlands, Amsterdam, Netherlands

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

**Introduction.** Peer support for persons with SCI is associated with improved participation, life satisfaction and wellbeing. However, in the Netherlands, little is known about the use of peer support in SCI rehabilitation centres. Therefore, the present study investigates the current and preferred use of peer support interventions in inpatient SCI rehabilitation in the Netherlands.

**Methods.** Mixed-method multicentre study. In all eight Dutch SCI rehabilitation centres, interviews are held among health care professionals (rehabilitation physician, occupational or physical therapist, social worker and peer supporters; N=30) on their experiences with and opinions on the use of peer support in their rehabilitation centre. The interviews are held at location or by phone, depending on the preferences of the interviewees, and last for approximately 45 minutes.

In addition, a focus group is organised with peer supporters from the Dutch patient organisation (N=7). This focus group targets the vision of the peer supporters and the overall preferred organisation of peer support in all eight centres.

Furthermore, adults with SCI (N=250) with various levels and severities of injuries and discharged from rehabilitation in 2014 or 2015, are surveyed about their experiences and preferences related to peer support during inpatient rehabilitation. This survey contains questions about persons’ opinions of and experiences with peer support, and questions about self-efficacy.

**Results.** Not applicable.

**Conclusions.** This study will provide insight in the use of peer support in Dutch SCI rehabilitation. The results of this study will be used in a peer support implementation project in the Netherlands.
Effect of employment status on quality of life of individuals with spinal cord injury (SCI)

Dr Ioannis - Alexandros Tzanos¹, Dr Andreas Mavrogenis², Dr Evanthia Mitsiokapa², Dr Eleftherios Stefas³, Dr Konstantina Gioti¹, Dr Nikolaos Groumas¹, Dr Panagiotis Papaggelopoulos¹
¹National Rehabilitation Centre, Ilion, Greece, ²Attikon Hospital, Haidari, Greece, ³Evexia Rehabilitation Centre, Thessaloniki, Greece

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Individuals with SCI experience difficulties in entering labor market. However it is known that working has beneficial effects in various aspects of daily life. The aim of this study was to determine the level of the effect of employment on quality of life of the greek SCI population.

Methods: One hundred sixty four SCI individuals with a history of SCI of different causes were studied in this survey. They were residents of urban, suburban and rural areas of the greek territory. Questionnaires were completed for each one in interview form and when needed, clinical examination was performed for data collection. The questionnaire included demographic and clinical characteristics. World Health Organization Quality of Life Instrument (WHOQOL-BREF) was used for quality of life assessment. Statistical analysis of the findings was performed with t-test. Participants were divided in two categories regarding employment. Those that had a job or were students and those unemployed or retired.

Results: Employment status was found having statistically significant correlation with WHOQOL BREF-social relations (p=0,008), with WHOQOL BREF-physical capacity (p=0,001), with WHOQOL BREF-psychology (p=0,078), with individuals being employed having advantage. However employment do not seem to have impact on the rest dimensions of quality of life (environment, general health).

Conclusion: Spinal cord individuals with employment exhibit higher levels of quality of life in the dimension of social relations, physical capacity, psychology.
Focusing on return to work after spinal cord injury through photovoice

Reg. OT, MSc. Lisa Bergmark, Dr Eric Asaba

1,2 Karolinska Institutet, Department of Neurobiology, Care Sciences, and Society, Stockholm, Sweden, 1,3 Rehab Station Stockholm, Spinalis SCI Unit, Stockholm, Sweden, 3 Stockholms Sjukhem, Stockholm, Sweden, 4 Tokyo Metropolitan University, Tokyo, Japan

Introduction: Persons with spinal cord injury (SCI) are at risk to be excluded from the labour market after injury, and interventions to support return to work (RTW) are today not sufficiently coordinated or person-centered. RTW after SCI needs to incorporate consumer voice to a greater extent. The aim of this study was to explore barriers and resources in return to work from the perspective of adults with spinal cord injury using photovoice.

Method: Photovoice methods (PV) aim to capture significant events using photographs and narratives to involve participants as collaborators in the research process. Participants (N=6) in the photovoice-group consisted of 3 men and 3 women, level C6-L1, AIS A-B, 29-52 years of age, and 1-10 years post injury, all working after injury. Participants met weekly during 2 months to share and discuss images and stories related to RTW and working life after SCI.

Results: RTW was illustrated as a bumpy road paved with obstacles such as needs of adjustments not met at the workplace and insufficient knowledge about SCI. Moreover, a lack of coordination of resources and unclear distribution of responsibility between stakeholders were raised. Work was made possible when needs within everyday life could be integrated with work and also communicated within the workplace.

Conclusion: Experience from a photovoice-group demonstrates a need to coordinate resources and clarify responsibilities in the rehabilitation process.
Major Barriers that influence Employment after Spinal Cord Injury in India: A Pilot Survey Report

Miss Getila Kshetrimayum, Miss Nishu Tyagi
Indian Spinal Injuries Centre, New Delhi, India

Background: Work is important to people with spinal cord injuries (SCI) because it improves self-esteem and overall life satisfaction. Although they can and do go on to have active work lives and successful careers but still they have more barriers to overcome than those without disabilities.

Objective: To investigate the employment status and identify the barriers during employment after spinal cord injury (SCI) in India.

Methods: Participants were 125 community-dwelling persons 20-64 years of age who had sustained SCI for more than one year. 50 clients were randomly selected and surveyed telephonically on the questionnaire comprising 30 questions related to Demographic details, Education, Personal, Family, injury characteristics, employment status before and after injury, accessibility issues and medical complications faced.

Results: 35 clients responded. Probability of employment was higher in men than women, older than 45 years at the time of injury than those aged 31-45 years of age. Moreover, employment was higher in individuals injured for longer than 15 years than those injured for 1-5 years and in individuals with incomplete tetraplegia than those with complete paraplegia. Employment rate decreased from 68% to 37% after SCI. Major barriers reported by client were related to urine leakage (20%), regular spasms (26%), burning sensation in legs (34%), unavailability of rest room at office (56%), management team at office were less aware about SCI (80%).

Conclusion: Injury characteristics are the most important predictor of employment in persons with SCI. Also, employment medical support system with proper SCI education are required at their office.
Post-injury occupations of persons with SCI living in Switzerland: Key demands and characteristics

M. sc. Marina Nützi¹,², Dr. Urban Schwegler¹,², Dr. phil. Bruno Trezzini¹,²

¹Swiss Paraplegic Research, Nottwil, Switzerland, Nottwil, Switzerland, ²Department of Health Sciences and Health Policy, University of Lucerne, Switzerland, Lucerne, Switzerland

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction:
Many non-working individuals with spinal cord injury (SCI) report a lack of suitable jobs as a major barrier to employment. However, hardly any studies examined the demands and characteristics of post-injury occupations of persons with SCI, leading to a lack of knowledge on potentially suitable jobs for the affected individuals. The objective of our study was, therefore, to determine key demands and characteristics of occupations that are currently performed by persons with SCI living in Switzerland.

Methods:
Current occupations of individuals with complete or incomplete para- and tetraplegia were identified using job titles indicated by the participants of the SwiSCI community survey 2012. These job titles were assigned to occupational titles from the Occupational Information Network (O*NET) based on which the key demands and characteristics of the post-injury occupations were determined.

Results:
The SwiSCI survey included 1,159 participants of working age, of which 664 were gainfully employed. A total of 736 job titles were reported, resulting in 258 different O*NET occupations. Preliminary results show that persons with SCI often work in technical, clerical or academic occupations that are characterized by high cognitive demands. In addition, we found that most of these occupations require conscientiousness and an interest in realistic and conventional work tasks.

Conclusions:
This study enhances the knowledge about the nature of post-injury occupations of persons with SCI. Moreover, our findings may inform the development of occupation-specific job matching applications for vocational guidance of persons with SCI and could support a sustainable work reintegration of the affected individuals.
Prevalence of parenthood in wheelchair-dependent persons with long-term Spinal Cord Injury in the Netherlands

MD Katrien Van Den Borne¹, MD Dorien Spijkerman⁷, MD Jacinthe Adriaansen³, PhD Rita van den Berg-Emons⁴
Libra Rehabilitation & Audiology, Eindhoven, Netherlands, Rijndam Rehabilitation, Rotterdam, Netherlands, Brain Center Rudolf Magnus and Center of Excellence in Rehabilitation Medicine, De Hoogstraat Rehabilitation, Utrecht, Netherlands, Erasmus Medical Center, Rotterdam, Netherlands

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction
Knowledge on prevalence and determinants of parenthood in Spinal Cord Injury (SCI) is important in the counselling of persons with SCI who are in their reproductive age; however, this knowledge is scarce. Aim of this study was to estimate the prevalence of parenthood in a cohort of wheelchair-dependent persons with long-term SCI who had their injury in their reproductive age. Secondary aim was to explore demographic and injury-related determinants of parenthood after suffering a SCI.

Methods
Multicentre cross-sectional study, part of the Dutch ALLRISC project (2011-2013). Information on parenthood was available in 255 persons (90%, mean age 48 years (SD 8.8)). Data on prevalence (having children before/after SCI) and determinants were obtained by questionnaires, oral interview and physical examination.

Results
Overall prevalence of parenthood was 49% (50% in men, 45% in women). Of this group of parents, the majority (66% in men; 72% in women) had children after their SCI. In both men and women, partnership was a determinant for having children after SCI (p<0.05). Other determinants were having an incomplete lesion (men; p=0.02), not having defecation difficulties (men; p=0.01) and having a non-traumatic lesion (women; p=0.04).

Conclusions
Prevalence of parenthood in wheelchair-dependent persons who suffered a SCI was much lower compared to that in the Dutch population (50 versus 74% in men, 45 versus 81% in women); several factors, both demographic and injury-related may contribute to this. However, still half of the persons who suffered a SCI had children, and mostly after their injury.
Relationship of Posttraumatic Growth and Adjustment to Spinal Cord Injury: Moderated by Posttraumatic Depreciation?

Mr. Simon Kunz¹,², Prof. Stephen Joseph³, Dr. Szilvia Geyh¹,², Dr. Claudio Peter¹,², for the SwiSCI study group
¹Swiss Paraplegic Research, Nottwil, Switzerland, ²University of Lucerne, Lucerne, Switzerland, ³University of Nottingham, Nottingham, UK

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: The study’s objective is to investigate the associations between positive (posttraumatic growth, PTG) and negative (posttraumatic depreciation, PTD) psychological changes experienced as a result of a spinal cord injury (SCI) on one side and life satisfaction and indicators of mental and physical health on the other side. The primary aim is to test whether PTD moderates the relationships between PTG and different adjustment indicators.

Methods: A total of 141 patients with new traumatic or non-traumatic SCI (59% with paraplegia, 86% with incomplete injuries) participated in the national Swiss Spinal Cord Injury Cohort Study (SwiSCI) and completed questionnaires assessing PTG and PTD, mental and physical health as well as life satisfaction at rehabilitation discharge. Correlational and regression methods were used to examine the research questions.

Results: PTD was significantly associated with lower mental and physical health and lower life satisfaction, with small to large effect sizes. PTD moderated the associations between PTG and depressive symptoms and life satisfaction (β of interaction term= -.18 and .24, respectively): PTG was significantly related to lower depressive symptoms and higher life satisfaction in individuals experiencing moderate to high levels of PTD. In contrast, PTG was unrelated to these outcomes in individuals with low PTD levels.

Conclusions: The results partially explain the mixed findings on the association of PTG and adjustment to SCI. PTG may only be associated with better adjustment when individuals concurrently experience PTD. However, the cross-sectional study design does not allow causal inferences about these associations.
Self-management from the perspective of health literacy: An under-researched topic in the field of spinal cord injury

Professor Sara Rubinelli1,2, Mrs Nadia Lustenberger2, Mrs Mirjam Brach1,2, Dr Stefan Essig2,3, Dr. med Hans Georg Koch1,3, Dr. med, PhD Anke Scheel-Sailer1,5, Professor Armin Gemperli1,2, Professor Gerold Stucki1,2, Mrs Claudia Panini1,2

1 University of Lucerne, Lucerne, Switzerland, 2 Swiss Paraplegic Research, Nottwil, Switzerland, 3 Institute of Primary Care and Community Care, Lucerne, Switzerland, 4 Swiss Paraplegic Association, Nottwil, Switzerland, 5 Swiss Paraplegic Center, Nottwil, Switzerland

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Traumatic spinal cord injury (SCI) is a life-changing event. In first rehabilitation, patients need to learn not only what SCI is but also – and most importantly – how to manage it once back to the community. But what is behind an appropriate self-management? In what is SCI different from other chronic conditions? The aims of this presentation are to identify the challenges of self-management in light of the complexity of the health condition, and to discuss their implications for education targeting self-management.

Methods: Critical review of conceptual and empirical studies addressing the multifaceted dimensions of self-management in SCI.

Results: Healthcare professionals (HPs) can help build knowledge, but knowledge alone does not ensure appropriate self-management of a health condition. Individuals with SCI need to be able to evaluate to what extent the information acquired applies to one’s own situation, to decide to put it into practice when necessary and to communicate with HPs and family. These skills are at the core of a concept known in the field of health communication as health literacy and give an insight of the multidimensionality of self-management of complex chronic conditions.

Conclusions: Today many education programs focus on knowledge and disregard other fundamental aspects behind self-management, such as the analytical skills needed to make decisions, high commitment and self-efficacy. We suggest that these limitations could be overcome by focusing self-management education on the enhancement of health literacy and by grounding it in models of behavior change to move from “knowing” to “acting”.

Survey of Spinal Cord Injury Survivors in Taiwan

Miss Hsin-ping Hung\textsuperscript{1}, Miss Li-Jung Mai, Mr. Cheng-Han Liu, Miss Yu-Chan Li

\textsuperscript{1}Spinal Core Injury Foundation, Taipei, Taipei, Taiwan

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Object: This survey aimed to understand the epidemiology and life of people with spinal cord injury (SCI-survivors) in Taiwan, which was executed by Spinal Cord Injury Foundation, Taipei

Method: A semi-structured questionnaire was used in the survey. Interviewed from May to Oct. in 2015, the survey has collected 385 effective samples through The Potential Development Center for Spinal Cord Sufferers and SCI county associations around Taiwan, by snow-ball sampling. Most of the respondents are clients of these originations.

Result:

1. 78.7% among SCI survivors are male patients. The average time after experienced SCI is 14 years. 38.2% of the survivors experienced SCI between 20 and 29 of age, which is also the high risk age layer in statistics.
2. The most three factors to cause SCI are vehicle accident (61.0%), falls (20.0%), and spinal disease (7.8%).
3. Many SCI survivors have experienced complications such as spasm (83.4%), neuralgia (68.8%), urethra infection (78.2%), and decubitus (64.2%).
4. 29.4% of respondents have been employed, but 60.3% people said they are in low income stages.

Conclusion:

In summary, 1) SCI people have lower employment rate and income than people without SCI, which may cause disadvantage in economic status. 2) Young males in low economic status may have higher risk to experience SCI. 3) Motorcycles are very popular transportation in Taiwan. Though wearing helmet during riding is necessary, it cannot protect riders from SCI while accidents happened, which may increase the number of SCI survivors during vehicle accident.
A Model for Estimating Life Expectancy Following Spinal Cord Injury

Dr Michael DeVivo
University Of Alabama At Birmingham, Homewood, United States

Introduction: The purpose of this study was to develop a model for estimating life expectancy following spinal cord injury (SCI).

Methods: The study population included 40,263 persons with SCI treated at model systems in the United States since 1973 who survived the first year post-injury. Risk factor information was collected prospectively from medical records and patient interviews. Mortality information was collected as of December 31, 2014, from routine follow-up by model systems supplemented with searches of the Social Security Death Index. A person-year data set was created, and logistic regression was used to determine mortality odds ratios (OR) for each risk that can then be used to estimate the probability of dying each year and the life expectancy of any individual person with SCI.

Results: There were 12,509 deaths among 663,112 person-years of follow-up. Statistically significant risk factors included age, sex, race, education, income, cause of injury, neurologic level of injury, AIS grade, ventilator-dependency, place of residence, type of health insurance, smoking status, diagnosis of diabetes, and length of time already survived after injury.

Conclusion: This life expectancy model provides valuable information to patients and families, health care providers, life care planners, health care planners and economists, insurance companies, and the judicial system. By including myriad risk factors, the model is more accurate than traditional life expectancy tables based solely on age and severity of injury. Accounting for trends in risk factors over time also allows more accurate determination of any progress toward improving life expectancy for persons with SCI.
Causes of death after traumatic spinal cord injury: a 70 year British study

Dr Gordana Savic¹, Dr Michael DeVivo², Dr Hans Frankel¹, Dr Mohamed Ali Jamous¹, Dr Bakulesh Soni³, Dr Susan Charlifue⁴

¹National Spinal Injuries Centre, Stoke Mandeville Hospital, Buckinghamshire Healthcare NHS Trust, Aylesbury, United Kingdom, ²University of Alabama at Birmingham, Birmingham, USA, ³Northwest Regional Spinal Injuries Centre, Southport Hospital, Southport and Ormskirk NHS Trust, Southport, United Kingdom, ⁴Craig Hospital, Englewood, USA

Objective: Explore causes of death after traumatic spinal cord injury (SCI) in the United Kingdom (UK), in persons surviving the first year post injury.

Design: Retrospective observational.

Method: The sample consisted of all patients with traumatic SCI admitted to Stoke Mandeville and Southport spinal centres who were injured 1943-2010, survived first year post injury, had residual neurological deficit on discharge and were British residents. Mortality information, including causes of death, was collected up to 31 December 2014.

Results: 2322 persons (42.3% of the sample) died, with 2170 (93.5%) having a reliable cause of death established. The most frequent causes of death were: respiratory (29.3% of all certified causes), circulatory, including heart and cerebrovascular diseases (26.7%), neoplasms (13.9%), urogenital (11.5%), digestive (5.3%) and accidents, including intentional and unintentional self-harm (4.5%). Analysed by SCI severity, respiratory diseases were the leading cause of death in persons with tetraplegia ABC (42.4% of all deaths), and circulatory disease in persons with paraplegia ABC (27.7%) and functionally incomplete SCI (33.4%). Analysed over time, leading causes of death in 1943-1970 period were: urogenital (31.5%), circulatory (24.7%), respiratory (19.9%) and skin related (6.8%); in 1971-1990 period: circulatory (27.1%), respiratory (24.3%), urogenital (18.3%) and neoplasms (13.6%); in 1991-2014 period: respiratory (32%), circulatory (26.7%), neoplasms (15%) and urogenital (7.1%).

Conclusions: Leading causes of death after SCI in persons surviving the first year were respiratory, circulatory, neoplasms and urogenital. The proportion of individual causes changed during the study period and with the level and completeness of injury.

Support: Acknowledged in presentation.
Demographic and Clinical Characteristics of Non-Traumatic Spinal Cord Disorder in Canada: A Population-based Study Using Administrative Health Data

Prof Sara Guilcher1, Prof Susan B Jaglal1,2, Dr. Jennifer Voth2, Dr. Chester Ho3, Dr. Vanessa Noonan4, Ms. Nicole McKenzie3, Dr. Yan Chen5

1University of Toronto, Toronto, Canada, 2Toronto Rehabilitation Institute, Toronto, Canada, 3Hotchkiss Brain Institute University of Calgary, Calgary, Canada, 4Rick Hansen Institute, Vancouver, Canada, 5Alberta Health, Calgary, Canada

Introduction: Non-traumatic spinal cord disorder (NTSCD) is a significant cause of spinal cord injury; however little is known about the demographic and clinical characteristics of NTSCD in Canada. The purpose of this study was to describe the characteristics of NTSCD using national health administrative data.

Methods: Using a retrospective cohort design, NTSCD were identified by hospital records across Canada between April 1, 2004 and March 31, 2010. Data were extracted from the Discharge Abstract Database (DAD), which includes diagnostic codes under the International Classification of Diseases and Related Health Problems, 10th Revision Canada (ICD-10-CA). Descriptive statistics were performed to describe demographic and clinical characteristics.

Results: A total 5,593 NTSCD patients were identified. The average age of the sample was 61.3 years (SD=17.36) and consisted of slightly more males (54.9%) than females (45.1%). Patients more frequently presented with paraplegia (48.0%) compared to tetraplegia (16.6%) and the majority lived in an urban setting (78.2%). Degenerative disorders were the most frequent cause of NTSCD (44.3%), followed by infection (7.6%), cancer (5.9%), inflammatory (4.5%), and vascular causes (4.5%). A substantial proportion of NTSCDs were of unspecified/unknown cause (26.0%). Two thirds of patients had multimorbidity (60.0%) either at the time of NTSCD diagnosis or at their next hospital admission. Frequent comorbid conditions included cancer (23.6%), hypertension (23.4%), and diabetes (16.7%).

Conclusions: This is the first epidemiological study using administrative health data to provide demographic and clinical data on NTSCD in Canada. The results have the potential to direct future research initiatives and policy decisions.
Descriptive Study of Earthquake Related Spinal Cord Injury in Nepal

Dr Christine Groves¹, Dr. Manoj Poudel¹, Dr. Bishow Thapa³, Mandira Baniya¹, Chanda Rana¹
³Spinal Injury Rehabilitation Centre, Kathmandu, Nepal

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: An estimated 200 individuals sustained spinal cord injuries during earthquakes in Nepal in April/May 2015. This retrospective chart review seeks to (1) describe the epidemiological features of these SCIs; and (2) discuss implications for future earthquake preparedness in resource-limited settings.

Methods: Data was collected from the medical records of all earthquake-related patients seen from 25 April 2015 through 4 May 2016. Data collected included patient demographics, mechanism of injury, initial medical treatment, neurological assessment, complications, outcomes and length of stay.

Results: 117 earthquake-related SCI patients were evaluated, with a female-to-male ratio of 1.3:1. 108 patients (92.3%) sustained vertebral fracture and/or dislocation. 76 (65.0%) underwent surgical fixation. The majority of patients (82.0%) presented with paraplegia, of whom most (60.4%) were incomplete. L1 was the most common (18.0%) neurological level of injury. 36 (30.8%) patients had documented pressure ulcers upon admission; six (5.1%) developed new pressure ulcers during their rehabilitation stay. Urinary tract infection was seen in 33 (28.2%) patients. Six (5.1%) patients were diagnosed with DVT. One patient developed clinically significant heterotopic ossification. No deaths occurred in this patient population. Significant improvements were seen in patients’ functional and psychological measures prior to discharge.

Conclusions: Similar to previous studies, the Nepal earthquakes resulted in a significant number of spinal cord injuries, with the majority occurring in women. This data highlights features of SCI associated with earthquakes and further supports the need for comprehensive planning and preparedness for SCI-specific acute care and rehabilitation following earthquakes, particularly in resource limited settings.
EPIDEMIOLOGY CHANGES IN SPINAL CORD INJURY PATIENTS TO REDEFINE REHABILITATION PROGRAMS IN SPINAL UNIT

PT Chiara Butera1, PT Barbara Bandini2, MD Marco Postiglione3, Ph.D. Andrea Guazzini2, MD Giulio Del Popolo2
1 University of Florence, Florence, Italy, 2 Careggi University Hospital, Florence, Florence, Italy, 3 Centre for the study of complex dynamics (CSDC), University of Florence, Florence, Italy

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

BACKGROUND
International and Italian epidemiology studies show an increase in Spinal Cord Injury patients age and in incidence of non traumatic and incomplete SCI.

OBJECTIVE
Describe epidemiological changes of SCI patients admitted to our Spinal Unit in the last 5 years, namely neurological and functional recovery as well as the correlation between clinical – demographic variables and the functional state at discharge.

METHODS
Retrospective observational study on 313 SCI patients (level C2-S4-5, AIS A,B,C,D) at their first postlesional admission to our rehabilitation service from 1st June 2010 and discharged before 31st March 2016. Variables considered: age at admission, gender, time as inpatient, admission and discharge level and degree of neurological lesion and functional scales (i.e. FIM, SCIM II and WISCI II).

RESULTS
Results showed mean age 54 (D.S. 17.78, min 15 max 90), male female ratio 2.26:1, 35% non traumatic lesions, 75.6% incomplete lesions and 52.9% paraplegics. As most frequent degree of lesion 46% Tetraplegics were AIS D and 37% Paraplegics were AIS A. 50% of SCI patients were over 58 years old with high incidence of tetraplegia and AIS D. Non traumatic lesions showed a higher frequency with the increase in age with a higher incidence of incomplete lesion. Young age, low level of lesion and lower severity lesion at admission were positive prognostic factors for functional recovery at discharge.

CONCLUSIONS
Increase of incomplete lesions and elderly new lesion patients and the variety of obtainable outcomes imply the need to reorganize patient management and redefine rehabilitation pathways.
Epidemiology of spinal cord injury in Ireland, a 5 year retrospective review.

Dr. Eimear Smith1, Dr. Patricia Fitzpatrick2
1National Rehabilitation Hospital, Co. Dublin, Ireland, 2School of Public Health, Physiotherapy and Sports Science, University College Dublin, Ireland

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: The last study of traumatic spinal cord injury (TSCI) epidemiology in Ireland was carried out in 2000; updating is awaited, with a prospective study now underway in 2016. Pending results of this, a feasibility study suggested that a 5 year retrospective review (2010-2014) could yield a complete dataset, to assist with health services planning.

Methods: All patients with TSCI discharged from the national SCI acute and rehabilitation centres were reviewed. Data was collected on gender, age, aetiology, level of injury, ASIA impairment scale, length of rehabilitation admission, discharge destination, mortality. Population denominator was the most recent census in 2011, rolled forward to 2014 for accuracy.

Results: Incidence of TSCI ranged from 9.8 to 13.9 per million per year. Mean age of injury onset increased from 46.7 (19.8) years in 2010 to 54.4 (19.6) in 2014. Males accounted for 72.6%. Cervical incomplete was the most common injury sub-type in each year accounting for 44.4% in total. Falls were the leading cause, accounting for 55.2% of TSCI. Mean length of rehabilitation stay was 108.9 days. Discharge destination was home in 64.6% of cases. Cervical complete injury was associated with significantly longer length of stay (p<0.001). Falls as causative factor and tetraplegic incomplete were associated with older age of SCI onset (p<0.001). Patients discharged home were significantly younger than those discharged to other destinations (p<0.001). Total mortality rate over the study period was 11%.

Conclusions: The epidemiological trends identified in this study are similar to trends observed elsewhere in the developed world.
Falls in inpatients with spinal cord injury

Ms Christa Schwager¹, Mrs Gabi Mueller¹, Ms Angela Frotzler¹, Ms Anne Katrin Brust¹, Mrs Stefanie Tesini¹, Mr Adrian Wyss²

¹Swiss Paraplegic Center, Nottwil, Switzerland

Introduction
Falls are widely accepted as indicator for quality of care and should be avoided. On the contrary patients with spinal cord injury (SCI) have a more than twice as high risk for falls than able bodied elderly individuals. In order to generate more knowledge about falls after SCI it is essential to identify a coherency between the risks and results of falls, e.g. when, how and why they happen.

Method
A single-center survey with consecutive documentation of falls of patients with SCI was carried out in a specialized clinic for SCI rehabilitation. Data was collected over a 5 year period using a standardized form.

Results
357 patients experienced a total of 625 falls during the assessment period. The overall period prevalence rate of inpatient falls was 8.6%. In 71.5% of all falls no other person was involved. 42.1% were transfer falls and 23.8% wheelchair handling falls. Regarding the environmental and personal factors, falls were related to a wheelchair problem 174 times, 137 times to false estimation of the situation. 121 patients experienced a total of 126 injuries related to falls. Most injuries were minor, only 4 falls resulted in fractures.

Conclusion
In the past, falls were classified as nursing errors. This study showed clearly, that most falls happened without the assistance or supervision of a staff member, while doing an activity. Environmental factors are more likely the cause for falls than personal factors. Severe injuries were rare, minor injuries occurred more often, but did not prolong the rehabilitation process.
Long term survival after traumatic spinal cord injury: a 70 year British study

Dr Gordana Savic, Dr Michael DeVivo, Dr Hans Frankel, Dr Mohamed Ali Jamous, Dr Bakulesh Soni, Dr Susan Charlifue

1 National Spinal Injuries Centre, Stoke Mandeville Hospital, Buckinghamshire Healthcare NHS Trust, Aylesbury, United Kingdom, 2 University of Alabama at Birmingham, Birmingham, USA, 3 Northwest Regional Spinal Injuries Centre, Southport Hospital, Southport and Ormskirk NHS Trust, Southport, United Kingdom, 4 Craig Hospital, Englewood, USA

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Objective: Explore long term survival after traumatic spinal cord injury (SCI) in the two oldest spinal centres in the United Kingdom (UK).

Design: Retrospective observational.

Method: The sample consisted of all patients with traumatic SCI admitted to Stoke Mandeville and Southport spinal centres, who were injured 1943-2010, survived first year post injury, had residual neurological deficit on discharge and were British residents. Mortality information was collected up to 31 December 2014. Life expectancy and trends over time were estimated by neurological grouping, age and gender using logistic regression of person-years of follow-up combined with standard life table calculations.

Results: For the 5482 cases of traumatic SCI the mean age at injury was 35.1 years, 79.7% were male, 1.3% had ventilator dependent tetraplegia, 6.3% C1-C4 tetraplegia AIS/Frankel ABC, 23.4% C5-C8 tetraplegia ABC, 41.2% paraplegia ABC, and 27.7% incomplete lesion (all Ds). On 31 December 2014, 54% of the sample was still alive, 42.3% had died and 3.7% was lost to follow-up. Estimated life expectancies improved significantly between the 1940s and 1980s, plateaued during the next two decades, before slightly improving again since 2010. The estimated current life expectancy, compared to the general UK population, ranged from 25% to 88% depending on the ventilator dependency, level and completeness of injury, age and gender.

Conclusions: Life expectancy after SCI remains significantly below that of the general UK population, but, after a period of stagnation, is again improving slightly.

Spinal cord injury as a result of an obstetric trauma

Dr Carolina Barbeiro¹, Dr Ana Vasconcelos¹, Dr Isabel Batalha¹
¹Centro Medicina Reabilitação Alcoitão, Alcoitao, Portugal

Introduction

Neonatal spinal cord injury has been reported after traumatic births and as a consequence of underlying lesions in the spinal cord. The authors present a case of a female child with the diagnoses of brachial plexus injury and spinal cord injury which occurred as a result of dystocia delivery of a macrosomic baby with moderate neonatal asphyxia.

METHOD
Describe a case report.

RESULTS

Infant observed in consultation in a Rehabilitation Center, with a month of life, no active movements in any segment of the upper right limb, globally hypotonic. Suggested right brachial plexus MRI, which came to demonstrate, in addition to traumatic roots pullout with arachnoid hernia at C6/C7 level, a spinal cord injury with extensive myelomalacia established at the C7/D2 transition. She started treatment at a Rehabilitation Center with a month. She presented neuromotor frame tetraplegia, had head control, no trunk balance and no right upper limb function. It was started intermittent catheterization due to pyelocalcial ectasia. She maintains the Rehabilitation Program without indication for brachial plexus surgery.

Conclusions:
The macrosomic fetus lead from the start, a greater likelihood of complications for the fetus. For the child the most frequent problem is brachial plexus injury. An infant’s observation must be comprehensive and not only dedicated to the main problem, in order to exclude concomitant diseases. Moreover, intervention strategies may need to be changed in relation to priorities.
Spinal cord injury caused by blast wave

Dr Birgitta Löthgren
1
1Rehabilitation Medicine, Göteborg, Sweden

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Background
Little is known regarding blast wave damage in the spinal cord.

Methods
Case story

Results
During a multiple shooting the patient was hit in the thorax. This result in severe bleedings and fractures of the vertebrae 3 as well as 5-6. No direct particles from the bullets or fractures went into the spinal cord. However, the pressure waves from the bullets rendered a swelling in the cord at the level of Th 5-6. The patient presented with immediate paralysis of the lower limb and pelvis and severe pain. He spent 3 weeks in the ICU and at the spinal cord unit the paresis was complete. When coming to the rehab unit, 7 weeks post injury he presented incomplete paraplegia. At discharge from the rehab unit, he was able to walk with crutches indoors and used wheel-chair for longer distances. 12 months post injury he is walking without assistive devices. However, he still has impaired sensory function in the legs and increased tonus which requires toxin injections.

Conclusion
Even indirect trauma can render spinal cord injury that requires specialized rehabilitation. At spray shootings, there is also need for assessing the function of the spinal cord.
Survival after traumatic spinal cord injury in Denmark: A hospital-based study among patients injured in 1990-2012

Mrs Bodil Bjørnshave Noe, Mrs Christina Malmose Stapelfeldt, Mr Erik Thorlund Parner, Mrs Ellen Margrethe Mikkelsen

1Research and Education Centre, Hospital of Westjutland, Herning, Denmark, 2Public Health and Quality Improvement, Aarhus, Denmark, 3Department of Public Health, Section for Biostatistics, Aarhus University, Aarhus, Denmark, 4Department of Clinical Epidemiology, Aarhus University Hospital, Aarhus, Denmark

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Hospital-based cohort study at Spinal Cord Injury Centre of Western Denmark (VCR)

Aim: examine the overall survival and mortality over time adjusted for age at time of injury and gender.

Methods

Review of medical records of TSCI patients admitted at VCR in the 1990-2012 period. The patients were followed until death, emigration or end of study (31 December 2014). Survival and mortality rate ratios (MRRs) with 95% confidence intervals (CI) were estimated for subgroups defined by year of injury (1990-1994, 1995-1999, 2000-2004, 2005-2009 and 2010-2012). Mortality was analysed using Cox proportional hazard regression. Adjustment for age at injury was performed (restricted cubic splines).

Results

Included was 665 patients (males 82%). During the observation period, 136 (20%) died. Two-year survival varied from 93% in 2005-2009 to 98% in 2000-2004. Using 1990-1994 as a reference, the adjusted MRRs varied between 1.22 (CI: 0.43; 3.42) and 0.48 (CI: 0.13; 2.71). The 5- and 10-year survival varied between 85% (2005-2009) and 95% (1990-1994), and between 77% (2005-2009) and 91% (1990-1994), respectively. No trend over time was observed either for 2-, 5-, or 10-year survival. Men’s mortality did not differ consistently from that of women. Except for the most recent time period, the overall survival of TSCI patients was higher among those aged < 60-years at the time of injury.

Conclusion

The survival after TSCI in Denmark did not change significantly from 1990 to 2014 and there seemed to be no gender difference. Mortality was highest among patients above 60 years of age at injury.
When Kids Fly: Causes of Adolescent Spinal Cord Injuries, To Direct Injury Prevention Programs

Miss Patty Antcliff, Dr. Herndon Murray, Dr. Emma Harrington, Dr. Anna Elmers, Mr. Matthew Weber

Shepherd Center, Atlanta, United States

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Catastrophic spinal cord injuries disproportionately affect adolescents, as this age group is known for risk-taking behavior. To design injury prevention programs for this population, precise information on how these injuries occur is needed. For this purpose, Shepherd Center embarked on a ten year retrospective review of adolescent admissions for SCI rehabilitation. We looked at age, gender, etiology of injury, months, and categorized road traffic accidents (RTA) and sports/recreation to identify high-risk activities.

Admissions data of 498 individuals from 2005-2015 was reviewed, including patients aged 10-19 years old admitted with a spinal cord or dual injury- brain and spine.

Of 498 individuals reviewed, most patients are male, 378, versus 119 female. 252 are paraplegic and 246 are quadriplegic. The highest number of injuries occurred in the summer and December, with the fewest in February.

The events were categorized as: RTA, sports/recreation, falls, violence, blunt trauma, unknown, and non-traumatic.

We admitted 270 RTA patients, 81% of which were auto crashes, 11% motorcycle crashes (MCC), 5% ATV, and 2% non-motorized bicycles.

Of 113 sports/recreation admissions the largest categories were 52% were water sports injuries, 13% football, and 8% winter sports.

Adolescents are participating in risky behaviors before the legal driving age of 16. 33% of youth aged 10-15 were injured due to motorized/unmotorized bikes, ATV and MCC while 16% aged 16-19 were hurt in that same category. Prevention efforts need to focus on safety enforcement geared towards younger adolescents. More research is needed into enforcement and compliance and its impact on catastrophic injuries.
A comparison of Woodway® body weight support treadmill training with Alter G® Anti-Gravity® treadmill training during spinal cord injury rehabilitation.

Miss Rachel Harrison¹, Mrs Kirsten Hart
²National Spinal Injuries Centre, Uk, Aylesbury, United Kingdom

Introduction
The aim of this project was to compare the current partial body weight support system (Woodway®) with Alter G® Anti-Gravity® treadmill to ascertain if the current system is still the most effective method to enable acute SCI patients to weight bear and facilitate stepping, with as little resource as possible.

Method
Twenty two patients undergoing inpatient rehabilitation at the National Spinal Injuries Centre, UK and matching the inclusion criteria were selected to take part in the project. Each patient undertook treadmill training via both methods and the chosen outcome parameters were recorded following each session. The session data gathered measured the resource required to facilitate a treatment session in terms of staffing, time and ease of application. Further information was gained via qualitative questionnaire to explore therapist perception of both treadmills with regard to quality of gait and ease of application.

Results
The results demonstrated that less resource was required in terms of time and staffing when using the Alter G® Anti-Gravity® treadmill, although treatment effect was similar with both treadmills. A greater ease of application was also demonstrated with the Alter G® Anti-Gravity® treadmill. These results will be explored further within the poster presentation.

Conclusion
The study demonstrated that the Alter G® Anti-Gravity® treadmill may be suitable as a rehabilitation tool in a busy NHS inpatient spinal cord injury rehabilitation unit. Limitations included data collection by multiple therapists and a lack of familiarity with the equipment.
Discrepancy of electrophysiologic and stenosis level in cervical spondylotic myelopathy

Dr Young-Ah Choi², Pf Moon Suk Bang¹, Pf Keewon Kim¹
¹Department of Rehabilitation Medicine, Seoul National University Hospital, Seoul, South Korea

Introduction: In cervical spondylotic myelopathy (CSM), level with structural stenosis seems not correspond to neurological level of deficit. However, it has not been clearly demonstrated. In this study, we aimed to demonstrate agreement or discrepancy between structural stenosis level and abnormal neurological level in patients with CSM. Structural stenosis level was determined by MRI and myotome with neurological deficit was determined by electromyography.

Methods: We reviewed, in 17 patients with CSM, electromyography (EMG) and magnetic resonance images (MRIs) to show objectively relationship between structural level of stenosis and neurological level with lower motor neuron involvement. Structural level was defined by spinal canal stenosis with definite cord compression. Neurological level was determined by myotomes with abnormal spontaneous activity.

Results: In all the patients except one, myotomes with abnormal spontaneous activity on EMG were lower by 1, 2, 3, or 4 levels than stenotic canal shown in MRI.

Conclusions: This retrospective study of 17 patients with MRI and electrodiagnostic studies has demonstrated the discrepancy between the segmental levels involved using electromyography and the structural stenosis levels on MRI. These findings can be advantageous in effectively evaluating the preoperative assessment of patients with CSM and prognosis.
Function Electrical Stimulation (FES) in Rehabilitation of Tetraplegia following traumatic Spinal Cord Injury (SCI): A Feasibility Study

Dr Siddeshwar Patil¹², Mr Wajid Raza¹, Mr Firas Jamil¹
¹Yorkshire Regional Spinal Injuries Centre, Wakefield, United Kingdom ; ²University of Leeds, Leeds, United Kingdom

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction:
SCI survivors with injuries between C4 and C7 are dependent on carers for activities of daily living with a consequent impact on their quality of life. Traditionally compensatory strategies to improve hand functions have been achieved both by surgical and conventional therapy with limitations/complications/contraindications. Our objective was to assess safety, feasibility and functional outcome in individuals with traumatic incomplete SCI between C4 and C7.

Methods:
Prospective study; acute traumatic SCI admitted to Regional SCI centre (Oct’14- April’15); six weeks each of conventional therapy followed by FES therapy. SCIM-III-Self-care score, Grip strength and Pinch strength assessed at end of conventional therapy (Pre FES) and end of FES therapy (Post FES); adverse events documented.

Results:
Total eight patients with C4-C7 incomplete (AIS B-2, C-5, D-1) tetraplegia, two were excluded [Pacemaker (n=1); seizures (n=1)]. Drop-out (n=1); Adverse events (n=0).

Post-FES improvement in mean scores were noted as SCIM-III Self-care from mean (2.2; SD1.78) to (5.8; SD1.48); Grip strength right hand (9.82; SD3.53) to (18.72; SD11.86); Grip strength left hand (8.08; SD3.09) to (13; SD7.17) and pinch strength right hand improved from (3.42; SD1.64) to (5.66; SD2.5); pinch strength left hand (1.72; SD1.33) to (4.48; SD2.8).

Upper-extremity motor-score improved Post-FES from Pre-FES mean of 9.2 to 16.6 (right hand) and 8.8 to 15.8 (left hand).

Conclusions:
Although results promising, needs exercising caution due to small number. However we can conclude that FES hand therapy is feasible and safe. We can speculate that findings from a multicentre study with a larger cohort will be conclusive.
Evaluation of walking ability in spinal cord injury patients

MSc Zuzana Hlinková¹, MSc Veronika Michálková¹, Dr. Jiří Kříž²

¹University Hospital Motol, Prague 5, Czech Republic

Objective
To assess the development of muscle strength of lower extremities and gait ability during inpatient rehabilitation care about acute spinal cord injured patients at rehabilitation centres.

Patients and Methods
Thirty-eight patients after acute spinal cord injury were evaluated retrospectively in 2013-2015. Patients were treated at the spinal cord unit (SCU) and then at the rehabilitation centre. The first examination was done after the discharge from SCU (E1; 74 days from the injury on average). The second examination was done with the distance from discharge from the rehabilitation centre (E2; 288 days from the injury on average). The inclusion criterion for the study was an ability to undergo at least one of the gait tests: Timed Up and Go (TUG), 10 Meter Walk Test (10MWT) and 6 Minute Walk Test (6MWT). Lower extremity motor score (LEMS) was determined during both examinations.

Results
Mean value of LEMS in E1 was 38. In E2 it was 41. Only 74 % of patients were able to perform the walking tests in E1 completely. Mean time for TUG was 32.5s in E1, 19.5s in E2. Mean time for 10MWT test was 28s in E1, 18s in E2. Mean distance in 6MWT was 254m in E1, 338m in E2. 72 % of patients used gait as the only mode of locomotion in E2. Minimal value of LEMS in our group of patients was 22, 6MWT 95m, maximal value of TUG 28s, 10MWT 25s.

Conclusion
We tried to define parameters for prediction of regaining independent gait.
Scapular kinematics in novice able-bodied subjects during submaximal handrim wheelchair propulsion.

**Mr Michel Bekker**1,2, dr Ursina Arnet1,3, Prof. dr. Lucas van der Woude4,5, Prof. dr. DirkJan Veeger6,7

1Swiss Paraplegic Research, Nottwil, Switzerland, 2MOVE Research Institute, Amsterdam, The Netherlands, 3University of Lucerne, Department of Health Sciences, , Lucerne, Switzerland, 4Center for Human Movement Sciences, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands, 5Center for Rehabilitation, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands, 6Free University, Amsterdam, The Netherlands, 7TU Delft, Delft, The Netherlands

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

**Introduction:**

Shoulder pain and disorders affect persons with spinal cord injury (SCI) since they are dependent on the upper extremity for mobility and activities of daily living. In earlier research, shoulder pain and functional limitations have been associated with altered scapular kinematics (Kibler 2003). To investigate altered kinematics in persons with SCI over time during manual wheelchair propulsion, a baseline of normal scapular behaviour in able-bodied persons during this task will provide a helpful reference frame. The primary aim of this study is to describe scapular kinematics in able-bodied persons during steady state submaximal handrim wheelchair propulsion on a motor driven treadmill.

**Methods:**

Sixteen able-bodied novices in manual wheelchair propulsion participated. All subjects performed handrim wheelchair propulsion on a motorized treadmill during three four-minute low-intensity (0.25W/kg) practice blocks. Kinematic and kinetic data were obtained during all practice blocks. Subsequently, Euler angles of the upper body’s joints were reconstructed.

**Results:**

During the push phase of manual wheelchair propulsion the following scapulothoracic kinematics were found: average protraction was 32.7°±7.1° with a movement range of 15.6°±5.2°, medial rotation was -7.1°±9.2° with a movement range of 8.8°±7.5° and posterior tilt was 9.8°±8.3° with a movement range of 10.1°±4.6°.

**Discussion:**

The movement pattern shows good comparability to earlier studies in able-bodied and persons with SCI (Zhao 2015). These values provide a reference frame for the investigation of the scapular movement pattern in persons with SCI and for the interpretation of possible dyskinesia related to shoulder impairment.
Walking after a Traumatic Spinal Cord Injury: Retrospective Study Conducted in an Inpatient Rehabilitation Centre in Singapore

Dr Rathi Ratha Krishnan¹, Dr Kavita Venkataraman²,³

¹Tan Tock Seng Hospital, Singapore, Singapore, ²Saw Swee Hock School of Public Health, Singapore, Singapore, ³National University Hospital, Singapore, Singapore

Introduction: This study was conducted to understand the epidemiologic characteristics of patients with traumatic spinal cord injury (SCI) in Singapore, identify factors that correlate with walking on discharge and FIM motor score gain, with the ultimate intent of finding intervenable points to prevent and improve outcomes in SCI.

Methods: A retrospective records review of 122 traumatic SCI patients admitted to Tan Tock Seng Hospital (TTSH) rehabilitation centre from January 2010 to December 2013.

Results: 68.9% were tetraplegics and 27% were AIS grades A/B. Mean age was 49.6 (±19.4) years with 81.1% males. The most common cause of injury was falls on level ground (39.3%). AIS grades C/D vs A/B (OR 54, p 0.001), higher admission FIM motor scores (OR 1.069, p 0.018) and higher discharge FIM motor scores (OR 1.113, p 0.005) were significantly associated with walking on discharge. Older age (OR -0.233, p 0.041), presence of caregiver (OR -0.197, p 0.030) and delay in rehabilitation (OR -0.207, 0.043) were negatively associated with FIM motor score gains.

Conclusion: Patients with traumatic SCI were older and commonly sustained their injuries by falling on level ground, indicating a need to focus on fall prevention in the elderly. While factors correlated with walking on discharge were mostly non-modifiable, they may be used to guide clinical decisions for rehabilitation admission and intensity. Given the negative impact of delay in rehabilitation on FIM motor gain, it may be important to understand and minimize the causes of such delays, to improve functional outcomes in these patients.
Common data elements in cervical degenerative myelopathy (CODE-DCM): a protocol for an Internet-based method to establish a standardised reporting set

Mr Benjamin Davies¹, Mr Angelos Kolias¹, Dr Lindsay Tetreault², Prof Peter Hutchinson¹, Dr Michael Fehlings², Dr Mark Kotter¹

¹University Of Cambridge, Cambridge, United Kingdom, ²Toronto Western Hospital, Toronto, Canada

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Background
Degenerative cervical myelopathy [DCM] is a disabling and increasingly prevalent group of diseases. Although the field is rich in research, heterogeneous reporting of variables and use of disease nomenclature has challenged cross-study comparison and optimisation of treatment. The development of a minimum dataset and standardised index term would support DCM research in the future.

Methods/Design
This study protocol outlines the strategy to be used to develop a core reporting set for use in DCM. Using the results of a systematic review of the current reported variables, a DELPHI study will be conducted in order to inform a final consensus meeting. The final consensus meeting will be held on Facebook, to ensure easy, international representation and allow Grytic® Analytics to objectively assess discussions. This is a novel adaptation to Core Outcome processes. Consensus findings will be advertised and disseminated using a quality improvement strategy. Uptake will be reviewed at 5 years. An additional consensus meeting, involving statisticians, will advise on the method for reporting chosen variables. This protocol has been developed in adherence with Core Outcome Measures in Effectiveness Trials (COMET) Initiative and the Outcome Measures in Rheumatology (OMERACT) methodology.

Conclusions
This study aims to identify the essential data points for studies in DCM. It will employ a novel use of Facebook to allow easy, international representation at the consensus conference stage. We hope ISCOS attendees will participate in this process.
Development and Initial Validation of an Online, pan-Canadian Self-Management Program for SCI

**Dr. Dalton Wolfe¹**, Miss Lindsay Sleeth¹, Dr. Susan Jaglal², Dr. Sonya Allin², Dr. Sarah Munce², Karen Anzai⁵, Peter Athanasopoulos⁴, Dr. Gary Linassi³, Dr. Vanessa Noonan⁶, John Shepherd², Dr. Jennifer Tomasone⁷

¹Lawson Health Research Institute, London, Canada, ²University of Toronto, Toronto, Canada, ³University of Saskatchewan, Saskatoon, Canada, ⁴Spinal Cord Injury Ontario, Toronto, Canada, ⁵GF Strong Rehabilitation Centre, Vancouver, Canada, ⁶Rick Hansen Institute, Vancouver, Canada, ⁷Queens University, Kingston, Canada

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

**Introduction**

There is increasing realization that developing skills in self-management (SM) to manage one’s health is critical for persons with spinal cord injury (SCI). However, SCI-specific interventions are limited, and few incorporate theory-based approaches to facilitate and sustain behaviour change. Therefore, we sought to develop and test prototypes for enabling SM in persons with SCI, leading to the development of a pan-Canadian SM program to be tested in 2017-2018.

**Methods**

To better understand existing online SM initiatives, the group conducted an environmental scan, scoping and systematic reviews. These were validated against established frameworks; PRISMS SM taxonomy (Pearce et al., 2016), behaviour change techniques (Michie et al., 2013), evaluation of feasibility (Bowen et al., 2009). Emphasis was placed on stakeholder engagement, particularly persons with SCI to ensure the resulting program is relevant for end-users. An Advisory Committee, (n=25 researchers, clinicians, consumers, policy makers), provided feedback in meetings/focus groups. A Consumer Advisory Group comprised of 5 persons with SCI from across Canada also provided feedback on prototypes and ideas brought forward by the Design Team (n=3 persons with SCI).

**Results**

Activities resulted in 5 initial SM priority areas: bladder care, bowel care, peer support, physical activity, and pressure ulcers. Preliminary prototypes created through this iterative development process are currently being evaluated through focus groups and end-user usability testing.

**Conclusions**

Key activities over the next year will be to finalize development of the online tools and resources and establish a long-term sustainability plan, guided by partners from across the country.
Embedding the modules from www.elearnSCI.org into a Massive Open Online Course (MOOC)

Dr Joanne Glinsky\textsuperscript{1}, Professor Lisa Harvey\textsuperscript{1}
\textsuperscript{1}John Walsh Centre For Rehabilitation Research, University Of Sydney, Sydney, Australia

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: The ISCoS Education Committee aims to train healthcare professionals about spinal cord injuries (SCI), particularly in places with little SCI expertise. This poses a challenge because it is not feasible to send trainers around the world to conduct workshops. To address this, ISCoS developed an online educational resource (www.elearnsci.org). However, some individuals benefit from participating in a more structured and supported learning environment to motivate them to move through the online modules. Therefore, we embedded the physiotherapy module of www.elearnSCI.org into a Massive Open Online Course (MOOC). We trialled this concept to determine whether it could be adopted for other professions.

Methods: A free 5-week MOOC about the physiotherapy management of SCI was run in May 2016. The MOOC was based on the physiotherapy-specific module of www.elearnSCI.org. A website was constructed to house the MOOC (www.SCIMOOC.org). Participants were provided with a structured plan, directed to additional reading and participated in Facebook discussions. Participant knowledge and satisfaction with the course was quantified through a pre- and post-MOOC knowledge assessment, online course evaluation, internet usage statistics and Facebook activity.

Results: Over 5000 participants worldwide completed the MOOC. The main challenges were ensuring adequate IT support to cope with the number of participants and managing the Facebook discussions.

Conclusion: The MOOC increased knowledge about physiotherapy management of SCI. Participants enjoyed meeting colleagues from around the world through the Facebook discussions. MOOCs provide a way of exposing large numbers of healthcare professionals to www.elearnSCI.org and to training they may not otherwise receive.
Is non-response in surveys on persons with spinal cord injury a neglected topic? Results from a systematic review

Dr Christine Fekete, Dr Mirja H. Gross-Hemmi, Dr Teresa Brinkel, Dr Martin WG Brinkhof

Swiss Paraplegic Research, Nottwil, Switzerland, Department of Health Sciences and Health Policy, University of Lucerne, Lucerne, Switzerland

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Objective: To review the reporting of response rates and non-response issues in studies using survey methodology in persons with spinal cord injury (SCI).

Methods: English, German or French studies using survey methodology in persons with SCI published between 2011/01/01 and 2014/01/01 available on PubMed were included. Basic information on study and sample characteristics, recruitment procedures, sampling methods, sampling frames, response rates and the handling of non-response were extracted.

Results: From 51 included studies, 86.3% were conducted in the community setting and 80.4% used cross-sectional data. The N of the sampling frame was indicated in 63.4% of cross-sectional studies and 20.0% of longitudinal studies reported the N for the baseline sampling frame. 9.8% of cross-sectional studies provided basic demographics of the sampling frame and 12.2% compared respondents to non-respondents. From ten longitudinal studies, 30.0% indicated demographics of the follow-up sampling frame, 60.0% reported demographics of drop-outs or remaining respondents at different time-points and compared respondents to non-respondents. Response rates were reported and reproducible in 41.5% of cross-sectional studies, 10.0% of longitudinal studies reported response rates for all time points. Altogether, 11.8% of studies discussed potential non-response bias based on own analysis and 3.9% statistically corrected for non-response.

Conclusions: Response rates and non-response bias are neglected topics in SCI research using survey methodology. Improvements in reporting of response rates and non-response as well as the narrative, best statistically supported, account of non-response bias are essential steps to enhance methodological quality of survey research focusing on persons with SCI or other disabling conditions.
MULTICENTER VALIDATION STUDY ON AN ASSESSMENT SCALE OF GAIT IN WATER IN SUBJECTS WITH SPINAL CORD INJURY: preliminary results

PT Tatiana Bianconi¹,⃣ PT Barbara Bandini²,⃣ PT Federica Montanari³,⁵, Ph.D. Andrea Guazzini⁴, MD Jacopo Bonavita³, MD Adriana Cassinis¹, MD Giulio Del Popolo³

¹Niguarda Ca’ Granda Hospital, Milan, Milan, Italy, ²Careggi University Hospital, Florence, Florence, Italy, ³Montecatone Rehabilitation Institute, Imola (BO), Imola (BO), Italy, ⁴Centre for the study of complex dynamics (CSDC), University of Florence, Florence, Italy, ⃣Coordinamento Nazionale Operatori Professionali Unità Spinali (CNOPUS), Italy

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

BACKGROUND
A version of “Walking Index for Spinal Cord Injury” (WISCI II) has been developed for walking in water (“Water-WISCI”) which foresees 21 items at increasing levels of difficulty based on use of aids, orthotics and assistance required.

OBJECTIVE
To validate Water-WISCI in subjects with incomplete paraplegic or tetraplegic SCI.

METHOD
71 patients with incomplete SCI AIS C (30) and AIS D (41) with neurological level between C4 and L3 were enrolled and underwent gait evaluation both in and out of water.

Assessment of walking in water of each patient using Water-WISCI was carried out by 20 evaluators separately who viewed video footage of test subjects in water.

WISCI II was used as main reference measure for concurrent validity of Water-WISCI. Data recorded with other tests (10 Meter Walking Test, 6 Minute Walking Test, ASIA Motor-Score, SCIM III-mobility section) were also used.

RESULTS
Average correlation of evaluations obtained indicate a good reliability of $r=0.88$ (p.<0.01).

Concurrent validity appears adequately high ($r=0.86$; p.<.01) showing a common variance between the measures (i.e., Water-WISCI and WISCI II) of around 74%.

There was significant correlation between Water-WISCI and total 6 MinWT meters ($r=.69$; p.<.01), 6 MinWT steps ($r=.77$; p.<.01), SCIM III ($r=.75$; p.<.01), UEMS ($r=.28$; p.<.05), LEMS ($r=.79$; p.<.01) and ASIA MS ($r=.76$; p.<.01). Water-WISCI and WISCI II showed similar correlations with the same comparison values.

CONCLUSIONS
Results demonstrate reliability, concordance, construct validity and concurrent validity of Water-WISCI in subjects with incomplete SCI. Structure and content of the protocol have shown their effectiveness.
Spinal Cord Injury Functional Index (SCI-FI): ability to detect functional change from rehabilitation discharge to one-year post spinal cord injury

Dr Mary Slavin¹, Ms. Tamra Keeney², Dr. Pengsheng Ni³, Dr. David Tulsky², Ms. Pamela Kisala², Dr. Allen Heinemann⁴, Dr. Susan Charlifue⁵, Dr. Denise Fyffe⁶, Dr. Daniel Graves⁷, Dr. Ralph Marino⁸, Dr. David Rosenblum⁹, Dr. Denise Tate¹⁰, Dr. Lynn Worobey¹¹, Ms. Mary Dawson¹, Dr. Alan Jette¹

¹New England Regional Spinal Cord Injury Center, Boston University School of Public Health, Boston, United States, ²MGH Institute of Health Professions, Boston, United States, ³Center on Assessment Research and Translation, Department of Physical Therapy, University of Delaware, Newark, United States, ⁴Center for Rehabilitation Outcomes Research, Rehabilitation Institute of Chicago; Department of Physical Medicine and Rehabilitation, Feinberg School of Medicine, Northwestern University, Chicago, United States, ⁵The Rocky Mountain Regional Spinal Cord Injury System, Craig Hospital, Englewood, United States, ⁶Kessler Foundation, West Orange, United States, ⁷University of Louisville Medical Center, Louisville, United States, ⁸Thomas Jefferson University, Philadelphia, United States, ⁹New England Regional Spinal Cord Injury Center, Gaylord Hospital, Wallingford, United States, ¹⁰Department of Physical Medicine and Rehabilitation, University of Michigan, Ann Arbor, United States, ¹¹Department of Physical Medicine & Rehabilitation, University of Pittsburgh, Pittsburgh, United States

Introduction: We examined the ability of SCI-FI Computerized Adaptive Tests (CATs) to detect functional change in 119 adults at 9 SCI Model Systems programs (United States).

Methods: Both SCI-FI CAT versions, SCI-FI V1 [without use of assistive technology (AT)] and SCI-FI/AT [with AT], were completed at discharge from rehabilitation and 12 months post-SCI. For each domain (Basic Mobility, Self-Care, Fine Motor Function, Wheelchair Mobility, and/or Ambulation) effect size (ES) estimates and 95% confidence intervals (CIs) were calculated.

Results: Sample was 44% paraplegia, 80% male, 57% used a manual wheelchair, 38% used a power wheelchair, 34% ambulatory. ES (CI) for SCI-FI V1/SCI-FI/AT were as follows: Basic Mobility (n=119) overall ES = 0.63 (0.61-0.94)/0.57(0.42-0.74), paraplegia ES=1.09 (0.77-1.65)/0.98 (0.69-1.40), tetraplegia ES=0.45 (0.27-0.66)/0.41 (0.23-0.60); Self-Care (n=119), overall ES=0.42 (0.39-0.84)/0.42 (0.29-0.56); paraplegia ES=0.81 (0.54-1.32)/0.72 (0.50-1.12), tetraplegia ES=0.35 (0.16-0.54)/0.32 (0.15-0.52); Fine Motor Function (n=119) overall ES=0.29 (0.34-0.65)/0.24 (0.14-0.34); paraplegia ES=0.33 (0.13-0.57)/0.26 (0.08-0.45), tetraplegia ES=0.42 (0.26-0.60)/0.36 (0.19-0.54); Ambulation (n=30) overall ES=1.03 (0.53-1.48)/1.18 (0.78-1.79); paraplegia ES=1.28 (0.57-2.80)/1.55 (1.01-3.00), tetraplegia ES=0.95 (0.44-1.64)/1.00 (0.43-1.72); Wheelchair (SCI-FI/AT only) (n=84) overall ES=0.23 (0.08-0.40); paraplegia ES=0.43 (0.17-0.79), tetraplegia ES=0.15 (-0.13-0.44). All ES estimates were significant, except SCI-FI V1 Wheelchair (tetraplegia).

Conclusions: Both SCI-FI CAT versions yield similar ES estimates, which vary by domain and level of lesion: large ES for Ambulation and Basic Mobility (paraplegia); moderate ES for Self-Care; small ES for Fine Motor Function and Wheelchair. Findings support use of both SCI-FI versions in the SCI population and demonstrate the value of outcome measures that assess multiple domains. CATs will be demonstrated.
Introduction
This study intends to develop self-management items for the adherence of SCI patients to treatment by developing their self-management items to implement rehabilitation consistently, and to verify the reliability and validity of the developed items for helping SCI patients develop the ability of self-management to continue their treatment on their own through a multidisciplinary approach.

Methods
The process of developing the items was as follows: The first preliminary items were organized through a review of literature and existing tools, in-depth interviews, and expert interviews, and the items were then reorganized by a small group of expert’s discussion. The validity of the contents was verified by experts, and pilot study was performed to 15 inpatients who had spinal cord injury in the cervical or thoracic spine, and a one-on-one survey was performed.

Results
The validity of the contents were examined by organizing an expert group to verify the validity of the contents regarding the preliminary items, 34 items were derived including 8 items in the physical area, 2 items in the psychological area, 10 items in the socioeconomic area, and 14 items in the knowledge area. A pilot study was performed subjects were 15 inpatients. The value of Cronbach’s α which is the validity of this tool was 0.819.

Conclusion
The development of self-management items for SCI patients will enable appropriate therapeutic interventions for the patients by including not only the physical areas but also the psychological and socioeconomic areas that can help the patients adhere to rehabilitation.
Against the odds: extraordinary recovery from complete cauda equina syndrome following L3 fracture. Time still matters.

Dr Silvia Antiga¹, Dr Klint Asafu Adajay¹, Dr Fahim Anwar¹, Mr Pierluigi Vergara¹

¹Cambridge University Hospital, London, United Kingdom

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Aim: To highlight the current evidences in the treatment of cauda equina syndrome (CES) and the importance of early surgical intervention in CES secondary to lumbar spine fractures.

Methods: Case report and literature review.

Results: There is controversy in literature regarding the timeframe of surgical decompression of the spinal canal in CES. This case report describes a 24-year-old semi-professional golfer admitted to a Major Trauma Centre in United Kingdom with L3 fracture following a road traffic accident. A posterior fusion and decompression from L3 to L5 was performed within 12 hours from original trauma. Significant functional recovery with an improvement in the American Spinal Injury Association Impairment Scale from A to E was observed.

Conclusion: The timing of surgery following complete CES remains controversial, however even in complete CES early surgical intervention may have favourable outcome. Our case is unique in this sense as the patient presented with complete AIS A and recovered to AIS E with early decompression and stabilization of the fracture.
Blood-return, ANS, cardiovascular and pulmonary responses play an important role in facilitating complete paraplegia adapting to the neuromuscular electrically-induce walking

**Professor Humberto Cerrel Bazo**1,2, Dr Daniela Valotto1, Dr Anna Tessari1, Dr Roberto Corradini1, Dr Anna Bazzana1, Dr Andrea Calabrese1, Dr Rosetta Rampello1, Dr Querino Messina1, Dr Cristina Cadorin1, Dr Costanza Ferroni2, Dr Claudio Zanardo1, Dr Stefano Bressan1, Dr Raffaelo Ferrari1, Dr Massimo Toffano1, Dr Alessandra Pivetta1, Dr Stefano Bargellesi3, Prof Paolo Boldrini1,2,3

1Ospedale Riabilitativo di Alta Specializzazione, Motta Di Livenza, Italy, 2PM & R University of Padova, Padova, Italy, 3Physical Medicine & Rehabilitation ULSS 9 TV, Treviso, Italy

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Advances in spinal cord electrical stimulation can allow paraplegic individuals to stand and walk. We know little about the residual substrate in the SCI under which this and/or other neural or neuromuscular interfacing technologies may work. The objective of the study is to analyse the residual substrate that is require in SCI to adapt to an effort induce by an electrical neuromuscular neuromodulator device (NID) for stepping or walking.

Methods: Sample-comparison. Pilot study. 15 SCI + 5 control individuals. After a gait training program (GTP), SCI and control able-bodied (AB) were asses during a 45 min treadmill walking. O2-uptake (VO2), heart rate (HR), age-predicted HR(%HR), VE (ventilation), RR (respiratory rate), RER, O2-pulse for blood return, power requirement (PR) and physiological cost (PhysC), adrenaline, nor-adrenaline and lactic acid were evaluated.

Results: Physio R p≤.001 differences between the groups, higher for the NID-SCI group. VO2 S-S was achieved in 5-10 min lasting 15-33 minutes, longer for NID SCI. O2-Pulse in non-NID SCI group seems defective, a progressive downslope trend characterized the non-NID SCI with p≤.001 differences between the beginning and end. HR-VO2 profile correlate for the NID-SCI and not for the non-NID SCI. PR and PhysC was higher for the NID-SCI, no p<0.001 differences were found between the groups.

Conclusions: Steady-state difficult to achieve in less than 10-15 min in SCI. Muscle pump and cardiac compensatory mechanisms are important in the adapting responses. Blood-return seems influence by NID activity. Ashworth grade 2 seems favourable in NID-SCI group. Further studies are needed.
Can a novel 12-week wide pulse-width NMES resistance training intervention improve quadriceps muscle size and strength in people with SCI?

Miss Vanesa Bochkezanian¹, Professor Robert U. Newton¹, Dr Gabriel Trajano², Professor Anthony J. Blazevich¹

¹School of Medical and Health Sciences, Edith Cowan University, Joondalup, Australia, ²School of Human Movement Studies, Charles Sturt University, Bathurst, Australia

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

INTRODUCTION: Short pulse widths (100-200 μs) and low-to-moderate pulse frequencies (30-50 Hz) are commonly recommended for neuromuscular electrical stimulation (NMES) training in people with spinal cord injury (SCI), but this causes rapid muscle fatigue due to high stimulation intensities and non-physiological motor unit recruitment. Wide pulse widths (1000 μs) might optimise motor unit activation and delay fatigue, increasing muscle force and mass after training in people with SCI.

METHODS: Three individuals with SCI (subject A: T₃ SCI incomplete, wheelchair user; subject B: T₇ SCI incomplete, wheelchair user; subject C: T₁₂ incomplete, walker with one crutch) completed 12 weeks of NMES resistance training (RT) (2x30 min per week) on the right (R) and left (L) quadriceps muscles. Quadriceps femoris cross-sectional area (CSAQ) was measured with extended-field-of-view ultrasonography and isometric knee extensor torque was measured on a dynamometer.

RESULTS: CSAQ increased on average by 36.7% on R and 39.8% on L [Subject A: 55.3% (R) and 76.5% (L); Subject B: 39.9% (R) and 26.9% (L); Subject C: 15.0% (R) and 16.1% (L)]. Tetanic isometric knee extensor torque increased on average by 39.9% on R and 21.5% on L [Subject A: 19.8% (R) and 20.0% (L); Subject B: 64.0% (R) and 2.0% (L); Subject C: 35.9% (R) and 42.4% (L)].

CONCLUSIONS: The increases in muscular strength and QCSA highlight the potential of wide pulse-width NMES RT in people with SCI. Whilst further examination is required, clinicians might consider using NMES strength training to improve muscle mass and strength in people with SCI.
Combined treatment: cellular therapy and rehabilitation for chronic SCI patients. Final results phase I-II clinical trial.

Professor Gustavo Moviglia\textsuperscript{1}, Doctor Maria Teresita Moviglia, Doctor Samanta Piccone, Doctor Roberto Fernandez Viña, Doctor Gustavo Albanese\textsuperscript{2}

\textsuperscript{1}Maimonides University, Capital Federal, Argentina

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction:
In June 2013, 8 chronic and complete SCI patients started combined treatment: Cellular therapy and intensive rehabilitation looking forward to restore the spinal cord interruption. After 18 months of treatment 7/8 showed electromyography recovery in muscles, previously denervated, distant more than 2 segments below the last full preserved one. Following this results, in June 2015, according to Simon’s two step design, 6 more patients with the same conditions were added to the trial.

Methods:
Trial approvals, rehabilitation and cellular therapy were reported in ISCoS 2015. In June 2013, 8 Chronic ASIA A/Frankel A SCI patients (5 paraplegics and 3 quadriplegics) were accepted for the trial. Before starting treatment and every 6 months, electromyography of denervated muscles was performed. In June 2015 the same protocol was repeated on other 6 Chronic ASIA A/Frankel A SCI patients (2 quadriplegics and 4 paraplegics).

Results
Electromyography recovery was observed in muscles previously denervated distant more than 2 segments below the last full preserved spinal segment on 7/8 patients from the first group and on 4/6 patients from the second group. These changes started after 18 months in the first group and after 10 months in the second group. Together with the electrophysiological changes, patients from both groups showed functional recovery. According to NIH-USA scale, no severe adverse events associated with the treatment were observed.

Conclusions
Combined therapy applied to chronic and complete SCI patients is safe. Electrophysiological changes are objectives results to prove the efficacy of the treatment.
Early rapid neurological assessment for acute spinal cord injury trials

Dr Camila Battistuzzo, A/Prof Karen Smith, Ms Peta Skeers, Dr Alex Armstrong, Dr Jillian Clark, Jacqui Agostinello, Dr Shelley Cox, Prof Stephen Bernard, Prof Brian Freeman, Prof Sarah Dunlop, Dr Peter Batchelor

The University Of Melbourne, Department of Medicine (Royal Melbourne Hospital), Melbourne, Australia, Department of Epidemiology and Preventive Medicine, Monash University and Ambulance Victoria, Melbourne, Australia, The University of Western Australia, School of Animal Biology, Perth, Australia, The University of Adelaide, Centre for Orthopaedic and Trauma Research, Adelaide, Australia

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Clinical trials evaluating early therapies after SCI are challenging because of the absence of a rapid assessment. The aim of this study was to determine whether the severity and level of SCI could be established from a brief neurological assessment.

Methods: The SPinal Emergency Evaluation of Deficits (SPEED) was developed and retrospectively evaluated in 118 patients with SCI (AIS A-D). Foot motor and sensory function was used to indicate injury severity. C3 dermatome sensation, handgrip strength and location of spinal pain were used to indicate the level injury.

Results: With regards to injury severity, a high proportion of patients (94%) with no foot movement at the time of injury were initially motor complete (AIS A-B), while all patients with foot movement were motor incomplete (AIS C-D). This was reflected by a good correlation (rs = 0.79) and agreement (Kappa = 0.85) between the SPEED motor score and the acute hospital assessment. With respect to injury level, the majority of cases with cervical SCI (92%) had no or weak handgrip at the time of paramedic assessment, while all cases with thoracolumbar SCI had strong handgrip. The location of spinal pain was also in accordance with the level of spinal injury.

Conclusions: The SPEED assessment appears capable of accurately determining the severity and level of cervical SCI in the first hours post-injury. A neurological assessment that can be performed rapidly after injury is important for clinical trials of early therapy and to identify patients most likely to benefit from intervention.
Functional recovery for C6 traumatic tetraplegia after completing the rehabilitation phase at centre for the rehabilitation of the paralysed, Bangladesh.

Miss Anteena Aziz

Introduction: The purpose of the study has done to assess the functional outcomes of the patients with a complete C6 spinal cord injury after completing the Rehabilitation phase at CRP. The aim of the study is to evaluate the performance of Activities of daily living (ADL) achievement through the rehabilitation phase at CRP after being diagnosed with complete C6 SCI.

Methods: The study was a non experimental, survey using quantitative methods to explore patients’ functional outcome prospect. So, all the C6 SCI patients who have completed institutional rehabilitation at CRP stayed at the hostel before leaving CRP who have gone back home have been taken as the samples for the study. The sampling was purposive. 38 complete C6 Traumatic Tetraplegic patients were interviewed at their home during their home visit. Data was collected using functional measurement scale which was ordinal type. And for the measurement of functional ability, the score was used by the FIM (Functional Independent Measure). For the analysis of data descriptive statistic was used.

Result: Average functional was 4.86 and it was between the score 5 and 4.

Conclusion: Bangladeshi people carry loads on their heads and they also climb trees very often, and in this country safety measures are very poor during work. Most of them play a vital role to their family. After injury off course they lose some extent of functional ability but it is very important to find out how function will return to the C6 neurological SCI patients.
Graphene oxide scaffolds as promising substrates for advanced neuroregenerative therapies in spinal cord injury

Dr Elisa López-Dolado¹, Mr Ankor González-Mayorga¹, Dr Maria Concepcion Gutiérrez², Professor Maria Teresa Portolés³, Dr Maria Concepcion Serrano¹

¹Hospital Nacional de Parapléjicos, Servicio de Salud de Castilla-La Mancha, 45071-Toledo, Spain, ²Instituto de Ciencia de Materiales de Madrid, Consejo Superior de Investigaciones Científicas, 28049-Madrid, Spain, ³Biochemistry and Molecular Department I, Universidad Complutense de Madrid, IdISSC, 28040-Madrid, Spain

INTRODUCTION: The dramatic change in quality of life and life expectancy of SCI patients and the high sanitary costs associated are encouraging experts to explore new avenues for neural repair. Graphene-derived materials show promise for neural regeneration, even though their toxicity is still an open debate. In this study, we focus on the exploration of the chronic tissue responses induced by 3D scaffolds of graphene oxide (rGO) implanted into the SCI.

METHODS: Scaffolds were fabricated as previously described. Lesions consisted on a right hemisection at C6 on adult male Wistar rats. Treatment groups were: control (n = 3), injury (n = 8) and injury + scaffold (n = 8). Histological and immunofluorescence studies were carried out at 30 days to detect fibrotic, inflammatory, angiogenic and regenerative responses. The interface between rGO scaffolds and injured spinal cord was analysed by transmission electron microscopy.

RESULTS AND DISCUSSION: Injured animals without scaffolds showed more cavities and poorly structured lesion zones, thus demonstrating a significant role played by the scaffold in injury stabilization and sealing. Collagen fibres were evident around and inside the rGO scaffold. Most cells infiltrating the scaffolds were positive for vimentin and PDGFRb. Abundant new blood vessels were invading scaffold inner parts, with some new axons in their proximities. Macrophages were mainly at the interface, showing both M1 and M2 phenotypes. Ultrastructural studies demonstrated close contact of cells with rGO sheets and no signs of cell damage.

CONCLUSIONS: 3D rGO scaffolds show potential utility in SCI repair and encourage further investigation.
Observational study assessing neurological outcome following closed traction reduction in 42 patients with cervical spinal injury

Mr Balraj(Raj) Singhal

Burwood Spinal Unit, Christchurch, New Zealand

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Various groups have put forward recommendations on the optimum time interval between injury and cord decompression in cervical spinal injury: the aim of this study was to produce a retrospective case series, examining patients treated with a new spinal traction-reduction device developed in Burwood Spinal unit, to determine an optimum injury-reduction interval, producing the best neurological outcomes for patients. In this retrospective study includes patients with acute fracture-dislocation of the Cervical spine from 2008-2014, data were collected from patient charts and online databases, for 42 patients ranging in age from 14 to 91 years, and a follow-up period coinciding with discharge from the spinal unit, averaging 76 days (range 4 to 315 days).

36 patients were treated for cervical fracture-dislocation injuries, while four had experienced C2/3 hangman’s fractures, and two had C2 peg fractures. The median injury-reduction time interval in the 19 AIS-classified patients was 9.3 hours, and the estimated optimum injury-reduction interval in the full study population, resulting in a greater likelihood of reaching AIS grade E by the end of rehabilitation, was 13.5 hours. Of the 10 most severely impaired patients (AIS grade A), four (40%) improved to AIS B or better by discharge.

This paper highlights the need for rapid reduction of these injuries. The maximum gains occurred in patients who were reduced within the first 4-8 hours. This study also showed maximum FIM gains in the patients who were reduced in the first 4 hours.
pQCT derived bone indicator discriminates between AIS grades among individuals with chronic SCI

Dr Tomas Cervinka, Dr. Lora Giangregorio, Dr. B. Catharine Craven
1 Neural and Therapeutics Team, University Health Network-Toronto Rehabilitation Institute, Toronto, Canada, 2 Brain and Spinal Cord Rehabilitation Program, University Health Network-Toronto Rehabilitation Institute, Toronto, Canada, 3 Division of Physiatry, Department of Medicine, University of Toronto, Toronto, Canada, 4 Department of Kinesiology, University of Waterloo, Waterloo, Canada

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

In 2010, Rittweger et al. reported that the total bone mineral content (BMC) yielded by peripheral quantitative computed tomography (pQCT) at the tibia mid-shaft and above the malleolus were altered with neurologic impairment. We hypothesize that this ratio, the “Capozza index” may discriminate between ASIA Impairment Scale (AIS) grades among individuals with spinal cord injury (SCI).

We performed secondary analyses of pQCT baseline data from two SCI cohorts (N = 90, age 24-77 yrs., C2-T12, AIS A-D, duration of injury ≥ 2 yrs.) and (N = 77, age 21-80 yrs., C2-L4, AIS A-D, duration of injury ≥ 1 yr.). pQCT images of the proximal and distal tibia (38% and 4% sites) were available for 109/167 participants of whom 32 had complete paraplegia, 29 incomplete paraplegia, 24 complete tetraplegia and 24 incomplete tetraplegia. To determine BMC, scans were analyzed using the Stratec software (Contour mode 2 – threshold 169 mg/cm3). Descriptive statistics, including the mean and 95% confidence intervals (95%CI) of the Capozza index in individuals with SCI and AIS (A-D) subgroups were calculated.

The BMC ratio or Capozza index differs between AIS grades D (0.84 ± 0.10), C (0.65 ± 0.09) and A+B (0.54 ± 0.03). However, the index did not distinguish between AIS grades A (0.53 ± 0.02) and B (0.55 ± 0.05). The Capozza index holds promise for explaining the severity of bone deterioration attributable to AIS subgroups, thereby advancing our understanding of the heterogeneity of neuromuscular impairment post SCI.
Reactive EMG responses following an unexpected slip perturbation in individuals with incomplete spinal cord injury

Mr Tarun Arora¹, Dr. Joel Lanovaz², Dr. Kristin Musselman¹,³,⁴,⁵, Dr. Alison Oates²

¹School of Physical Therapy, College of Medicine, University of Saskatchewan, Saskatoon, Canada, ²College of Kinesiology, University of Saskatchewan, Saskatoon, Canada, ³Department of Neuroscience, University of Toronto, Toronto, Canada, ⁴Toronto Rehabilitation Institute - University Health Network, Toronto, Canada, ⁵Department of Physical Therapy, Faculty of Medicine, University of Toronto, Toronto, Canada

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction
Reactive balance control is important for fall prevention. Reactive responses to a perturbation are dependent on sensory detection which may be impaired after incomplete spinal cord injuries (iSCI). Electromyography (EMG) can provide insight into muscle activation components of reactive balance control. This study examined the changes in EMG following an unexpected slip during walking in individuals with iSCI compared to able-bodied (AB) individuals.

Methods
Participants with iSCI, and age and gender matched AB individuals walked on a 10 m walkway with an embedded roller-based slip device placed mid-path. Surface EMG was obtained bilaterally from Tibialis Anterior (TA), Soleus (Sol), and Gluteus Medius (GM) for ≥5 normal walking trials (NT) when the rollers were locked, and one unexpected slip trial (ST) when the rollers were unlocked to provide a slip perturbation. EMG was integrated (iEMG) 50 to 250 ms after heel contact on the force plate. Data were compared between conditions (NT/ST) and groups (SCI/AB).

Results
Data were recorded from 14 (12 male) iSCI (C2-L4, AIS-D), and 11 (9 male) AB individuals. A main effect for condition (p<.001) was found for iEMG: There was significantly more activity for the ST condition in the lead (p<.001) and trail (p<.001) TA, and the trail GM (p=.001). There was no main effect for group.

Conclusion
Individuals with high functioning iSCI (WISCI II ≥18) experience an increase in lower extremity muscle activity in response to a slip perturbation and the magnitude of the increase is similar to that seen in AB individuals.
The role of post-operative physiotherapy in Degenerative Cervical Myelopathy: a systematic review

Mr Abdul Badran, Mr Benjamin Davies, Dr Sukhvinder Kalsi-Ryan, Dr Mark Kotter

University Of Cambridge, Cambridge, United Kingdom, Toronto Western Hospital, Toronto, Canada

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Study design: Systematic review
Background: Degenerative Cervical Myelopathy (DCM) is the commonest cause of spinal cord dysfunction worldwide and treatment is largely limited to surgery. Physiotherapy is often provided as part of post-operative rehabilitation, however the evidence for this is unclear.
Objective: To conduct a systematic review highlighting all available evidence for or against the use of post-operative physiotherapy for DCM available in peer reviewed research, to assess efficacy for improving clinical outcome and recovery.
Methods: A systematic search was conducted in MEDLINE, EMBASE, CENTRAL, PEDro and Clinicaltrials.gov from their origin up to 1st May 2016. All clinical trials and systematic reviews investigating the use of physiotherapy as an intervention after surgical treatment of Degenerative Cervical Myelopathy to determine its effect on clinical outcome and recovery were included. Articles not written in English were excluded.
Results: 263 studies were identified through tailored systematic searches, after removing duplicates. After screening, only one record investigated post-operative rehabilitation using physiotherapy for DCM, however this was retrospective with no controls. This suggested that rehabilitation including physiotherapy improved post-operative recovery. There are no registered clinical trials on clinicaltrials.gov currently investigating the use of post operative physiotherapy in DCM.
Conclusion: The literature provides insufficient evidence to make any recommendation regarding the use of post-operative physiotherapy in DCM. However, it is a common standard of care to provide physiotherapy treatment as a post-operative intervention to optimize cervical strength, mobility and function. There is a need to build the evidence for post-operative rehabilitation related to DCM.
When is a spinal cord injury (SCI) complete!?

M. Christian Schuld1, Dr. Steffen Franz1, Dr. Norbert Weidner1, EMSCI Study Group2, Dr. Fin Biering-Sørensen3,4

1Heidelberg University Hospital, Spinal Cord Injury Center, Heidelberg, Deutschland, 2European Multicenter Study about Spinal Cord Injury, , , 3University of Copenhagen, Copenhagen, Denmark, 4Rigshospitalet, University of Copenhagen, Clinic for Spinal Cord Injuries, Neuroscience Centre, Copenhagen, Denmark

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction:
To address the controversy regarding the current definition of completeness of a SCI as being determined by absence of sacral sparing according to the International Standard for Neurological Classification of SCI (ISNCSCI).

Methods:
1330 ISNCSCI datasets of 665 individuals with SCI from the European Multicenter Study about SCI (EMSCI) database were eligible (age >= 16, 2 ISNCSCI examinations <= 30 days and 1 year after traumatic SCI). ISNCSCI datasets were reclassified by the EMSCI-ISNCSCI calculator using two different algorithms: the current definition of completeness based on the absence of sacral sparing (SACRAL), and a definition depending on no sensory or motor function caudal to 3 levels (3LEVELS) below the respective ipsilateral sensory or motor level without consideration of deep anal pressure or voluntary anal contraction.

Results: The initial AIS distributions of the SACRAL and 3LEVELS cohort are: A=46%/29%, B=11%/25%, C=18%/19% and D=25%/27%. More AIS B lesions at the expense of AIS A are found for 3LEVELS. The prognostic values of the initial AIS grades for the most frequent 1 year AIS progressions are: A to A (SACRAL 73%, 3LEVEL 63%), C to D (79% versus 68%) and D to D (94% versus 82%). The B to B progression is more often observed using the 3LEVELS definition (21% versus 45%).

Conclusions:
While the SACRAL definition may have a slightly better prognostic value, the 3LEVELS definition may have better face-validity and a more intuitive sense. A more detailed analysis is necessary to verify intuitiveness and prognostic properties of 3LEVELS.
Central Pain Syndrome after the surgery of the Cervical Spondylotic Myelopathy

Dr Hidenori Suzuki1, Dr. Tsukasa Kanchiku1, Dr Norihiro Nishida1, Prof Toshihiko Taguchi1

1Department Of Orthopedics Surgery, Yamaguchi Univ., Graduate School Of Medicine, Ube city, , Japan

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

INTRODUCTION: Central Pain Syndrome is a chronic neuropathic pain disorder caused by damage to the central nervous system. We investigated the survey on actual situation in the patients with Central Pain Syndrome after cervical spine surgery.

METHODS; A questionnaire survey of 151 people after CSM (Cervical Spondylotic Myelopathy) surgery was performed to determine the prevalence and severity of the Central Pain Syndrome at 7-127 months following CSM op. We also obtained information regarding neurological deficit, mood, global self-rated health and the impact of pain on function using SF-36, JOA Cervical Myelopathy Evaluation Questionnaire (JOACMEQ) and the Neuropathic Pain Symptom Inventory (NPSI, 2004; D. Bouhassira).

RESULTS; Average score of NPSI was 16.4 points. When we defined that the patients with over 10 points had neuropathic pain, 39 of the 78 subjects (50%) reported the presence of neuropathic pain. All scores in JOACMEQ and physical functioning (SF-36) of Group B (patients with neuropathic pain) were lower than Group A (without neuropathic pain) (p<0.05).

DISCUSSION/ CONCLUSION: Chronic pain is a major problem for people after CSM surgery. This study provides interesting information that half of the patients after surgery had chronic pain or numbness describing the pain as severe or excruciating. In addition OQL and ADL of the patients with Central Pain Syndrome were impaired severity. In summary, this study demonstrates that chronic pain have a negative influence on mood and lifestyle in patients following CSM surgery.
Difficulties in managing pain syndrome post spinal cord injury - a case report.

Dr Christina-anastasia Rapidi\textsuperscript{1}, Dr Evgenios Diamantidis\textsuperscript{2}, Dr Athina-Maria Nella\textsuperscript{1}, Dr Antonios Kontaxakis\textsuperscript{1}, Dr Elias Karagiannakis\textsuperscript{1}, Dr Sofia Fotaki\textsuperscript{1}, Dr Dimitra Kagiouli\textsuperscript{1}, Dr Avgerinos Bader\textsuperscript{1}

\textsuperscript{1}General Hospital of Athens "G. Gennimatas", Athens, Greece

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

AIM: The presentation of the need for long term management and multidisciplinary approach of patient with pain syndrome post SCI.

MATERIAL-METHOD: A 65 year old woman, presenting left hemiparesis and neck pain for 12 months, was diagnosed with a cervical spinal cord tumor (ependymoma C3-C4), which was treated surgically. After 11 months of inpatient rehabilitation she was discharged with C4 tetraplegia AIS C, motor score 16/100, sensory score 112/224, total SCIM Score 24. She has ever since regular follow-up (every 3-6 months) for a total of 6 years for pain syndrome (PS) and spasticity. a) ISCI pain Basic Data set - Version 2.0, b) Quality of Life SF36 questionnaire, c) ISCI Quality of life Basic Data set, d) mAsworth scale were used.

Results: PS of musculoskeletal type in both her shoulders and neck, and neuropathic type in her right shin and adductors’ spasticity were managed. Different therapeutic approaches were used: physical therapy, acupuncture, antiepileptics, antispastics, antidepressants, bottulinum toxin, NSAIDs and opioids. She has been managed by the rehabilitation team and apart from the PRM specialist, neurologist, anaesthesiologist and psychiatrist.

The therapeutic outcomes have been sufficient considering spasticity, but poor or with short duration for PS. The chronic PS affects the quality of life with fluctuations according the QOL SF36 and ISCI QOL, while her clinical assessment and cervical spinal cord imaging does not show deterioration.

CONCLUSION: Pain syndrome after SCI is a diagnostic and therapeutic challenge; it requires long term follow-up and continuous interventions.
Distinct spinal and supraspinal pain modulation after spinal cord injury

Dr Catherine R Jutzeler1,2, MSc Marina Freitag2, Prof Armin Curt1, Dr. John LK Kramer1,3

1ICORD, University Of British Columbia, Vancouver, Canada, 2Spinal Cord Injury Center Balgrist, Zurich, Switzerland, 3School of Kinesiology, University of British Columbia, Vancouver, Canada

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Accompanying neuropathic pain (NP) symptoms at and below the level of spinal cord injury (SCI), studies adopting quantitative sensory testing have reported evidence of altered sensation in otherwise intact dermatomes. While above level changes have been postulated as a function of chronic activation of descending inhibitory control pathways responding to the presence of neuropathic pain (i.e., conditioning stimulus), few studies have explicitly examined endogenous pain modulation. The present study aimed to address endogenous pain modulation in individuals with SCI. In a crossover-designed study, 34 individuals with SCI (19 with NP) and 15 healthy individuals underwent two experimental sessions. Topical capsaicin (0.075%) was applied for 30 minutes on the left hand in the C6 dermatome followed by 10 minutes of either homotopic or heterotopic transcutaneous electrical nerve stimulation (100Hz, TENS). Thermal and electrical thresholds, rating of perception to capsaicin and to contact heat pulses stimuli were assessed before, after 30 minutes of capsaicin application (pre-TENS), and post-TENS. In individuals with SCI and NP, behavioral responses to capsaicin and contact heat pulses were significantly lower compared to pain-free individuals (i.e., SCI and healthy controls). Individuals with SCI and NP were unable to modulate perception to capsaicin and contact heat stimulation in response to heterotopic TENS. The extent of modulation achieved through heterotopic TENS correlated with the intensity of ongoing NP symptoms. The presence of NP after SCI was associated with effective spinal pain modulation (i.e., homotopic TENS) to noxious stimuli above the level of injury, while supraspinal pain modulation was effectively reduced.
Home based neurofeedback treatment of central neuropathic pain: feasibility study

Mr Manaf Kadum Husein Al-Taleb¹,², Dr Mariel Purcell³, Mr Matthew Fraser², Dr Aleksandra Vuckovic¹
¹University of Glasgow, Glasgow, United Kingdom, ²Queen Elizabeth National Spinal Injuries Unit, Glasgow, United Kingdom, ³Wasit University, Wasit, Iraw

Background: Central neuropathic pain (CNP) is a common secondary consequence of spinal cord injury. Neuromodulatory treatments, such as neurofeedback or stimulation with magnetic and electrical filed can reduce pain but require costly equipment and trained personnel. Previously, we demonstrated that with the aid of a visual feedback people can be trained to voluntary modulate their brain activity recorded by electroencephalography (EEG), thereby reducing the intensity of CNP (Hassan et al, 2015 BMC Neurology, 15:200).

Methods: We developed neurofeedback software for a portable inexpensive neurofeedback system which consists of a wireless wearable EEG device (Emotiv, EPOCH, USA) and a tablet computer. It has two neurofeedback games, an electronic pain diary and a screen for setting training parameters. All system parameters can be accessed by technical support via Internet and patient can be reached via Skype.

Results: One patient (age 60, L3-4 incomplete, 9 years post-injury) with pain in buttocks and legs, manifested as freezing sensation, has been using the system for two months at his home, every 2-3 days for 30 min, in addition to medications. He reported more than 30% reduction of pain (on a visual numerical scale), improved sleep and reduced spasm in his feet. Training consisted of increasing EEG alpha (9-12 Hz) and decreasing theta (4-8 Hz) and beta (20-30 Hz) band power over electrode location C4.

Conclusions: This study demonstrates the feasibility of patient managed home based therapy, larger number of patients will be recruited in the near future.
The relationship with pain, function, complication, age and ADL for spinal cord injury patients from JARM Data Base

Dr Naohisa Kikuchi, Dr Koudai Asano, Dr Hidetaka Wakabayashi

Yokohama City University Medical Center, Yokohama, Japan

Objective: Recently chronic pain in the spinal cord injury patients has become a big problem. Pain causes QOL deterioration in these patients, sometimes it decrease opportunity of outside activities. And most of pain in these patients is intractable. Our association has the database for spinal cord injury patients in all areas of Japan. In this presentation, we tried to research of relationship with pain, injury level, ASIA impairment scale, complication and ADL for spinal cord injury patients from this database.

Methods: The data were collected from the Japanese Association of Rehabilitation Medicine Rehabilitation Database (JARM DB). The base data were collected from 3,453 spinal cord injury patients, then we extracted cases with deficit data (n=186). Mean age was 50.1±18.7 years old. The items for statistics were injury level, ASIA impairment scale, complication, spasticity, FIM total and each scale. We mainly used logistic regression analysis as multivariate statistics analysis.

Results: The statistically significant items (P<0.01) were age, spasticity, autonomic over reflection, paralytic ileus, bladder Incontinence, There were no significant correlation with pain and injury level, ASIA impairment scale, FIM total and each items. From this analysis, pain may correlate old age and autonomic nerve injury.

Conclusion: We showed relationship with pain and other factors in spinal cord injury patients from JARM DB. Age and autonomic factors may correlate pain. From these results, proper physical medicine, rehabilitation, and autonomic reactive drugs might be effective for intractable pain in spinal cord injury patients.
PTSD symptomatology in pediatric-onset spinal cord injury and its relation to injury event

Ms Noel Slesinger, Dr. Kathy Zebracki, Ms Virginia Terwilliger, Ms Jennifer Gowins, Dr. Lawrence Vogel

1 Northwestern University, Feinberg School Of Medicine, Chicago, United States, 2 Shriners Hospitals for Children, Chicago, Oak Park, United States, 3 Rush Medical College, Chicago, United States

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Literature concerning posttraumatic stress disorder (PTSD) and pediatric spinal cord injury (SCI) focuses primarily on risks for developing symptoms related to the injury. However, individuals with SCI may experience PTSD unrelated to the injury.

Methods: To compare PTSD Checklist-Civilian (PCL-C) scores for 2 groups with pediatric-onset SCI: 1) an SCI-Related Group who indicated their most significant stressor was related to their SCI (n= 52, C2-L3 LOI) and 2) SCI-Unrelated Group who indicated this stressor was unrelated to their SCI (n=27, C3-L2 LOI). Spearman’s rho and multiple regression analysis were used to explore relationships between coping mechanisms (Brief COPE), PCL-C, anxiety (Beck Anxiety Inventory), and depressive symptoms (PHQ-9).

Results: The SCI-Unrelated Group had significantly higher PCL-C scores (median= 8.0) than the SCI-Related Group (median= 6.0, U= 437.0, p<.05). For the SCI-Unrelated Group, PCL-C scores were correlated with greater anxiety (rs=.585, p=.001) and depressive (rs=.383, p<.05) symptoms, while the SCI-Related Group had a weaker correlation with BAI scores (rs=.397, p<.05) and Emotional Support subscale of the COPE (rs=.324, p<.019). BAI scores alone predicted PCL-C scores for the SCI-Unrelated Group, while BAI scores and negative coping mechanisms (substance use and behavioral disengagement) together predicted higher PCL-C scores for the SCI-Related Group.

Conclusions: The SCI-Related Group reported less PTSD symptomatology, which may be a result of receiving psychological treatment and more emotional support to cope with stress related to SCI. Therefore, to maximize positive outcomes, monitoring possible psychopathology unrelated to the experience of SCI after injury is recommended.
Scoliosis in paediatric onset spinal cord injuries

Dr Richa Kulshrestha¹, Mr Naveen Kumar¹, Mr Jan Kuiper¹, Mr Joy Chowdhury¹, Professor Wagih El Masri², Mr Aheed Osman¹
¹Robert Jones and Agnes Hunt Orthopaedic Hospital NHS Trust, Oswestry, United Kingdom, ²Keele University, Stoke-on-Trent, UK

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction
Children and adolescents with spinal cord injury (SCI) are at risk for developing scoliosis. Reported incidence is as high as 96% in preadolescent and very young age. We performed retrospective review of evolution of scoliosis and compared between traumatic and non-traumatic group.

Method
Retrospective longitudinal review of case notes was performed for patients injured at or less than 18 years of age. Current spinal alignment was compared with two previous time periods, at time of discharge and 10 years post injury.

Results
Of 69 individuals (47 males, 22 females), median age at injury was 17 years (range 0y–18y). 74%(51/69) had traumatic injuries. At discharge, 13%(8/60) of patients had scoliosis. At 10 years post injury 17%(8/48) patients in traumatic group had developed a new scoliosis and 4 of them were surgically repaired. In addition, 45%(5/11) of non-traumatic patients had developed a new scoliosis. The risk of a new scoliosis was higher for younger patients (OR=0.83 per year, 95% CI 0.71-0.94, p=0.005, logistic regression) and for non-traumatic patients (p=0.03, Chi-squared test). However, non-traumatic patients were on average also younger; a multivariable analysis based on age and trauma showed that younger age did (p=0.03) but being non-traumatic did not (p=0.72) increase the risk. An ROC-analysis found that an age of 14.5 year was optimal threshold to identify patients at risk of developing scoliosis.

Conclusion
Our analysis compares the traumatic and non traumatic paediatric SCI behave similarly and younger age <14.5 years is a risk factor for scoliosis in both groups.
Alteration of gene expression profiling in mice with spinal cord injuries by exposure to an enriched environment

Dr Jeehyun Yoo1,2, Dr Sung-Rae Cho3, Dr Ji Cheol Shin3, Ms Ahreum Baek3,4

1Department of Rehabilitation, Ilsanpaik Hospital, Inje University College of Medicine, Gyeonggi, South Korea, 2Department of Medicine, The Graduate School, Yonsei University, Seoul, South Korea, 3Department and Research Institute of Rehabilitation Medicine, Yonsei University College of Medicine, Seoul, South Korea, 4Department of Rehabilitation Medicine, Yonsei University Wonju College of Medicine, , South Korea

Introduction
An enriched environment (EE) provides greater possibilities for physical, cognitive and social stimulation and an EE exposure leads to various plastic responses. The aim of this study is to identify cell-specific expression changes after exposure to an EE using transcriptome analysis in spinal cord injury (SCI) models.

Methods: We applied transcriptome analysis to characterize global gene expression after SCI under different conditions (EE and standard cage (SC)) and different time points (3 hours and 2 weeks after injury). Also, transcriptome analysis of sham (laminectomy) group was done. Differentially expressed genes (DEGs), the result of transcriptome analysis, was then analyzed by a program Database of Annotation Visualization and Integrated Discovery.

Results: Comparing SCI with sham group at 3 hours, total 283 DEGs were screened out, 148 up-regulated genes and 135 down-regulated genes. Comparing SCI-EE with sham-EE at 2 weeks after injury, total 442 DEGs were screened out, 380 up-regulated genes and 62 down-regulated genes. Blood coagulation pathway, response to wounding, inflammatory response, defense response, and immune response were significantly altered in SCI group. Comparing SCI-EE to SCI-SC at 2 weeks after injury, total 93 DEGs were screened out, 31 up-regulated genes and 62 down-regulated genes, and defense response and immune response were significantly altered in SCI-EE group. In particular, ECM-receptor pathway and cell adhesion molecules pathway were significantly altered in EE group.

Conclusion: In this study, we have described global gene profiling under different conditions and time points. These results provide data resources for a better understanding of the SCI.
Biomarkers for acute spinal cord injury in rats; a proteomic research

Dr Mitsutoshi Ota1, Dr Takeo Furuya1, Dr Satoshi Maki1, Dr Yasushi Iijima1, Dr Junya Saito1, Prof Masashi Yamazaki2, Dr Masao Koda1

1Chiba University, Chiba, Japan, 2Tsukuba University, Tsukuba, Japan

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction
Definitive treatment for spinal cord injury (SCI) does not exist. To prevent the expansion of secondary injury, early intervention is desired. One of the factors that makes it difficult is the evaluation. There is a need for tools that can determine the severity of acute SCI. Comprehensive analysis by proteomics is the mainstream of biomarker discovery. We conducted the research in the CSF and blood of the rat SCI model.

Materials and Methods
One hundred and forty Sprague-Dawley rat 8-10 weeks of age were subjected to laminectomy at T9 level. We created four models; Sham without the addition of damage to the spinal cord, mild which add damage in 100kdyn, moderate which add damage in 200kdyn, severe which add damage in 300kdyn using the Infinite Horizon Impactor. The CSF and plasma samples were collected 6hr and 24hr after injury. Protein identification and quantification was done by LC-ESI-MS/MS (liquid chromatography-electrospray ionization-tandem mass spectrometry). Candidate proteins were validated by ELISA (Enzyme-linked immune sorbent assay).

Results
In total, 375 proteins were identified using proteomic analysis. Among these, 75 proteins showed the concentration of more than 2-fold compared to control samples taken from the sham group. Validation by ELISA revealed that Excitatory Amino Acid Transporter1 (EAAT1) and Myelin associated glycoprotein (MAG) are expected to be potential biomarkers for acute SCI.

Conclusion
In total, 375 proteins were identified by LC-ESI-MS/MS. MAG is expected to be a potential blood biomarker.
Significance of HLA matching in allogeneic human iPS cell-derived neural stem/progenitor cells transplantation therapy for spinal cord injury

Dr Masahiro Ozaki, Dr Akio Iwanami, Dr Jun Kohyama, Dr Narihito Nagoshi, Professor Morio Matsumoto, Professor Hideyuki Okano, Professor Masaya Nakamura

Department of Orthopaedic Surgery, Keio University School of Medicine, Tokyo, Japan, Department of Physiology, Keio University School of Medicine, Tokyo, Japan

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Background
Aiming at a first-in-human trial of human iPS cell-derived neural stem/progenitor cells (hiPSC-NS/PCs) transplantation for spinal cord injury, it would be realistic to use allogeneic human leukocyte antigen (HLA)-matched hiPSC-NS/PCs from the viewpoint of quality control and cost performance. The purpose of this study is to determine the clinical significance of HLA matching on post-transplant immunoreaction using mixed lymphocyte reaction (MLR).

Materials and Methods
Peripheral blood mononuclear cells (PBMCs) from volunteers were co-cultured with irradiated hiPSC-NS/PCs from a HLA-A, -B, -DRB1 loci homozygous donor. The proliferative activities of PBMCs were quantitatively measured by incorporation of 3H-thymidine represented as counts per minute (CPM). HLA genotyping of their PBMCs was performed prior to mixed culture. Stimulation index (SI) was calculated as the CPM in each MLR divided by the CPM in unstimulated PBMCs. Cut off value for immune rejection was defined as SI = 2. The expression of immune-related surface antigens on hiPSC-NS/PCs was analyzed using flow cytometry.

Results
Allogeneic HLA-matched response was equivalently low as HLA-mismatched response (SI < 2). Furthermore, autologous response was also similar to allogeneic response. hiPSC-NS/PCs expressed low percentage of HLA class II and co-stimulatory molecules, even in the presence of IFN-γ or TNF-α which were administrated to mimic an inflammatory environment at the injured spinal cord.

Conclusions
Immunological examination revealed no significant differences in immune response between HLA-matched and -mismatched group, which could be due to low antigen presenting function of hiPSC-NS/PCs.
Testing the Robustness of “Promising” Neuro-Protective Drug Candidates in a Cervical Hemi-Contusion Model in Rats.

Professor Wolfram Tetzlaff1, Dr. Ward Plunet1, Nicole Janzen1, Dr. Jie Liu1, Ms Adrienne Behrens1, Ms Elizabeth Raffaele1, Mr Yuan Jiang1, Ms Peggy Assinck1, Dr. Behnia Lashkari1, Dr. Jason Cheung1, Dr. Wenchun Wang1, Dr. Hui Jiang1, Dr. Lowell McPhail1

1University Of British Columbia - ICORD (International Collaboration on Repair Discoveries), Vancouver, Canada

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

A significant number of FDA approved drugs have demonstrated efficacy in preclinical spinal cord injury (SCI). However, most of these studies used thoracic models of contusion, yet less than 5% of human SCI are incomplete thoracic injuries. Most human injuries occur at cervical levels (>65%) and half of these are incomplete. This group should benefit the most from neuroprotective treatments. Many preclinical studies are underpowered, use very short (often <1 hour) intervention time window, and are subject to experimenter biases or conflict of interest, which significantly reduces their value as predictors of success in a human trial. We therefore created a team of research staff to assess the effects on functional recovery of the most promising FDA approved drugs when these are administered 3 hours after a cervical spinal cord hemi-contusion injury using group sizes of n=14-20 adult male Sprague Dawley rats.

In different sets of experiments, we tested riluzole (n =20), rosuvastatin (n = 14) inosine (n = 17), metformin (m=19) and fluoxetine (n = 20) regarding their potential to improve recovery of function in a skilled forelimb task and in a cylinder test of proximal limb use during vertical exploration. There were no significant differences between the treatment and the control groups. Of note, our lesion model did repeatedly reveal significant benefits of ketogenic diet in the past. In summary our data show that establishing robustness in preclinical models is challenging and possible reasons will be discussed, including differences in lesion severities, levels, types and study design.
Disaster preparedness in the area at risk of mega-earthquake in Japan

Professor Shinsuke Katoh¹, Dr Nori Sato¹, Dr. Tetsuya Enishi¹

¹Department of Rehabilitation Medicine, Tokushima University Hospital, Tokushima, Japan

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Risk of the mega-earthquake (Richter magnitude scale 8-9) in the Nankai Trough located off shore of south east Japan has been estimated as 70% in the next 30 years, and Tsunami in this case would be similar to that in the great east Japan earthquake in 2011. Worst scenario in Tokushima which faces the Pacific Ocean, expects death of 4% of inhabitants, and serious injuries are estimated as 0.6% of inhabitants. The mega earthquake may not cause many SCI patients since the victims would be hit by Tsunami, however, spinal cord injured persons living in the community are at the risk of complications after the disaster.

The local rehabilitation professionals themselves would also affected heavily, therefore, preparedness seems to be very important. Japan Rehabilitation Assistant Team (JRAT) has been established after the earthquake in 2011, and JRAT includes the organizations of physiatrists, physiotherapists, occupational therapists, nurses, orthotists and rehabilitation hospitals. Branch organization has been established in Tokushima with the help of the local government, and physiatrists and allied professionals are appointed as the coordinators.

The coordinators have started collecting information on spinal cord injured, reviewing local rehabilitation resources, condition of shelters, and seeking collaboration with public health nurses and other health professionals. These information would be share with the headquarter of JRAT and the branch JRAT which is not far from Tokushima but would not be affected much at the mega-earthquake. The society which does not have comprehensive information would need this kind of preparedness for the massive natural disasters.
Falls after spinal cord injury: An exploratory study using photovoice

Dr Kristin Musselman1,2,3, Dr. Cathy Arnold3, Clara Pujol1, Kaylea Lynd1,3, Dr. Sarah Oosman3

1SCI Mobility Lab, Toronto Rehabilitation Institute-University Health Network, Toronto, Canada, 2Dept. of Physical Therapy, University of Toronto, Toronto, Canada, 3School of Physical Therapy, University of Saskatchewan, Saskatoon, Canada

Introduction: Fall risk is high in individuals with incomplete spinal cord injury (iSCI); however, little is known about the causes and consequences. Our objectives were to 1) explore the factors affecting fall risk from the perspectives of individuals with iSCI, and 2) understand how the perceived fall risk impacts their participation in physical activity (PA).

Methods: An exploratory, mixed-methods study was completed with parallel collection of quantitative (clinical measures) and qualitative (photovoice) data. Eight individuals with iSCI (AIS C/D, level C2-T8) who fell in the previous year participated. Balance ability (mini-BESTest) and participation in PA (accelerometry) were measured. Over seven days participants wore accelerometers and took photographs addressing study objectives, followed by a semi-structured interview to discuss photographs using standard photovoice methodology. Inductive thematic analysis was used to identify key messages describing participants’ perceptions and experiences.

Results: Three themes emerged. 1) Perceived Challenges included environmental challenges in the community and home, limited fall prevention training, risky behaviors, and biological (e.g. inability to recover balance) factors. The latter was supported by mini-BESTest scores (11.3±10.9/28). 2) Impact of Perceived Fall Risk included impact on participation in life roles (e.g. parenting) and PA (e.g. gym exercise, outdoor cycling). Impact on PA was supported by the accelerometry data (>80% of time spent in sedentary PA). 3) Strategies to Avoid Falls were learned experientially and addressed behavioral and environmental factors.

Conclusions: Individuals with iSCI perceive a fall risk in diverse environments in combination with limited fall prevention training, thus negatively impacting their health and wellness.
Pediatric SCI Common Data Element (CDE) Recommendations: Updates to the National Institute of Neurological Disorders and Stroke SCI CDEs

Ms. Joanne Odenkirchen¹, Dr. Lyn Jakeman¹, Dr. MJ Mulcahey², Dr. Lawrence Vogel³, Ms. Muniza Sheikh⁴, Ms. Sherita Ala'i-Hansen¹, Ms Joy Esterlitz⁴

¹The National Institute of Neurological Disorders and Stroke, Bethesda, United States, ²Thomas Jefferson University, Philadelphia, United States, ³Rush University Medical Center, Shriners Hospital for Children, Chicago, United States, ⁴The Emmes Corporation, Rockville, United States

Introduction: The goal of the National Institute of Neurological Disorders and Stroke (NINDS) CDE project is to increase efficiency and data quality while facilitating data-sharing and data-mining. In 2014, the adult SCI CDE recommendations were made available. In 2015, pediatric-specific CDE recommendations were added to the existing adult recommendations for SCI clinical research studies.

Objective: Since the 2014 publication of the adult SCI CDE recommendations, the need for supplemental pediatric SCI CDEs was evident. Work to develop pediatric CDEs began shortly after the initial release of the adult SCI CDEs.

Methods: The pediatric working group consisted of international members with varied fields of expertise related to pediatric SCI. The group convened bi-weekly meetings for six (6) months in 2015. The group split its work of pediatric updates by domains, such as participant characteristics and pain. Recommendations were based on reviewing the established adult SCI CDE recommendations as well as other disease-specific CDEs. After internal working group review of domain recommendations, these pediatric CDEs were vetted during a November through December 2015 public review.

Results: Version 1.0 of the pediatric SCI CDEs was posted in February 2016. New pediatric SCI CDEs and recommendations include those developed for birth injury, sleep and functional outcomes.

Conclusion: The NINDS CDEs are a continually evolving resource, requiring updates as research advancements indicate. Information at this meeting will include examples of utilization of SCI CDEs in a research study and navigation and selection of CDEs from the NINDS CDE website.
IDAPP Project: Analysis of interim report and way forward

**Dr Harvinder Chhabra**, Dr Apichana Kovindha, Dr Gaurav Sachdeva, Dr Fin Biering-Sørensen, Dr Nazirah Hasnan, Dr Vanessa Noonan, Dr James W Middleton, Dr Marcel WM Post, Prof William H. Donovan, Dr Christine Groves, Dr David Berlowitz, Mr Stephen Muldoon

1. Indian Spinal Injuries Centre, New Delhi, India, 2. Chiangmai University, Chiangmai, Thailand, 3. University of Copenhagen, Denmark, 4. University Malaya Medical Centre, Kuala Lumpur 59100, Malaysia, 5. University of British Columbia and Rick Hansen Institute, Vancouver, Canada, 6. The University of Sydney, Kolling Institute of Medical Research, St Leonards 2065, NSW, Australia, 7. University of Groningen, University Medical Center Groningen, Groningen, The Netherlands; Brain Center Rudolf Magnus and Center of Excellence in Rehabilitation Medicine, University Medical Center Utrecht and De Hoogstraat, Utrecht, The Netherlands, 8. Past President ASIA & ISCoS, 9. Spinal Injury Rehabilitation Centre, Nepal, 10. Austin Hospital, Australia, 11. Livability, N Ireland

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

**ISCoS Database: ASCoN Pilot Project (IDAPP)** is of 1 year duration and involves 9 centres from Bangladesh, India, Malaysia, Nepal, Sri Lanka and Thailand. The objectives of the IDAPP are to capture demographic and selected injury/safety data on patients with SCI and to evaluate the database variables, processes involved and appropriateness for a subsequent larger database.

Data elements for IDAPP include the International SCI Core Data Set and the Minimal Safety Data Set, incorporating relevant aspects of ICECI.

An interim analysis of IDAPP was performed at six months. A questionnaire was administered to the study investigators to identify barriers in implementation.

A total of 426 patients were enrolled in the IDAPP, 341 males and 85 females. Falls (n=214) was a more common cause of SCI in comparison to transport related injury (n=171). Amongst falls, those from more than 1 meter (69%) were the commonest cause of injury. Most SCI (57%; n=227) were complete injuries.

The suitability of data elements, data quality and feasibility of capture through a user friendly web platform was confirmed. Some barriers for implementation and areas for further development were identified from the investigators’ responses to the questionnaire.

This workshop will discuss the processes involved with data collection and analysis, and how this compliments the global SCI mapping work being undertaken by the Committee. Interim IDAPP report would be presented during the workshop. Audience members will be encouraged to participate in discussions during the panel discussion about future directions for IDAPP and opportunities to partner with other SCI registries to guide development of strategies for primary and secondary prevention of SCI.

**Topics and Speakers:**
- **IDAPP: Introduction and Background** - Apichana Kovindha (9 min)
- **Database design** - Gaurav Sachdeva (9 min)
- **Quality processes involved** - Fin Biering Sorenson (9 min)
- **IDAPP: Interim Data Analysis Report** - Nazirah Hasnan (9 min)
- **Site Investigator Feedback** - Christine Groves (9 min)
- **Panel Discussion: Future directions for IDAPP** - Moderator: H S Chhabra (40 min)

Panelist (All speakers, Vanessa Noonan, James Middleton, Marcel Post, William Donovan, David Berlowitz, Mr Stephen Muldoon)
- **Wrap up and take home message** - H S Chhabra (5 min)
ISCoS Database: ASCoN Pilot Project (IDAPP): Interim Report by Prevention Committee

Dr Gaurav Sachdeva
Indian Spinal Injuries Centre, New Delhi, India

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Recognising the need to develop a resource to collect data on Spinal Cord Injuries, ISCoS decided to start initially with a data base for select centres at Bangladesh, India, Malaysia, Nepal, Sri Lanka and Thailand where there is no or scanty data. IDAPP has been proposed as the first step of a long-term international SCI database.

Objectives: The objectives of the project are to evaluate the database variables, processes involved and the web platform of IDAPP for appropriateness for a subsequent database.

Method: Data for patients enrolled from 1 Sept. 2015 till 29 of Feb. 2016 (6 months) was analysed using simple descriptive statistics. A Questionnaire for IDAPP Investigators was circulated to understand the relevance, appropriateness of study design, quality of documents, and the issues faced by the IDAPP team during the conduct of IDAPP.

Results: 426 patients (341 males, 85 females) were enrolled in the first six months. Falls (n=214) was the most common cause of SCI in comparison to transport related injury (n=171). Amongst falls, those from more than 1 meter (69%) were the most common. Majority (57%, n=227) of patients have complete injuries (AIS ‘A’). Appropriateness of study and quality and ease of use of the web platform was confirmed.

Conclusions: The appropriateness of the study including data variables, processes, quality and ease of use of the web platform has been confirmed. Interim data reveals that the demographics of SCI in the ASCoN region may be differ in some aspects from that of developed countries.
Cost-utility-analysis of an intensive hand therapy program: Results from the Spinal Cord Injury Physical Activity (SCIPA) ‘Hands On’ randomised trial

Miss Allison Yates¹, Dr Arthur Hsueh¹, Prof David Dunt¹, Prof Mary Galea²
¹Melbourne School of Population and Global Health, The University Of Melbourne, Carlton, Australia, ²Department of Medicine (Royal Melbourne Hospital), The University of Melbourne, Parkville, Australia

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Loss of hand function following tetraplegia profoundly affects quality of life. This paper reports the cost-effectiveness of an innovative eight-week intensive hand therapy program for recently injured tetraplegic patients.

Cost-utility analysis was undertaken alongside the multi-site SCIPA ‘Hands On’ trial, which compared usual hand therapy (SC) with SC plus functional electrical stimulation (FES)-assisted hand therapy (IN), involving 70 people with C2 to T1 motor complete or incomplete traumatic tetraplegia.

Quality adjusted life years (QALYs) were estimated using Health Utilities Index® Mark 3 administered at baseline, post-intervention and six months; cost data were gathered directly from the trial. Intention to treat analysis was from a third party payer perspective.

33 and 37 participants were randomised to SC and IN respectively. Between-group baseline characteristics were similar: 87% male; mean age 35 years; 54% had C4 injuries; 47% had American Spinal Injury Association Impairment Scale (AIS) C or D injuries.

Six-month point estimate results showed IN produced AU$1,395 cost savings and 0.03 QALYs gained per patient compared to SC, with an 82% cost-effectiveness probability for an AU$50,000/QALY gained threshold. Varying cost and utility values had little effect on outcome.

Exploratory sub-group analyses found IN had a 45% maximum cost-effectiveness probability for AIS A/B injuries, but was dominant for AIS C/D injuries.

Based on cost-utility analysis, adding FES-assisted hand therapy to usual hand therapy may be a cost-effective alternative to usual therapy alone for recent tetraplegia injuries overall, especially for people with recent AIS C/D injuries. Further research with larger samples is recommended.
Psychosocial rehabilitation of persons with spinal cord injury

PhD Christel Van Leeuwen¹, PhD Marcel Post¹,², PhD student Elsemieke Visse¹,²

¹Brain Center Rudolf Magnus and Center of Excellence in Rehabilitation Medicine, University Medical Center Utrecht and De Hoogstraat Rehabilitation, Utrecht, Netherlands, ²University of Groningen, University Medical Center Groningen, Center for Rehabilitation, Groningen, Netherlands

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: The Toolkit Mental and Social Rehabilitation (Toolkit) was developed to improve psychosocial rehabilitation of persons with spinal cord injury (SCI) by presenting therapies clearly, setting specific psychosocial treatment goals, and monitoring the progress of psychosocial rehabilitation.

Methods: A mixed methods before and after design was used in three SCI rehabilitation centers in the Netherlands. Two questionnaires were developed and administered to all team members: the Toolkit Evaluation Questionnaire (α = .93) and the Mental and Social Rehabilitation Scale (α = .81 - .84). Furthermore, semi-structured interviews were conducted among professionals (N = 11) after the intervention, and with persons with SCI who received treatment before (control group; N = 8) and after the pilot study (pilot group; N = 8).

Results: Interviewed professionals indicated that the Toolkit provided information and structure and improved communication between professionals and persons with SCI. Professionals who knew about the implementation of the Toolkit found it a useful tool to improve psychosocial rehabilitation. However, after implementation professionals’ opinions about psychosocial rehabilitation were not more positive compared to before. According to persons with SCI, the Toolkit seemed to contribute to the clarity of the available psychosocial therapies.

Conclusions: The Toolkit may be a useful tool in improving psychosocial rehabilitation. Suggestions of both professionals and persons with SCI will be taken into account to improve the Toolkit. The first step will be to enhance psychosocial goal-setting in the SCI rehabilitation team.
Obstructive sleep apnoea (OSA) is extremely prevalent among people with quadriplegia, but the reasons are not well established. OSA in quadriplegia may be partially attributable to unopposed upper airway parasympathetic activity causing mucosal vascular engorgement. This study investigated the effect of a topical vasoconstrictor, phenylephrine, on the upper airway of people with OSA and quadriplegia using 3-Tesla (3T) magnetic resonance (MR) imaging.

Method: 6 people with quadriplegia and OSA (SCI-OSA), 15 able-bodied participants with OSA (AB-OSA), and 12 able-bodied participants without OSA (AB-CTRL) were recruited. Participants underwent a 3T-MR scan of their upper airway before being administered an atomised dose of phenylephrine to their nose and throat and a repeat scan five minutes later. Volumetric analysis of the upper airway was performed pre- and post-phenylephrine.

Results: Repeated measures ANOVA indicated a statistically significant increase in velopharyngeal volume across groups after phenylephrine administration, (p=0.006). A significant interaction effect between phenylephrine administration and group was noted, (p=0.043), indicating that velopharyngeal volume increased significantly for both SCI-OSA (3.51±0.83 vs. 3.84±1.41 cm³) and AB-OSA (3.24±1.54 vs. 4.09±1.74 cm³) post-phenylephrine, but not for AB-CTRLs (2.96±0.85 vs. 3.05±1.07 cm³). No other changes were observed from pre-to post-phenylephrine for other upper airway structures examined.

Conclusion: Vasoconstriction of the upper airway using phenylephrine produces enlargement of the velopharynx in both SCI-OSA and AB-OSA groups. Due to the reduced acceptance of conventional treatment options for OSA in SCI, there may be a role for topical vasoconstriction in the treatment of OSA in quadriplegia.
Diaphragm Pacing in Spinal Cord: 15 year experience in changing the management of mechanical ventilation- Early Implantation is Optimal

Dr Raymond Onders¹, MaryJo Elmo¹, Cindy Kaplan¹
¹University Hospitals Case Medical Center, Cleveland, United States

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Background: In spinal cord injury(SCI) the need for prolonged mechanical ventilation(MV) is associated with high mortality and poor outcomes. Diaphragm Pacing(DP) can decrease or replace MV in SCI.

Methods: Retrospective review of prospective databases of all patients at a single site who were evaluated and/or implanted with DP under 9 separate IRB and/or FDA trials. All patients underwent complete neurophysiologic study of the diaphragm and respiratory control which included: arterial blood gases, chest x-rays, phrenic nerve studies, sleep studies and fluoroscopic sniff test. All implanted patients had confirmation of diaphragm response with intra-operative visualization during laparoscopic mapping of the diaphragm.

Results: From 2000 to 2016, 405 patients were implanted with DP: 117 SCI, 232 ALS and 56 diaphragm dysfunction (DD). All SCI patients with stimulable diaphragms were able to be free from MV with 50% replacing MV full time and another 34% attaining at least 12 hours of continuous DP use. In recent reports in SCI, early use of DP after injury has shown up to 36% of patients can have recovery of respiration, with removal of the electrodes possibly because of the neuroplastic effects. DP SCI patients report improved sense of smell, decreased secretions/suctioning and increased independence. DP has been safely implanted in pediatric patients and those with internal cardiac pacemakers.

Conclusions: DP has consistently shown to be safe and preferred mode of breathing in SCI. Newer data shows benefit of DP in other respiratory compromised populations. DP electrodes provide therapy and can monitor progress.
Inspiratory or expiratory muscle training in patients with spinal cord injury? That’s the question!

**Mrs Anja M Raab**, Mrs Mirjam Pfister, Dr Joerg Krebs, PD Claudio Perret, Dr Maria Hopman, Dr Gabi Mueller

1 Clinical Trial Unit, Swiss Paraplegic Centre Nottwil, Switzerland, 2 Institute of Sports Medicine, Swiss Paraplegic Centre Nottwil, Switzerland, 3 Department of Health Sciences and Technology, Institute of Human Movement Sciences and Sport, ETH Zurich, Switzerland, 4 Department of Physiology, Radboud University Nijmegen, The Netherlands

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

**Introduction**

Respiratory muscle training seems to have a positive effect on respiratory parameters in patients with spinal cord injury (SCI). In clinical practice respiratory muscle strength training programs have been established. However, it is still unknown whether in- or expiratory muscle training is the more effective training regime.

**Aims**

To investigate the changes in respiratory muscle strength, respiratory volumes and respiratory resistance after inspiratory and expiratory muscle training in motor complete and incomplete SCI individuals.

**Methods**

Retrospective design. Individuals with traumatic or non-traumatic SCI (AIS A-D), C4-T12 were included. The patients performed a minimum of 10 in- or expiratory training sessions in a group-setting. Respiratory function measurements before and after the training period were used for analysis.

**Results**

From 2010-2015, 85 patients completed an inspiratory and 44 patients an expiratory muscle training. Maximal inspiratory pressure (p≤0.002) and maximal expiratory pressure (PEmax) (p≤0.007) increased after both training regimes regardless the completeness of lesion except PEmax in the motor incomplete group after expiratory training. Vital capacity, forced vital capacity and forced expiratory volume in the first second improved after both training regimes but only in patients with motor complete lesions (p≤0.001). Peak expiratory flow only improved after inspiratory training in motor complete SCI (p≤0.002). Respiratory resistance was not affected by either of the two training methods.

**Conclusions**

Inspiratory muscle training revealed a slightly better effect on respiratory function parameters compared to expiratory muscle training. Both training regimes showed a superior effect in motor complete patients than in incomplete patients.
Magnetic resonance imaging of the structure and size of the upper airway in patients with quadriplegia and obstructive sleep apnoea

Dr Fergal J. O'Donoghue1,2, Ms Hailey Meaklim1,2, Professor Lynne E. Bilston4,5, Ms Alice Hatt4, Dr Alan Connelly2, Professor Graeme Jackson2,3, Ms Shawna Farquharson2, Dr Kate Sutherland6, Professor Peter A. Cistulli6, Dr Doug J Brown7, Dr David Berlowitz1,3,7

1Institute for Breathing and Sleep, Austin Health, Melbourne, Australia, 2The Florey Institute of Neuroscience and Mental Health, Melbourne Brain Centre, Melbourne, Australia, 3Faculty of Medicine Dentistry and Health Sciences, University of Melbourne, Parkville, Australia, 4Neuroscience Research Australia, Randwick, Australia, 5University of New South Wales, Randwick, Australia, 6Department of Respiratory and Sleep Medicine, Royal North Shore Hospital and Sydney Medical School, University of Sydney, Sydney, Australia, 7Spinal Research Institute, Austin Health, Heidelberg, Australia

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Obstructive sleep apnoea (OSA) is extremely prevalent in quadriplegia. The reasons remain unclear, but they may include changes in upper airway anatomy after injury. This study utilised 3-Tesla (3T) magnetic resonance imaging (MRI) to investigate the differences in upper airway anatomy between people with quadriplegia and OSA (SCI-OSA), able-bodied people with OSA (AB-OSA), and able-bodied people without OSA (AB-CTRL). It was hypothesised that SCI-OSA participants would have a smaller airway lumen than both able-bodied groups.

Fifty participants from Melbourne and Sydney were recruited: 11 SCI-OSA, 19 AB-OSA, and 20 AB-CTRL. All underwent 3T MRI of their upper airway. Volumetric analysis of the upper airway was performed using AMIRA® software to calculate upper airway lumenal and soft tissue volume.

Results: Utilising mixed model analysis, there were no significant differences in total airway lumen volume observed between the three groups (Mean±SD; SCI-OSA: 16.4±5.6 vs. AB-OSA: 12.1±4.9 vs. AB-CTRL: 11.9±4.4 cm³; p=0.082). However, SCI-OSA participants were found to have a larger volume of soft palate (SCI-OSA: 14.1±2.3 vs. AB-OSA: 12.7±3.2 vs. AB-CTRL: 11.1±2.3 cm³; p=0.015) and retroglossal lateral pharyngeal wall (SCI-OSA: 10.1±2.9 vs. AB-OSA: 7.1±2.9 vs. AB-CTRL: 7.3±2.7 cm³; p=0.042) tissue than able-bodied participants.

Conclusion: The results suggest that the high rate of OSA in quadriplegia is not solely due to a smaller upper airway lumen.
Peak Expiratory Flow during standard spirometry is not a good substitute for Peak Cough Flow

PhD Karin Postma¹,², PhD Janneke Haisma³, PhD Johannes Bussmann²
¹Rijndam Rehabilitation Institute, Rotterdam, The Netherlands, ²Erasmus MC, University Medical Center Rotterdam, Rotterdam, The Netherlands, ³Kennemer Gasthuis, Haarlem, The Netherlands

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction:
Different thresholds of peak expiratory cough flow (PCF) are used to support clinical decisions on respiratory management following SCI. For example, decisions on extubation, decannulation, and the use of cough assist or airstacking. Unfortunately, measuring PCF adds to the usual bedside assessments. To minimize this extra burden, it would be valuable if peak expiratory flow measured during spirometry (PEF), part of standard care, could be used instead. Therefore, the objective of this study was to determine whether PEF could substitute PCF.

Methods:
The study population consisted of 44 patients with recent SCI who had a forced expiratory volume below 80% predicted: 86.4% men; mean (SD) age 47.1 (14.7) years; cause 81.8% traumatic; 13 patients with C1-C4 AIS ABC, 10 with C5-C8 AIS ABC, 10 with T1-S5 AIS ABC and 11 with AIS D. Expiratory flow was measured during standard spirometry (PEF) and during cough (PCF) with patients seated upright in their wheelchair.

Results:
Although PEF and PCF correlated moderately (r= 0.66, p<0.001), the differences between measures varied largely for individuals (95%CI: -1.74 – 3.74 l/sec). This disagreement exceeded published thresholds for respiratory management. At group level the mean scores of PCF were 1.00 l/sec (95%CI: 0.57 – 1.43) greater than PEF.

Conclusion:
Although we had a small sample size (and replication in a larger population may be necessary), results do suggest that PEF is not a good substitute for PCF. Therefore, we advise the assessment of cough flows in addition to standard spirometry to support clinical decision-making.
The need for ventilatory support in patients with acute cervical traumatic spinal cord injury and its effect on discharge destination.

**MD Karin Bosch**¹, MD, PhD Casper van Koppenhagen¹,², MD, PhD Herman Holtslag¹,²,³, PhD Marcel Post¹,⁴

¹Brain Center Rudolf Magnus and Center of Excellence in Rehabilitation Medicine, University Medical Center Utrecht and De Hoogstraat Rehabilitation, Utrecht, The Netherlands, ²Department of Rehabilitation Medicine, University Medical Center Utrecht, Utrecht, The Netherlands, ³Currently Department of Rehabilitation Medicine, Academic Medical Center Amsterdam, Amsterdam, The Netherlands, ⁴Department of Rehabilitation Medicine, University of Groningen and University Medical Center Groningen, Groningen, The Netherlands

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

**Objectives:**

Many people with traumatic cervical spinal cord injury (TSCI) are temporarily dependent on ventilation in the acute phase. We studied associations between ventilatory support, weaning, length of stay and discharge destination of people with acute TSCI in the acute phase.

**Methods:**

Retrospective, longitudinal chart review on 153 patients with acute cervical TSCI hospitalized in a level-1 trauma center from 2000-2013. Data extraction included patient and TSCI characteristics, mechanical ventilation, complications, length of stay and discharge destination. Level of lesion was C1-C4 in 44% and 34% were complete.

**Results:**

In total, 64/153 patients were ventilated during hospitalization. Of these 64 patients, 34 (53%) were successfully weaned during hospitalization, 15 (23%) were still on ventilation at discharge (ranging from a few hours a day up to 24/7), while another 15 (23%) died during hospitalization. Patients on ventilation at discharge showed a longer stay on the ICU compared to those independently breathing (Median 94 vs 0 days, p<0.001), total length of stay (Median 95 vs 21 days, p<0.001), worse AIS classification (p<0.01), slightly fewer transfers to a rehabilitation center for inpatient rehabilitation (27% versus 54%, p=0.093), and higher presence of additional injuries (p<0.001).

**Conclusions:**

Ventilation during acute hospital stay is associated with longer duration of hospitalization and ventilation at discharge implicates less referrals for inpatient rehabilitation after acute TSCI. More research is necessary to optimise weaning, and to enhance a rapid transition from hospital to a rehabilitation facility. Limitations are that this is a single centre study with a retrospective design.
Unilateral phrenic nerve stimulation in a subject with a C1 A.I.S. A spinal cord injury

Miss Marie McGroarty¹, Ms Jacqui Byrne¹, Mr Marcus Timlin¹, Dr Edmund Carton¹

¹Mater Misericordiae University Hospital Dublin, Dublin 4, Ireland

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Phrenic nerve stimulation has been shown to be a safe intervention for weaning subjects with ventilator dependent Spinal Cord Injuries (SCI) who have a functioning phrenic nerve. The subject of this case study suffered C1, C2 fractured vertebrae with a resultant C1 A.I.S. A SCI following a collision with a wall while playing soccer. A bilateral functioning phrenic nerve was confirmed by electromyographic response of the diaphragm to nerve stimulation under videofluoroscopy. This is only the second case in the Republic of Ireland (ROI) of implantation of a phrenic nerve stimulator (Atrotech Finland). An iatrogenic injury to the subject’s right phrenic nerve during implantation of the device meant it was only possible for unilateral stimulation of the left hemi-diaphragm. After a multi-disciplinary team discussion and subject consent, training commenced of the left hemi-diaphragm only, with a goal of 12 hours ventilator free breathing. A review of literature did not reveal any guidelines for unilateral phrenic nerve stimulation in SCI. Initial phrenic nerve stimulation was set to provide tidal volumes >400mls. Parameters were set to maintain normal arterial blood gases and oxygen saturation, and subjective ease of talking. Training began with 5 minute sessions TDS, progressing to 12 hours over a 4 month period. As a result of this successful weaning, the subject was able to be discharged from the acute setting to a post-acute specialist rehabilitation centre in the ROI. The subject had fewer respiratory tract infections and this ultimate achievement had a positive psychological benefit for the subject.
Effects of exoskeleton gait training in SCI persons: pain, spasticity and endurance

Dr Giulia Stampacchia, Ft Alessandro Rustici, Ft Samuele Bigazzi, Dr Carla D’Avino, Dr Adriana Gerini, eng Elena Battini, Ft Alessandra Franchini, Ft Tullia Tombini, eng Stefano Mazzoleni

1SCI Center, Pisa University Hospital, Pisa, Italy, 2BioRobotic Institute, SSS Sant’Anna, Pisa, Pisa, Italy

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Complete SCI persons are able to walk wearing a powered exoskeleton. The aim of the work is to evaluate the effect of a gait training in complete SCI on the ability to use a wearable exoskeleton.

Methods. Eleven motor complete SCI persons (9 ASIA A and 2 B) with different injury levels (1 C7; 2 D5-6; 8 L1-2), 8 males and 3 females, performed an exoskeleton gait training, three time a week, for a total of 20 sessions. The improvement walking capacity was evaluated applying: 10 Meter Walking Test (10MWT), 6 Minutes Walking Test (6MWT), Timed Up and Go Test (TUG), endurance (the maximum time of walking without rest) in the forth and in the last exoskeleton gait session. In addiction SCIM, Penn and Ashworth scale, Numeric Rating Scale (NRS) 0 – 10 for pain and subjective feeling of spasticity, Pain and QoL ISCoS scales, were administered before and after the training.

Results. Gait velocity increased from 0.10±0.03 to 0.14±0.05 m/sec, p<0.004; the distance in 6MWT increased from 33.6±11.7 to 46.6±11.9 m, p<0.001; TUG decreased from 113.6±41.4 to 75.4±15.1 sec, p<0.001; endurance increased from 21.6±8.4 to 32.3±17.1 minutes, p<0.001.

A reduced spasticity both objective (Ashworth rating from 5.1±5.2 to 2.6±3.6, p<0.01) and subjective feeling (NRS from 3.5±2.2 to 2.5±2.5, p<0.05) were observed.

Conclusions The results of this experience demonstrate that complete SCI persons can use the powered exoskeleton for walking and a period of rehabilitation training improves exoskeleton employment; the muscle spasticity results lower after the gait training with exoskeleton.
Exoskeletons and Rehabilitation after Spinal Cord Injury

Dr Ashraf Gorgey¹, Dr. Zeinab Abdelrehim²

¹Hunter Holmes McGuire Va Medical Center, Richmond, United States, ²Ministry of Health, Cairo, Egypt

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Background: Robotic exoskeletons have now become available for the rehabilitation of individuals with spinal cord injury (SCI). Exoskeletons have been defined as a wearable robots that provide unique opportunity for persons with SCI to experience ambulation years after injury. The purpose of this review is to introduce different exoskeletons’ brands which are available for the rehabilitation of persons with SCI. Moreover, we would like to highlight the major differences among these brands.

Methods: PubMed, Medline, Google scholar and Wikipedia were searched to identify the common exoskeleton brands that are commonly available for the rehabilitation of persons with SCI. We have also identified the major differences among these brands.

Results: Four brands mainly the Rewalk (8 studies), Ekso Bionics (4 studies), Parker Hannifin Indego (two studies) and Rexbionics were identified. Studies included those with complete and incomplete SCI with different levels (C4-T12; AIS A and D). ReWalk uses a left hip tilt sensor to initiate ambulation with a watch communicator to control movements and perform self-initiated standing and walking. Ekso a hydraulically powered exoskeleton system relies on weight shifting and using crutches or walker to stand and walk. Indego has a lighter design (27 lbs) and allow the users to use it in conjunction with their wheelchairs. Rex is the heaviest (110 lbs.) with a limited speed and can be used for C4 SCI.

Conclusion: Different exoskeleton brands are now available and provide a safe environment for persons with SCI to ambulate with the focus on mitigating health related secondary complications.
Gait progression in the EksoTM robotic-exoskeleton after 8 weeks training in participants with Spinal Cord Injury (SCI).

Dr. Philos., MSc Ulla Vig Nissen¹, MD Carsten Bach Baunsgaard¹, PhD Angela Frotzler², MSc Anne Katrin Brust³, Dr Cornelia Ribeill³, Yorck-Bernhard Kalke³, Nатача Леон⁴, German Novillo⁶, Thomas Glott⁵, Arve Opheim⁵, Penalva, MD, PhD Jesus Benito⁶, PhD Narda Murillo⁶, Kersti Samuelsson⁷, Wolfram Antepohl⁷, MD Ulrika Holmström⁸, MD, PhD Niklas Marklund⁸, Janneke Nachtegaal⁹, Willemijn Faber⁹, MD David Gobets⁹, Professor, MD Fin Biering-Sørensen¹

¹Clinic For Spinal Cord Injuries, Hornbaek, Denmark, ²Swiss Paraplegic Centre, Nottwil, Switzerland, ³SCI Centre Orthopaedic Department Ulm University, Ulm, Germany, ⁴Fundación Lesionado Medular, Madrid, Spain, ⁵Department of rehabilitation medicine University Hospital, Linköping, Sweden, ⁶Spinal Cord Rehabilitation Unit, Uppsala, Sweden, ⁷Sunnaas Rehabilitation Hospital, Sunnaas, Oslo, Norway, ⁹Institute Guttmann, Spain, ⁹Heliomare Rehabilitation Center, Wijk aan Zee, The Netherlands

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction:
The aim was to examine progression of gait and level of assistance in the EksoTM robotic exoskeleton (Ekso) in people with SCI.

Methods:
Convenience sample of 73 participants SCI with American Spinal Injury Association impairment scale (AIS) A-D and neurologic level of injury C1-L2 were enrolled in an open label multi-center study including 9 European SCI centers.
Ekso training consisted of 1 hour training-sessions (TS) 3 times/week for 8 weeks (24 sessions). Progression was measured as number of steps, minutes of stand- and walking time, Ekso-mode and the assistive device used.

Results:
Fifty four persons completed the study. Mean(SD) age was 39.9 (±14.1) years, and 16 (30%) were females. Time since injury <1 year: n=25 (46 %), >1 year: n=29 (54%). Level and severity of injury: T1-L2, AIS C/D: n=17 (32%); T1-L2, AIS A/B: n=23 (43%); C1-C8, AIS C/D: n=11 (20%); C7-C8 AIS A/B: n=3 (5%). Median stand-time (IQR) at TS1 28.5 (10.7) and TS24: 32.0 (14.6) minutes. Median walking-time (IQR) at TS1 14 (7) and TS24 24 (15) minutes. Median number of steps/session (IQR) TS1 361 (256) and TS24 973 (703). Assistive devices front-wheeled-walker vs crutches, TS1 94% vs 6%, at TS24 30% vs 70%.

Conclusions:
Following 8 weeks training in the Ekso the number of steps, stand and walking time increased substantially. Progression in Ekso device-settings changed towards more independence and with less assistance, and more persons used crutches during training. Results of gait-function outside Ekso, balance and change in neurological status will also be presented.
Psychological and physical effort during robotic exoskeleton assisted walking on treadmill and overground in SCI persons

Dr Giulia Stampacchia, Ft Samuele Bigazzi, Ft Alessandro Rustici, Dr Marco Dini, Dr Silvia Corbianco, Dr Adriana Gerini, Dr Carla D'Avino, Ing Elena Battini, Ing Stefano Mazzoleni

1 Center for Spinal Cord Injury, Pisa University Hospital, Pisa, Italy, 2 Department of Translational Research, Pisa University, Pisa, Italy, 3 BioRobotic Institute, SSSant'Anna, Pisa, Italy

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

New robots for gait rehabilitation in SCI persons are currently available. The aim of this work is to evaluate psychological and physical effort of SCI persons using two different types of robotic exoskeletons. Research funded by Italian Ministry of Health (RF-2011-02346770).

Methods Eight SCI persons (4 motor complete: ASIA A or B; 4 incomplete: ASIA C or D) with different injury levels (7 paraplegics; 1 tetraplegic), 5 males and 3 females, underwent robot-assisted gait training both overground (Ekso) and on treadmill (Lokomat); a questionnaire investigating the subjective feeling of Fatigue (F), muscle Relaxation (R), mental Effort (Ef), Fear or Discomfort (D) Satisfaction (S), Emotion (E) during the gait training was administrated and the VO2 consumption and MET were collected.

Results The mean VO2 consumption at rest was 2.77 ± 0.13 ml/kg/min. Walking with Lokomat resulted in high scores of R, S and E and low scores of F, Ef and D; VO2 consumption was 4.14 ± 0.85 ml/kg/min and 1.48 ± 0.30 MET. Overground walking resulted in high scores in all the 6 items; VO2 consumption was 7.02 ± 1.69 mL/kg/min and 2.56 ± 0.60 MET. Higher scores were observed in F: 5.63 ± 1.60, Ef: 7.75 ± 1.58 and D: 5.75 ± 2.38 during overground than treadmill training: F: 3.25 ± 2.76, Ef: 4.25 ± 2.76, D: 1.50 ± 1.77 (p<0.05) and an higher VO2 consumption was observed as well (p<0.05).

Conclusions Overground robot-assisted gait training needs higher cognitive and cardiovascular efforts than robot-assisted gait training on treadmill.
Psychological aspects in patients with spinal cord injury after treatment with the exoskeleton

Dr Lina Di Lucente, Dr Alessandra Cicuti, Dr Stefano Bellotti, Dr Federica Ricci, Dr Francesca Mancini, Dr Monica Torre, Dr Marco Molinari
1Santa Lucia Foundation (I.R.C.C.S.), Rome, Italy

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

This work stems from the assumption that the use of the exoskeleton may influence psychological variables such as anxiety, depression, extraversion and self-esteem, investigating any differences of psychological states in patients for spinal cord injury in a protocol for the use of the exoskeleton. The psychodiagnostic test battery is administered before and after treatment, between patients who undergo robotic training and other subjected to conventional treatment. The study was conducted on 20 patients in a system of hospitalization with spinal cord injury, including 17 men and 3 women, with a mean age of 40.45 years (±14,310). 10 patients of the total sample have undergone rehabilitation program using robotic training. To evaluate psychological status, were administered: STAI-X 2 Scale-anxiety, QD Scale-depression), Extroversion, EPQ-R Cognitive Behavioral Assessment scales and Self-esteem of (CBA). Using the student’s t test and the analysis of variance were evaluated the differences on levels of depression, anxiety, extraversion and self-esteem between the control group and the treated group.

The study found no statistically significant differences between the two groups. However the first evaluation of the variables, the anxiety levels were slightly lower in patients undergoing robotic training (M=35.6 DS=9.24) compared with the control (M=36.50 DS=9.70) and it showed slightly higher scores of self-esteem (M=57.10 DS= 5.33) and motivation (M=13 DS=4.08) compared with the control group (M=42 DS=6.55; M=12.50 DS=4.06) that showed lower levels of depression instead (M=3,60 DS=2,50) compared of rewalk group (M=6.33 DS= 5.89).

At follow-up were considered only patients undergoing robotic training in order to assess the influence on the psychological aspects before and after treatment. A statistically significant difference emerged only for variable motivation, in which subjects to follow up show higher levels (M= 14.25; DS=1,67) compared to the initial phase (M=11.5; DS= 1,67) (F= 49; p >.001).

No statistically significant differences were found between the first and second assessment, however with the performance of the scores we can verify after treatment that the subjects show levels of depression faster than initial trend with a decrease of extraversion, while they seem to slightly improve levels of anxiety.
Degenerative spine disorders in chronic spinal cord injury

Dr. Veronika Hysperska¹, Dr. Renata Hakova¹, Dr. Jiri Kriz¹
¹University Hospital Motol, Prague, Czech Republic

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction
Degenerative changes of chronically overused segments develop frequently after spinal cord injury (SCI). The upper extremities are most often involved but the spine may also be affected. We present a case study of chronic SCI patients with clinically manifested degenerative changes of the spine below the level of injury.

Patients and methods
SCI patients are at a higher risk of degenerative changes compared with the healthy population. It is caused by long-term sitting in a wheelchair as well as the loss of trunk muscle tone and compensatory hypermobility of spinal segments close to the spine stabilization surgery. Pathologies below the level of injury manifest themselves by a non-specific clinical picture created by sensory deficit. Obtaining laboratory and imaging data is essential for diagnosis.

Results
During the last 3 years we observed 4 patients with spinal cord lesions NLI C8-T9, AIS A and C who suffered worsening of neuropathic pain or increase in spasticity or autonomic dysreflexia symptoms. Degenerative lumbar spine changes with stenosis or instability were found to be responsible for these symptoms. After surgery, symptoms were abated in all 4 patients. The temporary limitation of activities, self-sufficiency and quality of life considerably improved.

Conclusions
The aforementioned symptoms may be the only warning sign of ongoing complications in a chronic SCI patient. After excluding the most frequent complications such as urinary tract infections or pressure sores, degenerative changes of the spine below the level of injury should be considered.
Memory Complaints and Cognitive Dysfunction in Patients with Cervical Spinal Cord Injury

Miss Jihyang Kim1, Ms. Soo-Yeon Kim2, Mr. Hyun-Yoon Ko3

1Rehabilitation Hospital and Department of Rehabilitation Medicine, Pusan National University Yangsan Hospital, Yangsan, South Korea, 2Rehabilitation Hospital and Department of Rehabilitation Medicine, Pusan National University Yangsan Hospital, Pusan National University School of Medicine, Yangsan, South Korea, 3Rehabilitation Hospital and Department of Rehabilitation Medicine, Pusan National University Yangsan Hospital, Pusan National University School of Medicine, Yangsan, South Korea

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Several investigators have reported that 10% to 60% of individuals with spinal cord injury (SCI) demonstrate cognitive dysfunction in the areas of attention, concentration, memory, abstract reasoning, verbal learning, and information processing. The aim of this study is to investigate the cognitive characteristics of patients with cervical SCI above C6. Methods: Twenty-four cervical SCI above C6 (20 men, 4 women; age range 47-83, mean age 60.67) and 25 healthy control (14 men, 11 women; age range 47-83, mean age 60.76) participated in the study. Patients with AIS A were 9 (37.5%), and incomplete injuries (AIS B, C, D) were 15 (62.5%). Subjective memory complaints were reported by one simple question, “Do you have problems with your memory?” Comprehensive neuropsychological tests to evaluate the various kinds of cognitive domains. SCI group was higher in the ratio of men and depression score. Therefore, sex ratio and depression score were controlled as a covariate in the statistical analysis (ANCOVA). Results: The patients with cervical SCI complained of subjective memory deficit and depression more than healthy control group. Both groups showed normal cognitive functions with cognitive tests except for delayed recall tests of verbal memory assessment. The patient group, however, showed significantly lower performance in verbal memory and frontal/executive functions than healthy control group. Conclusion: We concluded that the patients with cervical SCI need intervention not only in the mental health functioning but also in the cognitive functioning, especially for verbal memory, and frontal/executive functions.
Obesity in spinal cord injury

Dr Yannis Dionyssiotis¹,², Professor Georgios Lyritis²,⁵, Dr Grigoris Skarantavos³,⁴, Professor Panayiotis Papagelopoulos³

¹PRM Department, European Interbalkan Medical Center, Thessaloniki, Greece, Thessaloniki, Greece, ²Faculty of Medicine, University of Athens, Greece, Kifissia, Greece, ³1st Department of Orthopaedics, General University Hospital ATTIKON, Athens, Greece, Athens, Greece, ⁴Rheumatology and Metabolic Bone Diseases Unit, General University Hospital ATTIKON, Athens, Greece, Athens, Greece, ⁵Hellenic Osteoporosis Foundation, Kifissia, Greece, Kifissia, Greece

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Obesity is a common complication of spinal cord injury (SCI). The purpose of this study was to assess obesity by anthropometric and densitometric measurements in SCI. Methods: Thirty-one complete SCI (AIS A) separated according to the neurological level in group A (n=16, high paraplegia: above the seventh thoracic neurological levels) and group B (n=15, low paraplegia) were compared with 33 controls. For the assessment of obesity we used body mass index (BMI) and dual energy X-ray absorptiometry (DXA, Norland) to study all subjects. Using the DXA method we calculated the total body fat in grams (fat mass). Results: BMI values for paraplegic population were statistically lower compared to control group (p=0.025) and within the normal range of BMI. However, the comparison according to neurological level of injury revealed a significant difference between high paraplegics and controls (p=0.021). Using DXA fat was increased in body composition in paraplegics compared with controls (p<0.05). The correlation of BMI with fat mass was statistically significant paraplegics and controls (r=0.57, p=0.0001 and r=0.73, p=0.0001, respectively). In paraplegics total fat measured by DXA was increased at any given BMI value compared to the control group (r²=0.3 vs. r²=0.54, respectively). Further analysis between the two paraplegic groups showed a significant correlation between BMI and fat mass only in the group of low paraplegia (r=0.72, p=0.004). Conclusions: The BMI is often used as a measure of obesity but assess body composition inadequately. The whole body DXA gives valuable clinical information regardless of the neurological level of injury.
Introduction

Patients with spinal cord injury (SCI) complain of cold sensations in their extremities. It is unclear if these sensations are related to neuropathic pain or are caused by a change in perception of cold stimuli. Literature describes non-painful abnormal sensations being present in 25 percent of traumatic SCI patients. The prevalence of disturbing cold sensations is not known.

Objective

This research focuses on the prevalence of the symptoms of (disturbing) cold sensations in SCI patients and characteristics of this population.

Method

An online questionnaire was filled out by 75 SCI patients.

Results

48 questionnaires were returned. They were all from chronic (>6 months) patients, most were traumatic (40) and had a complete lesion (27). 31 patients reported complaints of cold sensations, most of them had complaints in their lower extremities. Cold weather, low blood pressure and psychological stress had a negative effect on the complaints. In 11 out of 22 cases the location of the neuropathic pain and the cold sensations overlapped.

Conclusions

Cold sensations have a prevalence of 64%, among chronic patients with mostly traumatic lesions. The cold sensations may be related to cold weather and neuropathic pain. Further research is necessary to access the role of temperature regulation and to develop an effective treatment.

Clinical message

Cold sensations in extremities are a common complaint in SCI. Environmental temperature is likely to contribute to the severity and there may be a relation to neuropathic pain.
Running through the veins- Incidence of venous thromboembolism (VTE) in a Supra-Regional Spinal Injury Centre in UK.

Dr Rohit Bhide¹, Dr K Mathew¹, Dr Ram Hariharan¹, Dr Rhona Maclean², Mr Pradeep Thumbikat¹

¹Princess Royal Spinal Injuries Centre, Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, United Kingdom ,
²Haematology, Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, United Kingdom

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Background: Recent studies place the incidence of VTE in SCI between 10% and 30%. Prophylactic anticoagulation for circa 3 months is now routine at most centres.

Methods: We analysed administrative data to identify tests carried out to detect VTE for all inpatient admission episodes for the year 2015. Total number of scans and positive results were explored in depth. Root cause analysis of positive scans and their impact on rehabilitation were assessed.

Results: 43 scans (24 CTPAs, 18 Dopplers, 1 MRV) in 37 patients were performed from a total 649 (266 initial, 383 repeat) admission episodes to the centre. 11 patients (29.7%) (8 initial, 3 repeat admissions) with VTE [5 positive scans (4 CTPAs, 1 Doppler) and 6 equivocal scans (3 CTPAs, 3 Dopplers)] were identified, who received therapeutic anticoagulation. Gender distribution was approximately equal (males 55%) and median age was 58 years. VTE occurred on average 54 days post-admission and 151 days post-injury, with only one patient noted to have equivocal Doppler 456 days post-injury (345 days post-admission).

Conclusion: Incidence of VTE in SCI population (1.7%) in this study is slightly high compared to normal population, but not alarmingly so. It is lower than the previously published data from this centre (Thumbikat et al. 2002) and other recent studies. We identified a significant difference in incidence of VTE between newly injured patients and readmissions. The current practice of administering 3 months of prophylactic anticoagulation is reasonable given the rarity and unpredictability of VTE occurrence beyond this period.
Spinal Cord Injury complications: two years observational study in a Portuguese Rehabilitation Center

Dr Carlos Ernesto Pereira¹, Dr Maria Pais Carvalho², Dr Anabela Ferreira¹

¹Centro de Medicina de Reabilitação de Alcoitão, Cascais, Portugal, ²Centro Hospitalar Tondela-Viseu, Viseu, Portugal

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction
Spinal cord injury is a complex condition with repercussion in a wide range of body functions. Rehabilitation center physicians will always have to deal with complications attributed to this condition. In this study, we wanted to know what is the reality of SCI complications at our center, Centro de Medicina de Reabilitação de Alcoitão (CMRA),

Methods
Observational study, using discharge data from every SCI patient discharged from Rehabilitation Service for Adults 1, at CMRA, in the period between January 1st 2014 and December 31st 2015.

Results
A total of 322 individual discharge summaries were analyzed, 195 from men, 127 from women. Mean age was 53,1 (±17,6), most frequent level was cervical (42,8%), followed by thoracic (41,6%) and mean inpatient rehabilitation program duration was 68,9 (±44,8) days. With a mean of 1,2 (±1,1) complications per admission, 33,8% had no reference to occurrence of complications. In the remaining, urinary tract infections were the most common (136 cases).
The number of complications was correlated with age (p<0,05) and length of admission (p<0,01).

Conclusion
Good practice in rehabilitation of SCI patients requires being aware of complications one will probably encounter during the rehabilitation program. This study allows us to better understand some of the challenges we face everyday in our current practice, helping us to be prepared to deal with them.
Semen and sperm quality in patients with Spinal cord injury: Literature review

Dr Aram Mashoof Fard, Dr Chalil Vinod, Mr Surendra Bandi

Salisbury NHS Foundation Trust, Salisbury, United Kingdom

Introduction: The majority of men with spinal cord injury (SCI) are infertile because of a combination of ejaculatory dysfunction, impaired spermatogenesis, and poor semen quality.

Objective: This study is looking at the effect of SCI on the quality of semen and sperm.

Method: This study is a literature review of major biomedical databases (EMBASE and MEDLINE). Search strategies were used to accommodate appropriate MeSH and free text terms.

Results: Most men with SCI have normal sperm count but abnormally low sperm motility. In a study (n=388), the overall prevalence of azospermia was 7.0%.

There were significant differences in the percentages of motile sperm, normal morphologic sperm, and sperm DNA fragmentation between the infertile men with SCI and the control group (P<0.05 and P<0.01).

It has been reported that sperm concentration decreased slightly with time. Completeness of SCI and semen collection method are other risk factors influencing semen quality.

Many inflammatory proteins were identified in seminal plasma of men with SCI. These studies suggest an immunological basis for abnormal semen quality in men with SCI.

Conclusion: It is well established that semen quality of semen with SCI is poor. These changes can be seen as early as 2 weeks after injury. These changes may be explained by accessory gland dysfunction, long ejaculatory abstinence periods and possibly by position-generated heat stress. Further studies are needed to elucidate the mechanisms of diminished sperm quality with a focus on improving the testicular environment in these men.
Sexual function dysfunction in women with spinal cord injury and its impact on quality of life: an Indian scenario

Dr Shipra Chaudhary¹, Dr Neha Singh²
¹Dept of PMR, PGIMER & Dr RML Hospital, New Delhi, New Delhi, India, ²Dr, Neha, India

Introduction: Sexual function is tremendously affected by spinal cord injury (SCI) in both men and women. Sexuality is identified as a very important aspect of life, and restoration of sexual function may have a significant impact in the rehabilitation process and may improve quality of life.

Methodology: An ongoing cross-sectional study in which 30 women with SCI with duration of injury more than 1 year, attending our OPD for regular follow up were interviewed using a semi structured Performa. Performa included the question regarding the demographic profile, injury profile and in reference to sexual function and satisfaction with sexual life. Also SCIM and WHO –QoL Bref were applied to each patients.

Result: Mean age of the women with SCI was 37 years. Twenty one patients were married while five were abounded by their spouse. Most of the women with SCI have decreased desire, arousal and lubrication during sexual activity. There is significant negative impact of SCI in female sexual life, with a marked reduction of sexually active women, as well as significant decrease in the frequency of sexual intercourses and in the ability to achieve orgasm. Satisfaction with sexual life is also decreased after SCI.

Discussion: In our study SCI has a significant impact on sexual functioning of the women however; ability to do activity of daily living and mobility appears to be a prime concern, which along with bowel and bladder dysfunction more strongly affects the quality of life.
Assessment of nurses knowledge and perceived barrier to express pressure ulcer care/management practice in India—a cross section study

Dr Shipra Chaudhary

Dept of PMR, PGIMER & Dr RML Hospital, New Delhi, New Delhi, India

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: Despite the existence of international guidelines and extensive evidence regarding their cause and prevention, pressure ulcers (PU) still occur in significant numbers. Management of hospital-acquired PU is an essential aspect of nursing practice that requires knowledge of risk assessment, prevention, identification, and treatment strategies. The aim of this study was to assess nurses’s knowledge of PU management to identify knowledge gaps and barrier which affect successful PU care.

Method: It was a multicentric cross section study. Two hundred nurses from four tertiary care hospitals in Delhi participated in this study. The participants completed a semi structured Performa and Pressure Ulcer Knowledge Test (PUKT). This test comprises of 47-items to examine the knowledge on PUs prevention, staging, and wound description. A cutoff score of 90% of participants answering an item correctly was used to gauge “adequate” knowledge level.

Results: Twenty-six questions (53%) were answered correctly by 90% or more of participants, and 6 questions were answered correctly by 50% or less, identifying important knowledge deficits. The mean PUKT score was 79%; Approx 1.8% achieved a score of 90%. There were small but significant positive effects of years of nursing experience on the knowledge scores. In-service training was the second source of education on pressure ulcer, coming after university training. Shortage of staff and lack of time were the most frequently cited barriers to carrying out pressure ulcer risk assessment, documentation, and prevention.

Conclusion: Our results identified deficits in PU knowledge and areas where nurses would benefit from focused education strategies.
Biofeedback to increase pressure relief movements during wheelchair sitting: a systematic review with behaviour change technique coding

Luke Brennan², Marianne Mullane², Associate Professor Jillian Swaine¹,²
¹University Of Notre Dame Australia, Fremantle, Australia, ²University of Western Australia, Perth, Australia

INTRODUCTION One international guideline for pressure ulcer prevention is to reposition every 15 minutes when sitting. External visual, auditory or tactile biofeedback may compensate for altered sensory feedback, by prompting repositioning. The primary aim of this systematic review is to determine if biofeedback changes the repositioning activities of people who use wheelchairs. METHODS: The Cochrane systematic review of interventions procedures were followed with protocol PROSPERO registration #CRD42016032644. To identify standardised behaviour change techniques (BCTs) in the interventions; two reviewers were trained in the taxonomy of BCTs. RESULTS: Four hundred and twenty-one studies were identified and screened. Six studies met the inclusion/exclusion criteria but only one was a clinical trial. The clinical trial involved 422 ICU patients who were non-randomised and its intervention used continuous bedside pressure mapping (biofeedback) in addition to pressure injury prevention (PIP) practice to cue nurses to change the patients’ positions. The control group received PIP only. The primary outcome was the development of a Stage 2-4 pressure injury. The intervention group had proportionately fewer PIs as compared to the control group (χ²= 5.6, p=0.02). There was high risk of bias in 3 of the 6 criteria. There were 4 BCTs identified in this intervention: action planning, biofeedback, prompts/cues and adding object to the environment. CONCLUSIONS: There was no evidence for biofeedback affecting behaviour change in persons who use wheelchairs and limited for caregivers. Four BCTs were identified for use with caregivers.
Healthcare professionals’ views on prevention of pressure ulcers in spinal cord injury in Switzerland

Mrs Nadia Lustenberger1, Miss Claudia Zanini1,2, Mrs Mirjam Brach1, PhD, MD Stefan Essig1,5, Prof, PhD Armin Gemperli1,2, MD Hans Georg Koch3, MD Anke Scheel-Sailer4, Prof, MD Gerold Stucki1,2, PhD Sara Rubinelli1,2
1Swiss Paraplegic Research AG, Nottwil, Switzerland, 2Department of Health Sciences and Health Policy, University of Lucerne, Luzern, Switzerland, 3Swiss Paraplegics Association, Nottwil, Switzerland, Nottwil, Switzerland, 4Swiss Paraplegic Centre, Nottwil, Switzerland, Nottwil, Switzerland, 5Institute of Primary Care and Community Care, Lucerne, Switzerland, Luzern, Switzerland

Introduction:
Individuals with spinal-cord-injury (SCI) frequently suffer from deep pressure-ulcers (PU), which impact quality of life and generate high costs. Although the Swiss healthcare system offers a wide range of services to prevent PU, the prevalence among person with SCI is high. The aim of this presentation is to identify the barriers to preventing and reacting to PU for persons with SCI living in the community, from the perspective of healthcare professionals.

Methods:
Explorative study based on 25 semi-structured interviews with healthcare professionals working in specialized clinics, in care facilities and in homecare services. The verbatim transcripts of the interviews were analyzed using inductive thematic analysis.

Results:
The analysis highlighted that PU prevention can be hindered by a) unforeseen sudden events; b) desire to live a “normal” life which includes the skin being exposed to lesion risks; c) inability to adapt routine to evolving needs; d) psycho-social factors and e) biological factors. The barriers of reacting adequately to an early stage PS can be categorized in three groups: a) the underestimation of long-term consequences if short-term actions are not taken; b) suboptimal organization of the healthcare services; and c) personal choices.

Conclusion:
Prevention of PU can be improved by a) increasing the individual’s acceptance; b) fostering forward-thinking self-care and care-giving; and c) intensifying the knowledge exchange among healthcare professionals and people with SCI. Specialized counselling services on a regional level can avert the worsening of minor PU by early acting in collaboration with specialized caregivers, homecare services and ISC individuals.
When a pressure ulcer is not a pressure ulcer - Management of complex wounds in SCI - a Sheffield experience

Dr Rohit Bhide¹, Dr Kidangalil Mathew², Dr Ram Hariharan¹, Mr Pradeep Thumbikat¹

¹Princess Royal Spinal Injuries Centre, Northern General Hospital, Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, United Kingdom

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Background: Although the principles of pressure ulcers (PU) management in SCI patients are well known, complex wounds (CW) can masquerade as PU and do not respond well to conventional approaches due to unrecognised factors contributing to non-healing. Published evidence is lacking on the management of such wounds.

Methods: The authors present a case-series review of CW and highlight some unusual cases.

Results: Data relating to all patients who underwent surgery over a two year period was analysed and a variety of reasons for non-healing/persistence of PU were identified.

A left ischial pressure ulcer, which had persisted for several years despite previous surgical and conservative management, is discussed. CT pelvis demonstrated the ulcer tracking along the pubic rami into the left penile shaft. After ruling out urethral fistula by cystoscopy, multiple staged debridements were undertaken to excise tissue down to the penile base to facilitate wound healing. Associated pelvic osteomyelitis was treated. Following improvement in the wound condition, surgical closure was undertaken which resulted in complete wound healing. Other potential causes for persistence of PU including urethral and rectal fistulas, neurofibromas, infected joints and heterotopic bone are presented.

Conclusion: There is a small but significant proportion of pressure ulcers that fail to respond to conventional treatment strategies. This may be due to unrecognised factors masked by the ulcer. Unless these causes are identified and treated, these CW tend to recur. Excellent results are obtained through a systematic approach involving treatment of the underlying problem, staged debridement and closure when ready. Importance of appropriate imaging modalities is emphasised.
Long Term Treatment for up to 5 years of Tolerance to Intrathecal Baclofen with Pulsatile Bolus Infusions (PBI)

Dr Páll Ingvarsson¹, Dr Gudbjörg Ludvigsdottir¹²
¹Landspitali University Hospital, Department of Rehabilitation Medicine, Reykjavik, Iceland, ²Department of Medicine, Iceland University, Reykjavik, Iceland

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Aim: To investigate the long term effects, up to 5 (mean = 4,4) years, of intrathecal drug treatment with Pulsatile Bolus Infusions (PBI mode), with repeated bolus doses every 4 hours, according to Heetla et al. (Spinal Cord, 2010 Jun; 48(6):483-6).

Methods: A retrospective case-control study. 14 of in all 15 Icelandic patients, that were treated against spasticity of varying etiology (4 with SCI, 3 with MS) with >300 µg/day of either intrathecal Baclofen (10 patients) or a Baclofen-Morphine mixture (4 patients), accepted to change from Continuous Mode (CM) to PBI mode of drug delivery. Drug doses and responses to CM and PBI were compared.

Results: Initial response (after 1-2 years of treatment) was Good (4 cases) or Excellent (5 cases) in 9 of the 14 participants, and this treatment remained effective with 10% average increases in daily doses during 4,3 years of PBI treatment, compared to a mean increase of 138% during on average 7 years of CM treatment. Drug response was variable in the non-responders, but a mean dose increase of 205% during on average 3,4 years in the CM mode decreased to 60% during 4,5 years of PBI mode treatment.

Conclusion: Response improved dramatically and much less tolerance was seen in 64% (9/14) of the patients in this small pilot study. In the remaining 5 patients (36%), response was variable, but development of tolerance (i.e. daily dose increase) was much less. This implicates that the PBI mode of intrathecal Baclofen treatment deserves a much more widespread use.
Spasms identification using isokinetic dynamometer in patients with spinal cord injury

**Miss Rani Alves**, Mrs Elizângela Abreu, Mr Sérgio Freitas, Mrs Fernanda Lima, Mr Mário Lima

Instituto Nacional de Telecomunicação, Santa Rita do Sapucaí, Brazil, Universidade do vale do Paraíba, São José dos Campos, Brazil

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction: The spasms are involuntary contractions that represent a symptom of spasticity, common in paralyzed muscles by a spinal cord injury (SCI). Spasticity can be measured using an isokinetic dynamometer to calculate the peak resistive torque while moving the limb passively. The aim of the study was to identify the occurrence of spasms during passive knee motion of individuals after SCI with different ASIA ratings.

Methods: 13 volunteers with traumatic SCI were classified according to the degree of impairment (ASIA scale) and the degree of spasticity according to the Ashworth modified scale. Three physical assessments were conducted for each volunteer. Each physical assessment involved the capture of isokinetic dynamometer signals to determine the resistance to passive movement for seven replicates of knee extension/flexion of the lower limb most affected by spasticity. The volunteers were grouped into 3 groups: normal (no spasms), random occurrence and spasms. Average of maximum peak torque values was calculated. Statistical analysis was performed with variance test Kruskal-Wallis, post-test Dunn and Pearson. The level of significance was of p <0.05. Results: It was found in the signs of isokinetic dynamometry the occurrence of spasms, with the considerable increase in torque produced by the muscle groups flexors and extensors. No significant values were found among the three physical assessments for resistance to passive movement. Conclusions: It was possible to identify spasms occurrence by isokinetic dynamometer during passive movements and there were found significant differences for group normal compared to others. Spasms occurrence was statically correlated to ASIA scale.
Unidentified acute drug tolerance in complete paraplegia treated with intrathecal baclofen (ITB) therapy: a case report.

Dr Yosuke Iwamoto¹, Dr Naohisa Miyakoshi¹, Dr Toshiki Matsunaga², Dr Michio Hongo¹, Dr Yuji Kasukawa¹, Dr Yoshinori Ishikawa¹, Dr Daisuke Kudo¹, Dr Klmio Saito³, Dr Norimitsu Masutani¹, Dr Takashi Mizutani³, Dr Ryota Kimura¹, Dr Junpei Iida¹, Dr Yasuhiro Takahashi¹, Dr Yoichi Shimada¹

¹Department of Orthopedic Surgery, Akita University Graduate School of Medicine, Akita, Japan, ²Department of Physical Medicine and Rehabilitation, Akita University Hospital, Akita, Japan

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

【Purpose】To report unidentified acute drug tolerance in complete paraplegic patient treated with intrathecal baclofen (ITB) therapy.

【Case】A 61-year-old male affected by severe complete spastic paraplegia due to thoracic pyogenic spondylitis showed acute drug tolerance to ITB after 1 year and 7 months of treatment. Suddenly, a stable dosage of 180μg/day appeared to be inadequate to relief his spasticity. There was no apparent evidence of additional diseases, progression of neurological status, catheter leakage, or pump failure. The daily dosage was then increased to 295μg/day without stable decrease in spasticity. Thus the mode of administration was changed (“continuous” to “flex”) and a slow and progressive decrease of the daily dosage was performed to 195μg/day by 5% each 7 days while the clinical condition was monitored. The patient reached a complete withdrawal of the baclofen administration experiencing the same spasticity and motor performance he experienced at the beginning of his therapy with ITB. A stabilized daily baclofen dosage of 195μg/day was then reached to maintain the same improvement of spasticity that the patient had experienced before the onset of drug-tolerance, and continued over 5 years after the onset of drug-tolerance.

【Discussion】The factors of the rapid increase of spasticity during ITB therapy is mainly catheter or pump trouble. This is a case of long-term onset of this phenomenon without any system trouble. Flex infusion of ITB seems to be an effective treatment strategy to reverse the need for increasing ITB dosages in patients with the probable diagnosis of tolerance to ITB.
Development and Validation of a Simplified Sub Axial Cervical and Thoracolumbar Spine Fracture Classification System

Dr Harvinder Chhabra¹, Dr Srinivasa N Moolya¹, Dr P K Kartik Yelamarthy¹

¹Indian Spinal Injuries Centre, New Delhi, India, ²Indian Spinal Injuries Centre, New Delhi, India, ³Indian Spinal Injuries Centre, New Delhi, India

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Aim: To develop and validate a simplified subaxial cervical and thoracolumbar spine fracture classification system.

Methods: Based on experts’ clinical consensus conducted by senior author and his own experience, algorithmic approaches for management of sub-axial cervical & thoraco-lumbar trauma were developed and the Allen Ferguson as well as Denis classifications were modified to develop a simplified classification system that could guide management. Face and content validity of classification was done through circulation y email amongst members of ISCoS Spine Trauma Study Group. Construct validation was then done in two stages. First stage involved analyzing if management of 30 cases each of cervical and thoracolumbar vertebral fractures as suggested by proposed classification system matched that of experts. Second stage was a 1 year prospective study analysing if management suggested matched management actually carried out at our centre.

Results: In first stage there was 100% and 87.9% agreement between management proposed by experts and that suggested by proposed classification for subaxial cervical spine and thoracolumbar fractures respectively. In second stage, there was 95.23% and 100% agreement between management as carried out and that proposed by classification for subaxial cervical spine and thoracolumbar spine fractures respectively.

Conclusion: Proposed classification system can effectively help in classifying subaxial cervical and thoracolumbar spinal injuries as well as guide management. The classification is especially useful for less developed countries since only plain radiographs could help classify vast majority of cases. Next phase of validation involves reliability study followed by prospective application of classification system for developing global acceptance.
Efficacy of expansive laminoplasty for quadriplegic patients without cervical bony injury

Dr Young Woo Chung, Dr Sung Kyu Kim, Dr Tae Min Lee, Dr Hyoung Yeon Seo
Chonnam National University Hospital, Gwangju, South Korea

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Introduction
The main aim of surgical treatment for cervical injury with spinal cord damage is to maintain a stability of vertebral column by locating damaged spine to normal position and fixing the location to achieve decompression.

Methods
We picked 25 emergency room patients who showed quadriplegia after trauma between 2003 and 2013. Spinal cord compression was observed on MRI from the patients and expansive laminoplasty was operated on them. Clinical outcomes such as the grade of spinal cord edema on MRI before the operation, postoperative neurological changes, respiration state, complications and survival periods were analyzed.

Results
The emergency room patients’ motor index score was 23 in average (4-30), during follow-up periods the average score was changed to 29 (4-43). There was no significant neurological recovery except two subjects. The average time to have an operation after the injury took 26 hours (9-72 hours). 4 patients showed paradoxical respiration when they first admitted emergency room and the symptom continues after the operation and during follow-up periods. Another 4 subjects showed paradoxical respiration 2 days after the operation due to muscular fatigue. In the follow-up period, 6 patients died due to respiratory failure within 1 year after the surgery.

Conclusions
It is thought to be the efficacy of expansive laminoplasty for the quadriplegic patients without cervical bony injury is limited. In many patients, no significant neurological recovery was observed but it was clearly identified that prognosis was related to the grades of spinal cord edema and paradoxical respiration.
Long Term Patient Reported Clinical Outcomes in Patients with Type-II Odontoid Fractures

Dr Michael Haak\textsuperscript{1}, Dr Ryan Martin\textsuperscript{1}, Dr Michael Rutter\textsuperscript{1}, Dr. Benjamin Wagner\textsuperscript{1}

\textsuperscript{1}Geisinger Health System, Danville, United States

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

This is a study of patients with C2 (Odontoid fractures) treated both operatively and non-operatively comparing patient reported outcomes utilizing validated outcomes measures.

Methods: Single center retrospective case review of all Type II Odontoid fractures treated at Geisinger Medical Center from 2006-2015 were assessed for injury demographics, comorbidities, and treatment complications. All patients were contacted and surviving patients were administered the Neck Pain Disability (NDI) Questionnaire, Visual Analogue Scale (VAS) pain survey, and SF-12 Health Survey.

Results: A total of 38 patients (20 operative, 18 non-operative) completed the surveys. The average time from injury to survey completion was 36 months. At an average of 3 years post injury the patient recorded function was not significantly different for operative and non-operative patients.

Conclusions: Functional outcomes as reported by patients utilizing validated instruments did not demonstrate significant differences between patients treated for Type-II Odontoid fractures with either surgical stabilization or operative treatment. Significant mortality occurred in both groups.
Morphology of donor and recipient nerves utilised in nerve transfers to restore upper limb function in cervical spinal cord injury

Professor Mary Galea¹, Dr Aurora Messina¹, Dr Natasha Van Zyl², Dr Michael Weymouth², Dr Stephen Flood², Ms Catherine Cooper², Ms Jodie Hahn²
¹The University Of Melbourne, Parkville, Australia, ²Austin Health, Heidelberg, Australia

Poster Viewing with refreshments. 2, Exhibition/Poster/Catering Area, September 15, 2016, 9:50 AM - 10:45 AM

Background and aim: The loss of hand function after cervical spinal cord injury (SCI) has an enormous impact on independence. Multiple nerve transfer surgery has recently been applied successfully to restore some critical arm and hand functions. In this study we directly assess the morphology of nerves and muscles available for biopsy at the time of surgery. Our objective was to document the various morphologic features observed from donor and recipient specimens to determine whether they correlate with the indirect measures and to what extent they predict outcomes after surgery.

Methods: Nerve and muscle samples were collected from 3 patients (C5 AIS B, C4 AIS A, C4 AIS B), fixed in 2.5% Glutaraldehyde, processed and embedded in Araldite Epon. Semi-thin sections were cut, mounted onto slides, and stained with Methylene Blue for light microscopy. Nerve specimens included the nerves to supinator, brachialis, teres minor and triceps, the posterior interosseus nerve, anterior interosseus nerve and the posterior branch of the axillary nerve. Muscle specimens were taken from supinator and triceps.

Results: Approximately 80% of all nerves showed abnormalities. Most common were reduction of axon density, splitting and folding of myelin, and inflammation. Others included a thickened perineurium, oedematous endoneurium and Renaut bodies. Less common were degenerating axons and demyelinated axons. Of interest were the presence of very thin myelinated axons and foci of unmyelinated axons. Muscle samples showed advanced atrophy, disorganisation and deterioration of muscle fibrils.

Conclusions: Various abnormalities and possible regenerative efforts were noted in both donor and recipient specimens.
This study examined the outcomes of conservative management of Type II Odontoid Fractures managed with a cervical collar.

Methods: Single center case series of Type II Odontoid Fractures reviewed for injury demographics, radiographic appearance and patient reported functional outcome measures including Neck Disability Index, Visual Analog Score (pain), and SF-12 survey. A total of 69 patients were managed non-operatively.

Results: Radiographically, most of the patients (49%) developed a fibrous union; the remainder healed with bony union or developed radiographic non-union. Comparison of the patient reported outcomes did not differ between the groups.

Conclusions: Patient reported outcomes from non-operatively managed Type II Odontoid Fractures were the same regardless of radiographic outcomes - radiographically stable fibrous union may be acceptable and preclude surgical intervention.
Spinal Cord Injury and Physical Activity (SCIPA) “Switch-On”: Heterogeneity in sub-acute peripheral immune responses

Dr Jillian Clark1,2, Dr David Sharkey2, Professor Sarah Dunlop3, Associate Professor Ruth Marshall1,2, Dr Leonid Churilov4, Professor Mary Galea4

1Royal Adelaide Hospital, Adelaide, Australia, 2University of Adelaide, Adelaide, Australia, 3University of Western Australia, Perth, Australia, 4University of Melbourne, Melbourne, Australia

Background: Spinal cord trauma elicits inflammatory events, activating fundamental processes required to initiate beneficial clearance and repair. In addition to central glial-driven mechanisms, there is a growing appreciation that infiltrating peripheral immune cells favour effector cell recruitment, and can prime and amplify subsequent inflammatory responses. Excessive inflammation has detrimental consequences, contributing to tissue injury, generating central sensitisation, and undermining the occurrence of plasticity and its shaping by physical activity.

Aims: To examine: i) endogenous inflammatory immune responses after spinal cord injury; and ii) relationships between injury–inducible inflammatory processes and physical activity.

Methods: This multi-centre, assessor-blinded Phase I/II trial (SCIPA “Switch-On”) randomised participants (AIS A-C, above T12) to functional electrical stimulation [FES-C], or passive cycling [P-C]; 4 h.p.w; 4-16 weeks post-injury. Magnetic bead microarray assay determined cytokine/chemokine (TNF-alpha, IL1-beta, IL-6, IL-10, CCL2, CCL5, CX3CL1, CXCL8, GM-CSF, VEGF), BDNF, MPO and cathepsin D concentrations in blood specimens obtained at post-injury weeks 4, 5, 6, 7, 8, 10, 12, 16.

Results: 24 subjects, 19 male participated. Regarding our a priori hypothesis, TNF-alpha and BDNF were increased significantly (baseline vs. weeks 8, 10, 12; p<0.01; p<0.01; p<0.05; baseline vs. weeks 10, 12, 16 p<0.000; p<0.01; p<0.05, respectively). No significant difference was detected for other proteins examined.

Conclusions: We report marked heterogeneity in peripheral inflammatory and trophic factors. Peripheral BDNF may counter the detrimental effects of inflammation on local BDNF expression, attenuating CNS sensitisation to triggering events that amplify inflammatory responses.
Pretreatment with gamma-secretase inhibitor prevents tumor-like overgrowth in human iPSC-derived transplant for spinal cord injury

**Dr Toshiki Okubo**, Dr Akio Iwanami, Dr Jun Kohyama, Dr Narihito Nagoshi, Dr Go Itakura, Dr Morio Matsumoto, Dr Hideyuki Okano, Dr Masaya Nakamura

1Department of Orthopaedics Surgery, Keio University School of Medicine, Tokyo, Japan, 2Department of Physiology, Keio University School of Medicine, Tokyo, Japan

Topical Papers 4, Festsaal (Plenary), September 15, 2016, 10:50 AM - 11:55 AM

Introduction

We previously reported that transplantation of certain neural stem/progenitor cells derived from human iPS cells (hiPSC-NS/PCs) into the injured spinal cord results in tumor-like overgrowth and subsequent deterioration of motor function. Remnant immature NS/PCs must be removed or induced into more mature cell types, which may avoid tumor-like overgrowth following transplantation. Notch signaling controls the neural induction of NS/PCs, and inhibition of this signaling with gamma-secretase inhibitor (GSI) induces NS/PCs to develop into a more mature state with limited proliferation. The purpose of the present study was to elucidate the effects of GSI on tumorigenic hiPSC-NS/PCs.

Methods

hiPSC-NS/PCs, a potentially tumor-like overgrowth cell line, were cultured with GSI. Immunocytochemistry and microelectrode array were performed to compare their characterizations. Cell cycle/apoptosis analyses were also performed using flow cytometry, and global analyses of the gene expression profiles were performed by DNA microarray and RT-PCRs. Next, we performed contusive spinal cord injury (SCI) in mice and transplanted hiPSC-NS/PCs pretreating with or without GSI nine days after SCI. The survival and growth of transplanted cells was examined with bioluminescence imaging and immunohistochemistry. Behavioral analyses of motor function were performed by BMS score.

Results and Conclusion

Pretreating hiPSC-NS/PCs with GSI promoted neuronal differentiation and maturation in vitro, and in vivo GSI pretreatment reduced the tumor-like overgrowth of transplanted hiPSC-NS/PCs, inhibited deterioration of motor function and long-lasting functional recovery. These results indicate that pretreatment of hiPSC-NS/PCs with GSI control their proliferative capacity, triggers neuronal commitment, and improves the safety of hiPSC-based approaches to regenerative medicine.
Intramuscular cell implant in muscles with electromyography recovery in SCI patients previously treated with neural progenitor cells and intensive rehabilitation

Professor Maria Teresita Moviglia Brandolino¹, Dr Damian Couto¹, Dr Samanta Picone¹, Professor Gustavo Albanese¹, Professor Gustavo Moviglia¹

¹Universidad Maimonides, Ciudad Autonoma De Buenos Aires, Argentina

Introduction:
Between June 2013 and December 2015 six previously chronic and complete SCI patients were part of a clinical trial consisted of neural progenitor cells implant (each one received 3 implants, one each 12 months) and intensive rehabilitation program. During 2015 6/6 patients showed Electromyography recovery in muscles that were previously affected by the lesion. Despite this, muscular atrophy caused by previously denervation persisted. Looking forward to improve muscular trophism and contractile capacity we performed intramuscular cell implant in muscles with electromyography recovery.

Method:
In January 2016, 6 SCI patients who recovered electromyography register after neural progenitor cell implant received intramuscular cell implant. The implant consisted in a co culture of autologous muscular progenitor cells and effector T lymphocytes. Muscles that recover electromyography activity in response to voluntary order were selected. Using ultrasound guide cells were injected in between muscle fibers. Each muscle received 2-4 implants. All patients continued with the rehabilitation program

Results:
All implants were well tolerated. Implanted muscles showed: volume increase, improvement in strength and range of motion and ultrasound changes. The first changes were observed after three weeks; they persisted and improved after consecutive muscular implants.

Conclusion:
In previously denervated muscles, even thought muscular electrical activity associated with voluntary order has been recovery, improving muscular conditions is absolutely necessary to get a functional response. To achieve this goal, intramuscular cell implant seems to be effective. The amount of muscular cell that need to be implanted depends on the muscular volume and the severity of the atrophy.
Multicentre study on comorbidities in patients >65 with acute SCI & prediction of length of stay

Dr Piera Santullo¹, Dr Gordana Savic¹, Dr Silvia Antiga³, Dr Allison Graham¹, Dr Aram Fard², Dr Chalil Vinod², Mr Surendra Bandi²
¹National Spinal Cord Injury Centre Stoke Mandevile, Aylesbury, United Kingdom, ²Duke of Cornwall Spinal Treatment Centre, Salisbury, United Kingdom, ³The Royal Hospital for Neurodisability, London, United Kingdom

Topical Papers 4, Festsaal (Plenary), September 15, 2016, 10:50 AM - 11:55 AM

Aim:
To identify the trend in admissions of patients with acute spinal cord injury (SCI) >65 years old over a period of 24 years and to investigate the variation of length of stay (LOS) using comorbidity scales.

Method:
A multicentre, retrospective, descriptive study was performed at the Duke of Cornwall Spinal Treatment Centre (DoCSTC) and the National Spinal Injury Centre (NSIC). New admissions 1991-2015 were reviewed. Comorbidities in patients >65 years old admitted in 2013 were analysed.

Results:
The number of new admissions of people >65 increased by 2.9 times at NSIC and 1.8 times at DoCSTC during the 24 year study period.

In 2013, total number of new admissions in both centres was 248 (138 at NSIC; 110 at DoCSTC). 88 patients (35%) were >65 (39 patients at NSIC; 49 at DoCSTC). Their mean age was 73.3. The average number of comorbidities was 3.2 (range 0-8). The 5 most common comorbidities were: arthritis (79%), hypertension (48%), ischaemic heart disease (36%), diabetes (23%), hypercholesterolaemia (17%). The mean Charlson age comorbidity index (CACI) was 5.9 (4-12). The mean value of estimated relative risk of death was 7.3. Regression analysis demonstrated that significant predictors for longer LOS in people >65 were: age, CACI, estimated relative risk of death and presence of ischemic heart disease.

Conclusion:
The trend in admissions of people >65 with a new SCI increased during the last 24 years. Age, CACI, estimated relative risk of death and ischemic heart disease can help in predicting the LOS.
Rasch analysis of the Graded and Redefined Assessment of Strength, Sensibility and Prehension (GRASSP)

Dr Inge-Marie Velstra1, Dr Carolina Ballert2, Dr Jörg Krebs1, Dr Marc Bolliger3, Prof MD Armin Curt3

1Swiss Paraplegic Center Nottwil, Clinical Trial Unit, Nottwil, Switzerland, 2Swiss Paraplegic Research Nottwil, Nottwil, Switzerland, 3Spinal Cord Injury Center, Balgrist University Hospital Zurich, Zurich, Switzerland

Topical Papers 5, Geheime Ratstube (Parallel 1), September 15, 2016, 10:50 AM - 11:55 AM

The GRASSP is a valid, reliable and responsive outcome measure to evaluate upper limb function in tetraplegia but generates ordinal total scores with known disadvantages.

Aims: Assessment of GRASSP properties in a metric analysis using Rasch to:
1.) transform the GRASSP subtests qualitative (QlG) and quantitative grasping (QtG) ordinal scales towards interval level scales
2.) examine the psychometric characteristics of QlG and QtG

Methods
GRASSP was recorded at 1, 3, 6 and 12 months after SCI in 74 individuals with tetraplegia. A stacked Rasch analysis was performed separately for QlG and QtG (148 observations) to assess: item independency (LID), unidimensionality, stochastic order of response categories, item and model fit, reliability and differential item functioning (DIF) for the side and exam stage.

Results
All QtG item response thresholds were disordered and therefore the 6-item scales were rescored in a 4-item version and the items jars and pegs were removed. The Person Separation Index (PSI) for ability and difficulty of the QtG rescored version was 0.93. All QlG item response thresholds were ordered and the response scales have a PSI of 0.95. The item fit for QtG rescored version and QlG was good. There was no LID found for QlG and QtG and the analyses supported the unidimensionality of the subscales. Also, QlG and QtG items did not present DIF for exam stage and side.

Conclusion
The analysis with Rasch supports that QtG and QlG scores can be modified to interval level measurements for the assessment of clinical outcomes using sum scores.
Validity and feasibility of the Impact of Spasticity Evaluation Tool (I-SET)

MD Debbie Jagers, MD PhD Goevert Snoek, MD PhD Judith Fleuren

Rehabilitation Centre Roessingh, Enschede, Netherlands

Introduction: The Spinal Cord Injury Evaluation Tool (SCI-SET) is a reliable self-assessment questionnaire designed to measure the impact of spasticity on daily life.

Objective: To assess the construct validity and feasibility of the Dutch version of the SCI-SET, called the Impact of Spasticity Evaluation Tool (I-SET).

Patients: 26 participants with spinal cord injury.

Methods: The SCI-SET was translated using forward and backward translation. Participants completed the I-SET, the Spasm frequency scale, the Spinal Cord Independence Measure (SCI-M), the 36-item Short Form Health Survey and a Visual Analogue Scale (VAS) for severity of spasticity and impact of spasticity during three activities (making a transfer, during ADL activities, changing position). Spearman’s rank correlations were used to assess the correlation between the I-SET and the other parameters. For the assessment of the feasibility, two experienced occupational therapists completed a semi-structured interview.

Results: Statistically significant moderate correlations were found between the I-SET and the VAS-severity and the VAS-impact during the three measured activities (resp. -0.569, -0.597, -0.547 and -0.603). No statistically significant correlation was found with other measures. Occupational therapists indicated that the added value of the I-SET could be the quantification of interference of spasticity during different daily activities.

Discussion and conclusion: The I-SET and the other instruments measure slightly overlapping but different constructs. Thus, they can be used complementary.

Clinical message: The I-SET is a useful instrument because it seems to measure a different construct, providing a more detailed profile of impeded activities.
INTRODUCTION. The instrumented mat GaitRite may be a useful tool to evaluate gait of spinal cord injured (SCI) subjects but it has not been validated. OBJECTIVE To evaluate criterion and construct validity and test-retest reliability of spatio-temporal gait parameters measured by GaitRite in motor incomplete SCI patients. METHODS. Twenty-three subjects with motor sub-acute and chronic incomplete SCI AIS D able to walk with or without aids who fulfilled inclusion criteria were recruited after signature of informed consent. Concurrent application of the 10 meter walking test (10MWT), 6 minute walking test (6MWT), Walking Index for Spinal Cord Injury II (WISCI-II), Spinal Cord Independence Measure III (SCIM-III) and the GaitRite assessment was held. The 10 meter walking test (10MWT) and GaitRite evaluation were performed three-times in order to determine test-retest reliability. Criterion and construct validity was assessed by measuring correlations between different scales. Demographic data, neurological status and lower extremity motor score (LEMS) were also registered. Standard error of measurement and smallest real difference were calculated. RESULTS. GaitRite offers a valid and reliable way to measures mobility, symmetry and stability of gait SCI subjects. GaitRite precision and sensitivity is approximately three times better than clinical tests. Clinical tests cannot address stability properties of gait. Subjects’ higher gait velocity is related to more independence (SCIM-III), lower use of walking aids (WISCI-II), better strength in lower limbs (LEMS) and better gait’s mobility. CONCLUSION. Spatio-temporal gait parameters measured by GaitRite are both valid and reliable. Further studies are necessary to establish sensitivity of the instrument.
Exploratory study to suggest the possibility of MMP-8 and MMP-9 serum levels as early markers for remission after tSCI

Mr Raban Heller

HTRG Heidelberg Trauma Research Group, Department of Orthopedics, Traumatology and Paraplegiology Heidelberg University Hospital, Heidelberg, Germany

Study Design: A prospective observational study reporting the correlation between matrix metalloprotein serum levels and remission after traumatic spinal cord injury (SCI).

Objectives: To investigate serum cytokine levels as predictive markers.

Setting: Germany, Rhineland-Palatinate (Rheinland Pfalz).

Methods: Between 2010 and 2015, datasets from 115 patients (33 female, 82 male) after traumatic SCI were recorded at the BG Trauma Centre Ludwigshafen. We examined the serum levels of MMP-2, MMP-8, MMP-9, MMP-10 and MMP-12 over a 12-week period, i.e., at admission and 4, 9, 12 hours, 1 and 3 days and 1, 2, 4, 8, 12 weeks after trauma. Following the same match-pair procedure as in our previous studies, we selected 10 patients with SCI and neurological remission (Group 1) and 10 patients with an initial American Spinal Injury Association (ASIA) A grade and no neurological remission (Group 0). Ten patients with an isolated vertebral fracture without neurological deficits served as a control group (Group C). Our analysis was performed using a Luminex Performance Human High Sensitivity Cytokine Panel. Multivariate logistic regression models were used to examine the predictive value of MMPs with respect to neurological remission vs. no neurological remission.

Results: MMP-8 and MMP-9 provided significantly different values. The favoured predictive model allows to differentiate between neurological remission and no neurological remission in 97% of cases.

Conclusions: The results indicate that further studies with an enlarged collective are warranted in order to investigate current monitoring, prognostic and tracking techniques as well as scoring systems.
Bladder surveillance in SCI patient with long term SPC for more than 15 years

Dr Anton Pick1, Mr J Burki1, Mr I Omar1, Mr M Hell1, Mr Frank Lee1, Dr Angela Gall1, Mr Julian Shah1, Mr Rizwan Hamid1

1London Spinal Cord Injury Centre, Royal National Orthopaedic Hospital, London, United Kingdom

Introduction:
The majority of spinal cord injured patients have bladder dysfunction and require assisted bladder emptying techniques. Clean intermittent self catheterisation is preferred, but not always possible. Many patients opt to have a suprapubic catheter. Patients with a long term urethral or suprapubic catheter are believed to be at a higher risk of bladder malignancy. No empirically based regimen for bladder surveillance has been established.

Methods:
31 patients, 14 males and 17 females, underwent routine follow up surveillance rigid cystoscopy and bladder biopsy over 15 months. Procedures were carried out under general anaesthetic or sedation. At least one biopsy was performed in every case. All patients had had a suprapubic catheter for at least 15 years.

Results:
Patients ranged in age between 35 and 84 years with a mean age of 54.00+11.16. The duration of time patients had their suprapubic catheters was between 15 and 34 years with a mean of 18.60+5.19. Histology showed benign changes in all biopsy samples with chronic non-specific cystitis in 25 patients. 3 patients showed squamous metaplasia while 2 patients had focal squamous metaplasia with mild basal atypia. Histology was reported as chronic follicular cystitis in 1 patient.

Conclusions
Despite the established increased risk of bladder malignancy in patients with a long term suprapubic catheter, routine surveillance cystoscopies with biopsies in the current study sample of 31 patients did not reveal any malignant change. Further research is required to establish an appropriate regime for bladder surveillance in this cohort of patients.
Introduction: Nutrition influences the occurrence and healing of pressure ulcer (PU) but comprehensive data of nutrition parameters (NP) in spinal cord injured (SCI) patients with PU °III and °IV are still missing. The aim of the study is to describe NP in SCI patient with deep PU and to analyse the relation between NRS and NP.

Methods: Retrospective chart analyses in a consecutive sample of patients treated for PU °III and °IV between November 2011 and December 2014 in a specialized SCI acute care and rehabilitation clinic. Descriptive, subgroup and correlation analyses were done.

Results: In total 170 patients, 42 (24.7%) women, 19 (12.2%) paraplegic and 104 (61.2%) with a traumatic SCI were included. Pathologic blood parameters were found for c-reactive protein in 82.9%, vitamin D (72.9%), protein (41.2%), ESR (41.2%), albumin (33.5%), hemoglobin (33.5%), zinc (28.8%), acidum folicum (22.4%), transferrin (15.3%), copper (1.2%) and vitamin B1 (0%). Only ESR differed significantly in patient with PU °III versus PU °IV (p=0.047). The NRS was >3 in 39.7% of all patients, whereas percentages of NRS >3 were 28.3% in patient with PU stage III and 43.5% with PU stage IV, curiously not significantly different (p=0.07).

Conclusions: We found abnormal values in nutrition parameters both in laboratory examinations and in nutritional risk assessment tools in a significant number of patients with PU. Laboratory examinations and assessments at admission can help to detect and correct nutrition deficits in patients at risk in order to optimize wound healing.
In search of cure for patients in Kuwait: medical tourism for cell-transplantation abroad.

PM&R Specialist Salem AlKandari\textsuperscript{2}, Senior Registrar Lata Prasad\textsuperscript{2}, PM&R Specialist Maitha Al Kandari\textsuperscript{2}, PM&R Specialist Unnikrishnan Ramachandran\textsuperscript{2}, Professor Andrei Krassioukov\textsuperscript{1}.

\textsuperscript{1}Icord University Of British Columbia, Vancouver, Canada, \textsuperscript{2}Kuwait Physical Medicine and Rehabilitation Hospital, Ministry of Health, Kuwait, Kuwait

Topical Papers 7, Forum (Parallel 3), September 15, 2016, 10:50 AM - 11:55 AM

Background: Kuwait National Rehabilitation Hospital is a primary rehabilitation facility in Kuwait for individuals with spinal cord injury (SCI).

Objective: To examine patients with SCI who received cell-transplantation therapies (outside of Kuwait), their pre-treatment medical records and their perception of recovery.

Methods: Retrospective pre-transplantation data analysis and post-transplantation physical examination by primary care physiatrist and independent examiner were performed after at least one year of procedure. Assessments included lesion location, standard neurological evaluation, change in disability, and patients perception on possible benefits of interventions.

Results: We examined 6 individuals with chronic SCI who underwent cell-transplantation (76±32 months post SCI) in various centers (India, Iran, Germany, China, Egypt). The majority of individuals (50%) received autologous bone marrow cell-transplantation. Most patients had poor understanding of the procedures, nature of the transplanted cells and had no supporting documents regarding treatments. 83% of patients reported perceived improvement in the following: increased deep tissue sensation below the injury (100%) or increase in bladder sensation (20%). Examination after the cell-transplantation (post-transplant assessment was at 83±40 months) revealed that none of the examined individuals demonstrated improvement in motor score. Only one individual showed recovery in two sensory levels.

Conclusion: We were not able to document clinically useful sensorimotor, disability, or autonomic improvements in individuals after cell-transplantation therapy abroad. Some cell-transplantation centers didn’t provide medical documentation on procedures and didn’t follow treatment recipients. Despite the existence of numerous recommendations on cell transplantations we were not able to see any evidence that offered treatments followed valid clinical trials protocol.
Contributing factors to pressure ulcer incidence in inpatient SCI rehabilitation: using 2.5 years of implementation data to inform clinical practice

Dr. Carol Scovil1,2, Mrs. Heather Flett1,3, Ms. Trisha Domingo1, Mr. Jude Delparte1, Dr. Anthony Burns1,4

1University Health Network - Toronto Rehab, Toronto, Canada, 2Department of Occupational Science and Occupational Therapy, University of Toronto, Toronto, Canada, 3Department of Physical Therapy, University of Toronto, Toronto, Canada, 4Division of Physiatry, Department of Medicine, University of Toronto, Toronto, Canada

Topical Papers 7, Forum (Parallel 3), September 15, 2016, 10:50 AM - 11:55 AM

Introduction:
An improved understanding of factors contributing to pressure ulcers (PUs) following SCI is needed. Since 2011, the pan-Canadian SCI Knowledge Mobilization Network (SCI KMN) has focused on implementing PU best practices in SCI rehabilitation. This study (1) evaluated factors contributing to PU development using 2.5 years of data from one SCI KMN site, (2) informed quality improvement initiatives to reduce future PU incidence.

Methods:
A retrospective review (n=765) was conducted for inpatients admitted to SCI rehabilitation from 01/2012–09/2014. Variables included demographics, comorbidities, functional status, PU location and severity. For patients who developed stage 2 or greater PUs, risk factors contributing to PU incidence were categorized as follows: reduced pressure relief (infrequently off-loading, refusing to turn), equipment (delay, misuse, malfunction), transfer board usage and moisture.

Results:
Sixty-three individuals developed 89 stage 2 or greater PUs (8% incidence), with the following locations: coccyx/sacrum n=31, buttocks n=28, foot/ankle n=22, other n=8. Contributing factors included reduced pressure relief (63% of patients with PUs), equipment (80% of those with foot/ankle PUs), moisture (54% of patients with coccyx/sacrum and buttocks PUs), and transfer board use (46% of patients with buttocks PUs).

Findings informed the following interventions: 1) provision/monitoring of heel off-loading boots for high-risk patients; 2) patient and clinician education addressing non-adherence with turning; 3) addressing pain that limited repositioning; 4) improved processes for escalating concerns regarding PU risks.

Conclusions:
Best practice implementation data identified factors contributing to PUs. This in turn, informed ongoing improvement cycles and development of clinical interventions to reduce PU incidence.
Multi-pronged approach to pressure ulcer prevention and management in SCI rehabilitation: front-line to organizational-level interventions

Mrs Heather Flett\textsuperscript{1,2}, Dr. Carol Scovil\textsuperscript{1,3}, Mr. Jude Delparte\textsuperscript{1}, Dr. Anthony Burns\textsuperscript{1,4}, Mrs. Joanne Zee\textsuperscript{1,5}

\textsuperscript{1}University Health Network - Toronto Rehabilitation Institute, Brain and Spinal Cord Rehabilitation Program, Toronto, Canada, \textsuperscript{2}University of Toronto, Department of Physical Therapy, Toronto, Canada, \textsuperscript{3}University of Toronto, Department of Occupational Therapy, Toronto, Canada, \textsuperscript{4}University of Toronto, Department of Physical Medicine and Rehabilitation, Toronto, Canada, \textsuperscript{5}University of Toronto, Department of Health Policy, Management, and Evaluation, Toronto, Canada

Topical Papers 7, Forum (Parallel 3), September 15, 2016, 10:50 AM - 11:55 AM

Introduction: Given that 85% of individuals with spinal cord injury (SCI) develop a pressure ulcer (PU) in their lifetime, addressing PU prevention is complex, requiring interventions at patient, staff, and organizational levels. The SCI Knowledge Mobilization Network (KMN), targeted Best Practices Implementation (BPI) for PU prevention in SCI.

Methods: Objectives were: (1) Conduct comprehensive PU risk assessments, (2) Provide structured PU prevention patient education (3) Improve PU incidence monitoring.

Results: Successful outcomes from 2.5 years of systematic implementation at one KMN site (n=697) included: (1) Increased PU risk assessment completion (29% to 82%), (2) Increased patient education documentation (26% to 74%), and translation into daily life (58% to 78%), (3) Reduction in PU incidence (10% to 8%).

Due to PU prevention complexity, program and organizational support was essential. With strong local leadership support, additional interventions included: staff education, enhanced patient education materials and team communication processes. A Patient-Oriented Discharge Summary process was developed to support self-management in transitioning home and to consolidate SCI rehabilitation learning.

The local KMN team aligned with broader organizational strategic focus on patient safety and prevention of hospital-acquired conditions. PU risk assessment and incidence is monitored at all organizational levels. A local skin health committee was formed to align with organizational structures and ensure continuous quality improvement.

Conclusions: Tackling the complexities of PU prevention in SCI requires ongoing tenacity and systematic front-line, program and organizational interventions. Within our KMN site, the stage is set for continued improvements through systematic BPI, program and organizational PU prevention efforts.

Dr Marco Postiglione, Dr Massimo Nigi, Dr. PhD Maura Zucchini, Dr Giacomo Lucchesi, Dr. PhD Prospero Bigazzi, Dr Biondi Marco, Dr Lorenzo Diaz, Dr Giulio Del Popolo, Dr Massimo Ceruso

Hand Surgery, AOU-Careggi, Firenze, Italy, Spinal Unit, AOU-Careggi, Firenze, Italy, Clinica Ortopedica, AOU-Careggi, Firenze, Italy

Topical Papers 8, Prinz Eugen Saal (Parallel 4), September 15, 2016, 10:50 AM - 11:55 AM

Background: In tetraplegic patients, lost of upper limb active motion is considered one of the most severe components of the overall disability, as well as bowel, bladder and sexual activity. Elbow extension increases the handwork space by 800% and is particularly significant for wheelchair propulsion and overhead activities.

Purpose: We compare results and complications of two surgical options for the rehabilitation of elbow extension - deltoid to triceps transfer versus biceps to triceps - in two comparable groups of patients operated by the same surgeon.

Material and Methods: Since 1997, a total of 24 patients with cervical-level spinal cord injuries underwent surgical rehabilitation of the elbow extension: 11 had a deltoid to triceps transfer (DT) and 13 a biceps to triceps transfer (BT). Strength was measured using Manual Muscle Testing. Modified University of Minnesota Tendon Transfer Functional Improvement Questionnaire and the Canadian Occupational Performance Measure were administered to all.

Results: All patients achieved an antigravity strength (>M3), except two, one for each group. M4 strength was obtained in 10 patients of the BT group and in 7 patients of the DT group. Both groups were satisfied and obtained a significant improvement in the activities of daily living. However, patients in BT group obtained better results in the clinical scores.

Conclusion: Restoring elbow extension in tetraplegic patients significantly improves their functional performances: all patients in the study reported an improvement in activity after surgery. Biceps-to-triceps transfer is a reliable technique that produces consistent results in terms of functional improvement and strength.
A Motion-Preserving Surgical Treatment for Neuromuscular Scoliosis: Proof of Concept

Dr Randal Betz¹, Dr Mary Jane Mulcahey², Dr Laury Cuddihy¹, Dr Amer Samdani³, Dr M Darryl Antonacci¹

¹Institute For Spine And Scoliosis, Princeton, United States, ²Thomas Jefferson University, Philadelphia, United States, ³Shriners Hospitals for Children-Philadelphia, Philadelphia, United States

Introduction: Approximately 98% of skeletally immature children with SCI will develop neuromuscular scoliosis, and two-thirds will require surgical fusion. A posterior spinal fusion of the entire spine is standard of care. Maintenance of spinal flexibility and motion and potential growth is desirable. We present a case for proof-of-concept of utilizing a surgical motion preserving technique to treat progressive neuromuscular scoliosis.

Methods: An 11-year-old girl who sustained a T10 level (AIS A) paraplegia 3 years prior in a motor vehicle accident presented with a progressive 60° neuromuscular scoliosis of the lumbar spine. The scoliosis was too severe to correct or stabilize with bracing. Her mother was extremely reluctant to have an irreversible spinal fusion performed. The authors have extensive experience and success with motion preserving techniques for treating idiopathic scoliosis; thus, this option was proposed.

Results: Surgery was performed in July 2015 with a 50% correction of the curve (curve pre-op: 60°, post-op 30°). The patient now sits without a pelvic obliquity and continues to have full range of motion in her lumbar spine.

Conclusion: This case illustrates proof-of-concept for new thinking for treatment of children with neuromuscular scoliosis. Whereas the ultimate long-term outcome is not known, surgical correction of neuromuscular scoliosis without spinal fusion does not eliminate treatment options if needed in the future, allowing for replacement or any other new treatment. This is in marked contrast to a posterior spinal fusion, which is permanent and prevents alternative treatment options when they become available over the child’s life.
Assessing Diaphragm Denervation in Spinal Cord Injury- Early laparoscopy is the key in assessment and bridging with diaphragm pacing

Dr Raymond Onders1, MaryJo Elmo1, Cindy Kaplan1

1University Hospitals Case Medical Center, Cleveland, United States

Background: The diaphragm is the primary inspiratory muscle. Mechanically ventilated(MV) spinal cord injured(SCI) patients may have the ability to “trigger” the ventilator yet still have a completely denervated diaphragm. To be successful at weaning off of invasive MV, there must be intact lower motor neurons to the diaphragm muscle. Undergoing diagnostic laparoscopic evaluation for Diaphragm Pacing(DP) conclusively determines integrity of phrenic nerve function thus correctly identifying patients who can be weaned.

Methods: Prospective trial data base of patients taken for DP implantation under FDA/IRB approval was retrospectively analyzed for SCI patients who were found to have denervated diaphragms.

Results: From November 2009 to January 2016, 14 (18%) patients underwent laparoscopic evaluation for DP and were found to non-stimulable diaphragms. Ages ranged from 4 to 71 with an average age of 32 years. Ten were males. Average time spent on tracheostomy MV was 20.9 months (range of 6 months to 42 months). Four patients had positive phrenic nerve studies and two had positive fluoroscopic evaluations of the diaphragms. Nine patients were able to “trigger” their ventilator and had documented multiple failed weaning attempts.

Conclusions: This review shows a large percentage of patients underwent physically and psychologically taxing and absolutely futile ventilator weaning. The ability to trigger a ventilator does not translate to weanability. The data on utilizing DP to wean off MV has been widely published with more recent publication showing benefits of early implantation. Had these patients been offered DP early, months of needless weaning could have been avoided.
Probiotics (RC14-GR1 or LGG-BB12) as prophylaxis for urinary tract infection in persons with spinal cord injury (ProSCIUTTU): randomised controlled trial.

Dr Swee-Ling Toh¹², Dr. Bon San Bonne Lee¹³, Prof Judy Simpson², Dr. Obaydullah Marial¹, Ms Suzanne Ryan³
¹Prince Of Wales Hospital, Sydney, Australia, ²University of Sydney, Sydney, Australia, ³Neuroscience Research Australia, Randwick, Australia

Topical Papers 8, Prinz Eugen Saal (Parallel 4), September 15, 2016, 10:50 AM - 11:55 AM

Background:
Urinary tract infections (UTIs) are very common in people with spinal cord injury (SCI). UTIs are increasingly difficult to treat as the organisms that cause them become more antibiotic-resistant. Probiotics have been found to be efficacious in preventing UTIs in post-menopausal women.

Aim:
The main aim of this study is to determine whether probiotic therapy with combinations of Lactobacillus reuteri RC-14 + Lactobacillus GR-1 (RC14-GR1) and/or Lactobacillus rhamnosus GG + Bifidobacterium BB-12 (LGG-BB12) are effective in preventing UTI in people with SCI.

Study design:
Double-blind factorial-design randomised controlled trial with three year recruitment.

Setting: Multiple spinal units in New South Wales, Australia with their rural affiliations.

Methods: Eligible participants were people with SCI and stable neurogenic bladder management. 207 participants were randomised to one of four arms: RC14-GR1+LGG-BB12, RC14-GR1+placebo, LGG-BB12+placebo or two placebo capsules for 6 months. All regimens were indistinguishable in appearance and taste. Randomisation was stratified by bladder management type and inpatient status. The primary outcome was time to occurrence of symptomatic UTI.

Results: Patients randomised to RC14-GR1 did not have a longer time to UTI than placebo (HR 0.68, 95% CI:0.39-1.19, P=0.17) after allowing for pre-specified covariates. Patients randomised to LGG-BB12 also did not have a longer time to UTI than placebo (HR 1.30, 95% CI:0.74-2.26, P=0.36). Multivariable post hoc survival analysis for RC14-GR1 only vs the other three groups showed a possible protective effect of RC14-GR1 only (HR 0.46, 95% CI:0.21-0.99, P=0.03), but this result would need to be confirmed before clinical application.
The Art of Failing in Rehabilitation: Seminal Tips for the Professions

Dr Butt Lester¹
¹Craig Hospital, Englewood, United States

Plenary 4: The Art of Failing in Rehabilitation: Seminal Tips for the Professions. Lester Butt, Festsaal (Plenary), September 15, 2016, 12:00 PM - 12:45 PM

All rehabilitation professionals strive towards unparalleled excellence and absolute success in our respective practices. In spite of our most ardent efforts, this noble goal is not universally attained. How can we reconcile this aspirational goal and rehabilitative reality? If we rehabilitation professionals cannot achieve the best, let us then consider the antithesis, e.g. how to achieve absolute failure.

This lecture will provide essential gambits to ensure new dimensions for poor outcomes. Multiple levels for collapse and dysfunction will be broached. Specifically, these discussion areas will range from the macro, e.g. the health care system and the hospital, to the micro, e.g. the rehabilitation team and the individual provider.

Tips for unconditional failure will be provided within each of these domains. Through a fuller appreciation of the parameters of true failing, rehabilitation professionals can hopefully inch closer to our mutual aspirational goals of heightened success and quality outcomes.
Spinal Cord Injury (SCI): a narrative

SCI medical professionals have become very aware of the need to define and analyse care pathways for those who sustain an SCI. The purpose of this workshop is to present and discuss this from a consumer perspective – in particular, to consider how and when active consumer organisations might intervene to provide or supplement the services offered by the health sector. The format is rather different from a traditional workshop in that the arguments will be presented in the form of a narrative and the “chair” will take the role of narrator who introduces and provides background to the various topics discussed as well as describing certain features that are not presented in detail. We have adopted the term “narrative” to underline that we are not giving a chronological account of all aspects of comprehensive care. Contributors from different consumer organisations from different European countries will be asked to give their input based on experience from their organisation.
International Network of SCI Nurses Meeting

Miss Debbie Green\textsuperscript{1}, Ms Fiona Stephenson\textsuperscript{2}

\textsuperscript{1}International Network of SCI Nurses, Milton Keynes, United Kingdom

International Network of SCI Nurses Meeting (Discipline specific meetings/networking 5), Prinz Eugen Saal (Parallel 4), September 15, 2016, 1:35 PM - 3:05 PM

This will be the annual meeting for nurses working in the field of spinal cord injury. The meeting is a networking opportunity for nurses attending the annual ISCoS Meeting where they can update on the issues affecting SCI Nursing education / development and become involved in various international projects.
Meeting for the International SCI Data Sets Committee

Professor Fin Biering-Sørensen, Vice-chair Vanessa Noonan

Meeting for the International SCI Data Sets Committee (Discipline specific meetings/networking 2), Geheime Ratstube (Parallel 1), September 15, 2016, 1:35 PM - 3:05 PM

Agenda

1. Welcome - presentation

2. Apologies

3. New Data Sets:
   a. International SCI Endocrine and Metabolic Extended Data Set – chair Eva Noga-Widerström
   b. International SCI Pain Extended Data Set – chair William Bauman

4. Data Sets in Updated:
   a. International SCI Endocrine and Metabolic Basic Data Set – chair William Bauman
   b. International SCI Core Data Set – chair Michael DeVivo
   c. International SCI Bowel Basic Data Set – chair Klaus Krogh

5. New Data Sets in development:
   a. International SCI Socio-demographic Data Set – chair Yuying Chen (in review)
   b. International SCI Fracture History Data Set – chair Leslie Morse (dataset going for review)
   c. International SCI Caregiver and Social Support Data Set – chair Susie Charlifue
   d. International SCI Pregnancy and Delivery Data Set – chair Amie Brown McLain
   e. International SCI Male Sexual Function Extended Data Set – chair Nancy Brackett
   f. International SCI Voluntary Exercise Data Set – chair Mark Nash
   g. International SCI Urinary Tract Infection Extended Data Set – chair Lance Goetz

6. Pediatric extension to the International SCI Data Sets – Mary Jane Mulcahey

7. NINIDS CDE project – Vanessa Noonan

8. Electronic Medical Records adopting the International SCI Data Sets – VA, EPIC – Fin Biering-Sørensen

9. Any other business
Paediatric Spinal Cord Injury and PEPSCI Collaboration

Mrs Bashak Onal¹,², Dr Allison Graham³, Dr Marika Augutis³, Dr Erin Kelly⁴, Dr Anke Scheel⁵, Dr Joost van Middendorp⁶, PEPSCI Collaboration, Dr Julian Taylor¹,²

¹ National Spinal Injuries Centre, Stoke Mandeville Hospital, Buckinghamshire Healthcare NHS Trust, Aylesbury, Buckinghamshire, HP21 8AL, United Kingdom, Aylesbury, United Kingdom , ² Stoke Mandeville Spinal Research, Stoke Mandeville Hospital, Aylesbury, Buckinghamshire, HP21 8AL, United Kingdom, Aylesbury, United Kingdom , ³ Sundsvall Hospital, Stockholm, Sweden, Stockholm, Sweden, ⁴ American Academy of Pediatrics, Illinois, United States of America, Illinois, United States of America, ⁵ Swiss Paraplegic Centre, Nottwil, Switzerland, Nottwil, Switzerland, ⁶ Pfizer B. V., Capelle a/d IJssel, Netherlands, Capelle a/d IJssel, Netherlands

Paediatric Spinal Cord Injury and PEPSCI Collaboration (Gartensaal), Gartensaal, September 15, 2016, 1:35 PM - 3:05 PM

Meeting

General discussion topics and importance:
Spinal cord injury (SCI) in children is rare. To date most research has been clinician-led with little input from service-users. A group of rehabilitation specialists in Europe formed the Pan-European Paediatric Spinal Cord Injury (PEPSCI) Collaboration, to identify service-user priorities with a quantitative survey to scope future research areas. Results obtained from this international survey will aid in deciding future research agenda for paediatric spinal cord injury and targeting clinically and socially relevant issues for future service developments related to paediatric SCI management. This meeting aims to bring researchers, clinicians and allied healthcare professionals together who have common interests in spinal cord injury, particularly in the paediatric population.

Particular learning objectives:
The meeting will focus on recent updates from PEPSCI Collaboration and key achievements. The meeting aims to motivate participants in sharing knowledge and practice in paediatric spinal cord injury to support future directions in undertaking collaborative research.

Specific presentations and/or discussions:
The following areas will be covered:
• Aims and objectives of PEPSCI Collaboration in relation to paediatric spinal cord injury research
• Preliminary survey results from PEPSCI Collaboration
• Collaborator support for new research ideas in paediatric spinal cord injury
• Opportunities for wider development in relevant research ideas

Involvement of audience in the meeting:
Group discussions will be encouraged to share good working principles in relation to paediatric spinal cord injury and associated research.
Quality of Life Special Interest Group Meeting

Dr Susan Charlifue

Craig Hospital, Englewood, United States

Quality of Life Special Interest Group Meeting (Kunstlerzimmer, ISCoS Office), Kunstlerzimmer (ISCoS Office), September 15, 2016, 1:35 PM - 3:05 PM

We are requesting space to hold our SCI Quality of Life Special Interest Group meeting on the afternoon of the second day of the meeting. We anticipate 15-20 attendees.
SClPT Workshop

Mrs Ulla Bergner

1Traumacenter Murnau, Murnau, Germany

SClPT Workshop (Discipline specific meetings/networking 3), Rittersaal (Parallel 2), September 15, 2016, 1:35 PM - 3:05 PM

This workshop is primarily for physiotherapists but anyone interested is welcome. During this workshop we will discuss the future direction of the International Network of SCI Physiotherapists. This network currently has its own constitution and is affiliated with WCPT and ISCoS. We will discuss the pros and cons of these arrangements and a proposal from ISCOS to become a discipline-specific special interest group of ISCoS. We will also discuss some of the physiotherapy-specific initiatives including training workshops, elearnSCI.org, online courses and online resources. There will also be an opportunity to talk about some of the challenges faced by physiotherapists in providing evidence-based treatments.
The LHS for SCI - An Initiative of the Global Disability Action Plan in the Context of the IPSCI Implementation

Prof. Gerold Stucki, Dr. Mirja Gross-Hemmi, Mrs Brigitte Schmid
Swiss Paraplegic Research, Nottwil, Switzerland

The LHS for SCI - An Initiative of the Global Disability Action Plan in the Context of the IPSCI Implementation (Discipline specific meetings/networking 4), Forum (Parallel 3), September 15, 2016, 1:35 PM - 3:05 PM

The Learning Health System for Spinal Cord Injury (LHS-SCI) is an initiative aligned with the World Health Organization’s (WHO) Global Disability Action Plan 2014-2021 ‘Better health for all people with disability’. The overall aim of the LHS-SCI initiative is to support the continuous improvement of the lives of persons with SCI in the community by means of an international evidence- and rights-informed research and policy effort. Thanks to advancements in the emergency servicing, acute and post-acute medical and rehabilitation care, people with SCI are living longer and in better health. As a result, it has become increasingly important to focus on the lived experience of SCI, both from the perspective of health but also from the perspective of functioning, as characterized by the WHO’s International Classification of Functioning, Disability and Health. This lived experience, and recommendations for optimizing the experience, are summarized in the International Perspectives on SCI report (IPSCI).

The manner in which a society responds to the health and rehabilitation needs of SCI people – including the provision of assistive technology and the availability of return to work and school programmes – will affect the kind of life an SCI person will live and how she or he will participate in all areas of life. In accordance with the actions recommended in the WHO Global Disability Action Plan, IPSCI recommends the strengthening of each country’s health and rehabilitation system, and encourages the use of models of health and functioning data generation to monitor improvement and provide a basis for international comparison. Learning from the successes of health system reforms is key to the success of the LHS-SCI initiative and will enable participating nations to jointly develop research and policy capacity for better policies, services and care. Currently, 27 nations are participating in the initiative. LHS-SCI is divided into three stages to achieve its overall aim: 1) Generating evidence through the International SCI Survey and Description of the Cross-cultural Societal Response; 2) implementing National Stakeholder Dialogues; and 3) building capacity through Policy and Research Capacity Efforts.

In this scientific workshop the LHS-SCI mission and its implementation will be discussed.

The Learning Health System for SCI (WHO Workplan). Doug Brown
Studying the lived experience of persons living with SCI. Jerome Bickenbach
The International SCI survey conducted in more than 20 countries in 2017. Mirja Gross-Hemmi
Planning of the InSCI survey in South Africa – experience from one participating country. Conran Joseph
Discussion
Epidemiological survey of spinal cord injuries (SCI) in Fukuoka Prefecture, Japan

Dr Hiroaki Sakai¹, Dr Takayoshi Ueta¹, Dr Takeshi Maeda¹, Dr Eiji Mori¹, Dr Itaru Yugue¹, Dr Osamu Kawano¹, Dr Tsuneaki Takao¹, Dr Muneaki Masuda¹, Dr Yuichiro Morishita¹, Dr Tetsuo Hayashi¹, Dr Akinobu Matsushita¹, Dr Kensuke Kubota¹, Dr Keiichiro Shiba¹

¹Spinal Injuries Center, Iizuka, Japan

Introduction: Japan is rapid aging of society. In Japan, SCI in aged person becomes huge medical issue. In this study, the data of 2005 (population aging rate=19.4%) and 2013 (population aging rate=23.6%) were analyzed to investigate epidemiological changes of SCI due to aging populations.

Methods: An office of registry management of SCI in Fukuoka prefecture (population=5million) was established in the Spinal Injuries Center in 2006. The office sent out the forms of questionnaires by mail to emergency hospitals in Fukuoka prefecture since 2006.

Results: The forms of questionnaires for this study were sent to about 150 hospitals. The response rates were 91.9% in 2005 and 76.5% in 2013.

Incidence and age: A total of 294 SCI with Frankel A, B, C and D in this 2 years period were registered (155 SCI in 2005 and 139 SCI in 2013). The incidences of SCI estimated from the number of patients registered and the reply rate were 33.7 per million per annum in 2005 and 36.2 per million per annum in 2013. The mean age at injured were 57.8 years old in 2005 and 63.1 years old in 2013.

Level of injury: There were 251 patients with cervical SCI (129 patients in 2005 and 122 patients in 2013) and 38 patients with thoracic SCI and caudal region injury (26 patients in 2005 and 12 patients in 2013).

Conclusions: This study might be able to become critical data to understand the epidemiological changes of SCI with rapid aging of society.
Introduction:
Charcot neuro-arthropathy is a rare late complication affecting patients with spinal cord injury (SCI). Often its symptoms in SCI patients are non-specific and undefined, difficult to recognise and they can be unnoticed. Abdominal X-ray is one of the routine investigations for long term renal surveillance despite its controversial indication.

Method:
Clinical history, physical examination, radiological findings of three patients diagnosed with Charcot Neuroarthropathy as incidental finding of routine abdominal X-Ray for the follow up of the urinary tract were reviewed.

Result:
two cases of Charcot arthropathy of the hip and one case of Charcot arthropathy of the spine diagnosed with abdominal X-ray for renal surveillance were found. The patient’s neurological levels was ranging between C7 and T9, two of them had sensory incomplete neurology and one patient had a complete lesion. All of patients had a recent history of ischial pressure sore. All three of them were longstanding spinal cord injury

Conclusion:
These cases emphasises the importance of looking thoroughly at the abdominal X-ray for the diagnosis of this condition to prevent further morbidity. Long-term urological management in spinal cord injury patients is debatable. Incidental findings like these mentioned, can add value to this routine test.
Idiopathic spinal cord herniation: clinical outcomes of 24 cases and consideration of prognostic indicators

Dr Akio Iwanami, Dr Yuichiro Hirose, Dr Nobuyuki Fujita, Dr Tomohiro Hikata, Dr Kota Watanabe, Dr Ken Ishii, Dr Morio Matsumoto, Dr Masaya Nakamura

Keio University School Of Medicine, Tokyo, Japan

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

BACKGROUND:
Idiopathic spinal cord herniation (ISCH) is a rare disease that presents with slowly progressive myelopathy. Recently several case reports were demonstrated, but no report with a large sum of cases. The etiology and pathogenesis of ISCH is mostly unknown. The purpose of this study is to clarify the surgical outcomes of 24 cases with ISCH in our hospital retrospectively and discuss clinical features and pathogenesis of this disease.

METHODS:
Twenty-four patients with ISCH were treated surgically by enlargement of the dural defect. The patient's neurological status and surgical outcome were evaluated by the modified Japanese Orthopaedic Association (JOA) scores. Correlations between the surgical outcomes and patients' age, disease duration were assessed retrospectively. The patients were also divided into three groups based on the type of neurological defect: Monoparesis (M) group, Brown-Sequard type (BS) group, and Paraparesis (P) group. The difference in the duration of disease, preoperative JOA score, and the recovery rate were compared between the two groups.

RESULTS:
There was no recurrence of ISCH after surgery. The mean recovery rate was 50.8%. There was a significant correlation between the patient's age and the recovery rate, and between the disease duration and the recovery rate. Interestingly, the recovery rate was significantly lower in the P group than in the M or BS group.

CONCLUSIONS:
Surgical outcomes of enlargement of the dural defect for ISCH were stable and favorable without recurrences or any complications. Age at the time of surgery, disease duration, and type of neurological deficit are important prognostic indicators.
A Radiographic Evaluation Of Facet Sagittal Angle In Cervical Spinal Cord Injury Without Major Fracture Or Dislocation

Dr Tsuneaki Takao, Dr Kensuke Kubota, Dr Yuichiro Morishita, Dr Takashi Maeda, Dr Eiji Mori, Dr Itaru Yugue, Dr Osamu Kawano, Dr Hiroaki Sakai, Dr Muneaki Masuda, DR Tetsuo Hayashi, DR Akinobu Matsushita, Dr Takayoshi Ueta, Dr Keiichiro Shiba

Spinal Injuries Center, Iizuka, Japan

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction
Most patients with traumatic cervical spinal cord injury (CSCI) without major fracture or dislocation are elderly and present with spinal hyperextension predominantly at the C3-4 level. However, few reports have described the biomechanical etiology of CSCI. The aim of the current study is to evaluate the relationship between the facet sagittal angle and incidence of traumatic CSCI.

Materials and Methods
A total of 113 patients with CSCI were included in this study. These subjects had an injury at the C2-3 segment, 61 at the C3-4, 32 at the C4-5, 13 at the C5-6, and 4 at the C6-7. Eighty four healthy volunteers without neurologic deficits or cervical cord pathology on MRI were defined as control subjects.

We used a plain radiograph to measure the facet sagittal angle at 5 intervertebral disc levels. We defined the facet sagittal angle as angle between the inferior margin of the superior cervical spinal body and inferior articular process of superior vertebra.

Results
The incidence of CSCI at the C2-3, C3-4, C4-5, C5-6, and C6-7 segments was 2.7, 54, 28.3, 11.5 and 3.5%, respectively. For all segments, except C2-3 and C6-7, C3-4 of the facet sagittal angle was significantly smaller than C4-5 and C5-6.

Conclusions
The cervical spinal cord at the C3-4 segment might receive the highest load during acute hyperextension of the cervical spine because of the facet joint morphology. This facet sagittal angle at the C3-4 segment may play an important role in the etiology of traumatic CSCI at the C3-4 segment.
Acute Traumatic Spinal Cord Injury Patient Perceptions of Transition from Acute Care to Inpatient Rehabilitation

Dr Matthew Sonagere¹, Dr. Christina Oleson¹, Prof John Ditunno¹
¹Thomas Jefferson University Hospital, Philadelphia, United States

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction
Immediately following a traumatic spinal cord injury (SCI), achieving medical stability and preventing complications are the primary areas of focus. Inadequate attention is paid to a patient’s comprehension of their specific injuries and their anxiety about the future. A better understanding of early experiences in acute care is needed to improve among physicians, nurses, therapists, and patients. These measures could reduce a patient’s distress about individual diagnosis and prognosis, transition to rehabilitation, and eventual discharge home.

Methods
A 19-question survey was administered to 24 patients with acute C2-T12 AIS A-D SCI. Questions were designed to investigate patient’s understanding of their injuries, medical intervention received to date, prognosis, and transition to rehabilitation.

Results
Twenty-one patients from 14 different acute care hospitals completed the survey. Findings demonstrated that 17 patients wanted to know more about their current medical condition; 15 reported receiving insufficient information to envision their level of function in the future; 11 patients with a variety of neurological levels of injury desired both better communication with their treating team and improved staff responsiveness, while 15 desired more information about rehabilitation. Those with high cervical AIS-A SCI had more anxiety about breathing and staff responsiveness to requests, while patients with incomplete injuries reported anxiety about pain, family visitation, and sleep problems.

Conclusion
Our findings suggest that communication and staff responsiveness are the most important areas for improvement in acute care. In addition, most desired additional explanations of their injury and prognosis as well as the transition to rehabilitation.
Analysis of cortical plasticity after spinal cord injury using resting state-fMRI in awake adults mice

Mr Kohei Matsubayashi1, Mr Akio Iwanami1, Mr Narihito Nagoshi1, Mr Yuji Komaki3, Mr Morio Matsumoto1, Mr Ryosuke Ishihara4, Mr Norio Takata4, Mr Masaru Mimura4, Mr Hideyuki Okano2, Mr Masaya Nakamura1
1Department of Orthopaedic Surgery, Keio University School of Medicine, Shinjuku, Japan, 2Department of Physiology, Keio University School of Medicine, Shinjuku, Japan, 3Central Institute for Experimental Animals, Kawasaki, Japan, 4Department of Neuropsychiatry, Keio University School of Medicine, Shinjuku, Japan

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

[Introduction] It is recently reported that after spinal cord injury (SCI), neuronal connectivity changes occur not only in the spinal cord, but also in the brain. The purpose of this study is to clarify the functional connectivity changes in the brain after spinal cord injury by taking the resting state-fMRI (rs-fMRI).

[Method] After habituating the mice, we took the rs-fMRI and standardized the measurement data, using the existing mouse template brain (ref). By classifying the regions of the brain based on the Allen mouse brain atlas, we analyzed the brain functional connectivity. Next we produced the complete transection and contusion models on T10 level of spinal cord in mice. We took rs-fMRI of these mice at 1, 3, 7 and 14 weeks after injury and analyzed the changes in functional connectivity of their brain.

[Results] In the comparative analyses before and after the transection SCI, we detected the functional connectivity changes occurred in primary motor cortex and secondary motor cortex. Moreover, by analyzing the brain connectivity of the contusion injury models, we detected the functional connectivity changes that accompanied motor recovery.

[Conclusion] In the current study, we demonstrated the feasibility to take and evaluate the rs-fMRI of mice. We also showed the relative relationships of the changes in the cerebral connectivity after injury and identified the regions that were strongly related to the functional recovery after SCI.
Atrophy of spinal cord as a consequence of postnatal haemorrhagic infarction

Dr Richa Kulshrestha, Dr Debbie Short, Mr Joy Chowdhury

Robert Jones and Agnes Hunt Orthopaedic Hospital NHS Trust, Crewe, United Kingdom

Introduction
Spinal cord injuries in new born infants following a traumatic delivery or umbilical cord catheterisation due to thromboembolism are well known. Cases with atraumatic acute onset neonatal paraplegia has also been described in preterm or small for gestational age babies with stormy postnatal course related to ischaemic aetiology. We describe a rare case of haemorrhagic infarction of spinal cord.

Case report
A term female baby was born by normal vaginal delivery. She had meconium aspiration at birth leading to severe respiratory distress requiring neonatal intensive care. She required umbilical catheterisation at birth. She needed treatment for persistent pulmonary hypertension. She also required heparin infusion for poor right lower limb circulation following femoral arterial puncture. At two weeks she developed flaccid paraplegia. MRI scan of spine on day 15 showed haemorrhagic infarction of the spinal cord was seen from the level of thoracic inlet from vertebral level C7-T1. Although there was blood seen in thecal sac, there was no focus of haemorrhage within cord. A follow up MRI scan at 10 months revealed severe atrophy of cord distal to C7. At two and half years of age she has good upper limb function, diaphragmatic breathing and flaccid paralysis of lower limbs.

Conclusions
In an acutely unwell term infant with symptoms of paralysis or spinal cord damage, haemorrhagic/ischaemic infarction needs to be considered in the differential diagnosis. To our knowledge this is first reported case of spinal cord injury in a term infant with a haemorrhagic aetiology.
BDNF increase during wheelchair half-marathon race in persons with spinal cord injury.

Mr Hideki Arakawa1, Mr Takeshi Nakamura2, Mr Yukihide Nishimura1, Mr Tokio Kinoshita3, Mr Yoshiichiro Kamijo1, Ms Mari Kakita1, Mr Fumihiro Tajima1

1Wakayama Medical University, Wakayama, Japan, 2Yokohama city university, Yokohama, Japan

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Brain derived neurotrophic factor (BDNF) is the most prevalent growth factor in the central nervous system (CNS). It is essential for the development of the CNS and for neuronal plasticity. The benefits of acute and chronic physical exercise induced BDNF are well-documented in humans, however, exercise effects on BDNF levels have not been analyzed in persons with spinal cord injury (SCI). The aim of this study was to investigate the effects of wheelchair half-marathon on BDNF levels in persons with SCI. Using a nonrandomized study in an actual race, nine persons with cervical spinal cord injury (CSCI group) (35.3 ± 12.6 years) and eight persons with thoracic or lumbar cord injury (SCI group) (55.6 ± 10.4 years) completed a wheelchair half-marathon race. The outcomes included measures of serum BDNF levels, blood platelet levels, plasma cortisol levels. The wheelchair half-marathon significantly increased serum BDNF levels in both groups immediately after the race (post-race) compared with baseline (pre-race), and the magnitude of increase in serum BDNF levels were similar between the groups. However serum BDNF levels returned to baseline in both groups at 1h after the race (recovery). In contrast, blood platelet levels did not change throughout the race in both groups. Plasma cortisol levels were significantly increased in the SCI group and did not increase in the CSCI group. The results of our study suggest that wheelchair half-marathon increases serum BDNF levels in persons with CSCI and SCI.
Paroxysmal hypertension and hypotension in same patient with tetraplegia: Poikilopiesis Spinalis

Dr Siddeshwar Patil, Mr Wajid Raza, Mr Firas Jamil

Yorkshire Regional Spinal Injuries Centre, Wakefield, United Kingdom

INTRODUCTION:
Cardiac dysfunctions are common complications following Spinal Cord Injury (SCI). We aim to present and discuss a chronic tetraplegic spinal cord injured patient presenting with paroxysmal hypertension and hypotension.

METHODS:
A 60+ year old gentleman with chronic tetraplegia of 34 years and background history of Renal cell carcinoma and post-traumatic syringomyelia managed conservatively.

RESULTS:
This gentleman presented with 6 months history of episodes of blanking out initially for a few seconds and progressing to a few minutes. He was reviewed by his general practitioner who noted on occasions high blood pressure of 180/110 and episodes of hypotension 50/40.

On admission he was observed for blood pressure monitoring and was noted to fluctuate between low of 50/30 mmHg to a high of 190/120. He was also noted to have episodes of unconsciousness lasting from 3 minutes to 10 minutes and apnoeic spells.

He was reviewed by Neurology team and Cardiology team but no finding consistent with presentation.

We reviewed literature and there were only about three cases reported back in 1960s.

At the time of submission of this abstract there was some positive changes in blood pressure stability following regular tilting but no significant change.

CONCLUSION:
We believe this rare presentation is educative to be discussed at a forum like ISCOS for the benefit of the participants and in gathering any ways of better management of our patient as well as share the results of our management using tilt table for regulation of BP.
Scoliosis is defined as a lateral spinal curvature with a Cobb angle of 10° or more. Physiological retention of conus medullaris at the level of the first lumbar vertebra during the embryologic life of the fetus which stretches the spinal cord with resultant mechanical, ischemic, and metabolic changes in the clinical picture is called Tethered Cord Syndrome. 29 years old male patient has been suffering from waist pain, tension feeling in the back part of his leg and walking difficulties for eight years. Gibbus deformation is detected in the torakal part. There is right torakal (curve convex is on the right) left lomber skolyoz. In the torakolomber local hypertrikosis is detected. In long distances (more than 500 meters) antalgesic walk was independent from pattern. In lomber spinal MRG examination, at the level of T7-T8 disc, a septa existence which divides spinal channel and dural bladder from the middle line is detected. These symptoms are matching with cord split malformation. There is 47 degree right skolyoz in torakal and there is 30 degree left scoliosis in lomber which is compensated to torakal. As a result the mature patients who has spine infilection and spine pain complaints, might possibly have split cort malformation. At first, inspection and hypertrikosis should be checked, a complete neurological examination should be done, if there is a progressive scoliosis, MRG should be asked without any hesitation. It should be always kept in mind that rarely seen split cort malformation is oftenly appears with scoliosis.
The clinical influence of spinal cord compression on the neurological outcome after cervical spinal cord injury without fracture or dislocation

Dr Tsuneaki Takao, Dr Itaru Yugue, Dr Yuichiro Morishita, Dr Takeshi Maeda, Dr Eiji Mori, Dr Osamu Kawano, Dr Hiroaki Sakai, Dr Muneaki Masuda, Dr Tetsuo Hayashi, Dr Akinobu Matsushita, Kensuke Kubota, Dr Takayoshi Ueta, Dr Keiichiro Shiba

1Spinal Injuries Center, Iizuka, Japan

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: The biomechanical etiology of traumatic cervical spinal cord injury (CSCI) remains under discussion, and its relationship with cervical spinal cord compression is one of the most controversial issues in the clinical management of traumatic CSCI. The aim of the current study was to clarify the influence of cervical spinal cord compression on neurological functional recovery after traumatic CSCI without major fracture or dislocation.

Methods. Patients non-surgically treated for an acute CSCI without major fracture or dislocation were selected. We analyzed 160 subjects with traumatic CSCI using T2-weighted mid-sagittal magnetic resonance imaging. The sagittal diameter of cervical spinal cord, degree of spinal cord compression, and neurologic outcomes in motor function, including improvement rate, were assessed.

Results. There were no significant relationships between degree of cervical spinal cord compression and their American Spinal Injury Association motor scores at both admission and discharge. Moreover, no significant relationships were observed between degree of cervical spinal cord compression and their neurological recovery during the following period.

Conclusions. Our results showed no relationships between pre-existing cervical spinal cord compression and neurological outcomes after traumatic CSCI. These results suggested that decompression surgery might not be recommended for traumatic CSCI without major fracture or dislocation despite pre-existing cervical spinal cord compression.
The difficulties in the diagnosis of atlanto-occipital dislocations

Dr Hiroyuki Katoh¹, Dr Akihiko Hiyama¹, Dr Daisuke Sakai¹, Dr Masato Sato¹, Dr Masahiko Watanabe¹

¹Tokai University School of Medicine, Kanagawa, Japan

Introduction: Although the survival rate of atlanto-occipital dislocation (AOD) has slowly increased, it is still associated with significant morbidity and mortality. In this study we retrospectively reviewed the clinical and imaging characteristics of 14 AOD cases treated at the trauma center of our institute in the past 15 years.

Methods: Data regarding the causes of injury, associated injuries, clinical outcomes, and imaging characteristics were collected.

Results: The cause of injury was traffic accidents in 9 cases, falls in 4 cases, and a compression injury in 1 case. Associated significant injuries were observed in 13 of the cases with thoracic trauma being the most frequent. Twelve cases arrived in the state of cardiopulmonary arrest and ultimately did not survive. Trauma radiographs including lateral cervical X-rays were taken on arrival and CT scans were obtained if stabilized, and the diagnosis of AOD was made by the trauma physicians in only 50% of the cases. Analysis of the X-rays and CT scans revealed Traynelis classification type I injury in 2 cases, type 2 injury in 10 cases, and 2 unclassified cases. The average basion-dens interval was 16.5±7.3mm and the basion-axis interval was 14.6±9.0mm, but there were 3 cases in which these measurements were within the normal range of under 12mm, making diagnosis difficult. Posterior occipitocervical fixation surgeries were performed on the surviving 2 cases.

Conclusion: The diagnosis of AOD remains a challenge to trauma physicians due to the high association with other life-threatening injuries and the lack of straight-forward radiologic criteria.
Initial User Feedback on an Online, Theory-based Bladder Self-Management Program for People with Spinal Cord Injury (SCI)

Miss Lindsay Sleeth¹, Dr. Dalton Wolfe¹, Anna Kras-Dupuis², Stephanie Marrocco¹, Samantha Jeske¹, Samantha McRae¹
¹Lawson Health Research Institute, London, Canada, ²St. Joseph’s Healthcare London, London, Canada

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction
Given an increasing appreciation for the importance of self-management (SM), we are developing an online theory-based SM intervention focused on enhancing skills and behaviours to improve bladder health in persons with SCI.

Methods
Development of working prototypes was guided by a mixed methods approach involving information seeking activities (scoping review and environmental scan) and pre-trial focus groups (consumers: n=6, post-injury > 6 months, C4-T12, AIS A-D; clinicians: n=3). A small trial (n =4, some bladder dysfunction) was conducted to examine initial satisfaction and usability of the program. This was evaluated by Bowen’s feasibility framework (Bowen et al., 2009) whereby users rated the prototype on the following constructs: satisfaction, intent to continue to use, perceived appropriateness, actual use, and perceived demand. Participants were also asked to name 3 things they were most/least satisfied about with the program.

Results
The preliminary information seeking activities, together with the pre-trial provided valuable information that is currently being used to modify the program and improve the design and function. Overall, users indicated general satisfaction and acceptability with the prototypes, although noted the high degree of complexity that may impact the intended use. Subsequent clinician focus groups and consultations have also been helpful to ensure the program is clinically relevant, as well as feasible.

Conclusion
Based on the guidance provided by the users, there are plans to continue to the refine the program, and focus on ensuring feasibility. This information will inform a full scale trial that will be implemented in the fall of 2016.
Hip joints heterotopic ossification effect on daily activities and treatment approach.
I. Svilkina¹ ², D. Namniece, A. Nulle¹
National Rehabilitation Centre „Vaivari“¹, Jurmala, Latvia; Riga Stradins University, Latvia ².

Key words:
Spinal cord injury (SCI), heterotopic ossification (HO), spinal cord independence measure (SCIM)

Introduction: Traumatic SCI often results in profound and long-term disability, which is life changing for the injured individual and family. Heterotopic ossification (HO) is ossification out side the skeleton. It’s a common complication after SCI. Ossification can decrease the mobility of joints, can be a cause of pain and harder spasticity. Brooker classification is used for hip.

Methods: 2 male patients with traumatic SCI. One of them- 30 years old, after C4 fracture AIS-B, injured in 2012, with bony ankylosis at right hip. Other one 30 years old man after Th12 fracture AIS-A (2014). HO in both hips (3 grade). The patients were assessed using International Classification of Functioning, Disability and Health, ASIA, Modified Ashworth Scale, hips ROM, SCIM.

Conclusion:
• Reducing mobility of joint can be a factor for more limited daily activities.
• It can be a reason for stress fractures of spine fixing construction for active wheelchair users.
• Comprehensive evaluation is necessary for HO surgical treatment indications and the risk / benefit ratio.
Delivering care under uncertainty: providers’ experiences in caring for women with spinal cord injury during pregnancy and childbirth in Switzerland

Mrs Sue Bertschy¹², Prof. Jürgen Pannek³, Prof. Thorsten Meyer⁴
¹Swiss Paraplegic Research, Nottwil, Switzerland, ²University of Lucerne, Lucerne, Switzerland, ³Swiss Paraplegic Center, Nottwil, Switzerland, ⁴Hannover Medical School, Hannover, Germany

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: When different health problems such as pregnancy and spinal cord injury (SCI) occur together, providing adequate care becomes even more challenging. As a result, expertise from different medical specialties are required, especially spinal cord medicine and gynaecology. What is totally normal for one specialization, could cause a problem for the other specialization. Therefore, the aim of this study was to reconstruct healthcare providers’ perceptions and experiences in caring for women with SCI during pregnancy and childbirth in Switzerland.

Methods: We conducted qualitative expert interviews and analysed data using grounded theory techniques. Fifteen health professionals were interviewed; they comprised gynaecologists (n=4), midwives (n=3), physical medicine and rehabilitation professionals (n=4), urologists (n=3), and a peer counsellor (n=1).

Results: Care delivery experiences of health professionals could be described as a forced reaction to decision making under uncertainty. However, health professionals seemed to express three different attitudes while handling the situation: (i) a protective-concerned attitude, (ii) no “big deal” attitude, or (iii) precautious attitude. The applied strategies were influenced by the conditions of the health care system, policies in place, and health professionals’ behaviours.

Conclusions: A need for more specific services, information, guidance, and guidelines for health professionals caring for woman with SCI during pregnancy and childbirth was identified. We strongly recommend further research on the development of integrated care concepts as well as clinical studies for establishing a more profound knowledge base.
Effect of micturition type on social reintegration of people with spinal cord injury (SCI)

Dr Ioannis - Alexandros Tzanos¹, Dr Andreas Mavrogenis², Dr Evanthia Mitsiokapa², Dr Ioannis Kapralos¹, Dr Konstantina Gioti¹, Dr Charalambos Konstantinidis¹, Dr Nikolaos Groumas¹, Dr Panagiotis Papaggelopoulos²

¹National Rehabilitation Centre, Ilion, Greece, ²Attikon Hospital, Haidari, Greece

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: The patients with SCI appear with different ways of micturition depending in the level and the severity of the injury. The aim of this study was to determine if the way of micturition is correlated with the social reintegration of these patients.

Methods: One hundred sixty four SCI individuals with a history of SCI of different causes were studied in this survey. They were residents of urban, suburban and rural areas of the Greek territory. Questionnaires were completed for each one in interview form and when needed, clinical examination was performed for data collection. The questionnaire included demographic and clinical characteristics. Craig Handicap Assessment and Reporting Technique (CHART) was used to assess social reintegration. Statistical analysis of the findings was performed with ANOVA.

Results: People with SCI performing intermittent catheterization (120) have not statistically significant difference in social reintegration compared with those with normal micturition (31). The p-value in the six dimensions of social reintegration ranged between 0.19 and 0.932.

Conclusion: Spinal cord individuals exhibit the same levels of social reintegration independently of their way of micturition.
Effect of severity of injury and micturition type on emotional status of individuals with spinal cord injury (SCI)

Dr Ioannis - Alexandros Tzanos¹, Dr Andreas Mavrogenis², Dr Evanthia Mitsiokapa², Dr Eleftherios Stefas³, Dr Konstantina Gioti¹, Dr Christina Rapidi⁴, Dr Nikolaos Groumas¹, Dr Panagiotis Papaggelopoulos²

¹National Rehabilitation Centre, Ilion, Greece, ²Attikan Hospital, Haidari, Greece, ³Evexia Rehabilitation Centre, Thessaloniki, Greece, ⁴Gennimata Hospital, Athens, Greece

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: Individuals suffering from SCI face changes in emotional status with various intensity. The aim of this study was to determine the effect of severity of injury and micturition type on emotional status of individuals with spinal cord injury.

Methods: One hundred sixty four SCI individuals with a history of SCI of different causes were studied in this survey. They were residents of urban, suburban and rural areas of the greek territory. Questionnaires were completed for each one in interview form and when needed, clinical examination was performed for data collection. The questionnaire included demographic and clinical characteristics. Patient Health Questionnaire-9 (PHQ-9) was used for determination of emotional status. Statistical analysis of the findings was performed with t-test and ANOVA. Severity of injury was measured with ASIA scale. Participants were divided regarding micturition type in those with normal micturition and those performing intermittent catheterizations.

Results: ASIA level had not statistically significant correlation with PHQ-9 (p=0.450). Also micturition type had not statistically significant correlation with PHQ-9 (p=0.575).

Conclusion: Severity of injury and micturition type had no significant effect on emotional status of individuals with spinal cord injury.
Introducing monitorable tailored transanal irrigation therapy for neurogenic bowel: First feedback and description of a clinical research program.

Mr Claes Hultling, Professor Anton Emmanuel

Karolinska Institutet, Stockholm, Sweden, University College London, London, United Kingdom

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction:
Bowel dysfunction severely impairs quality of life in spinal injury individuals. Transanal irrigation therapy has been shown to be an effective therapy when conservative management fails, but there remain opportunities to improve initial uptake and adherence. The Navina™ Smart system (Wellspect HealthCare) is an electronic system with an app. We describe a clinical research program developed to facilitate the management of TAI.

Methods:
The program comprises a literature review, a pilot study and a long-term study. The pilot study includes 30 experienced TAI-users with neurogenic bowel dysfunction (NBD) who use Navina Smart during a 4-week period and evaluate their experiences and perceptions in quantitative and qualitative terms. The long-term study includes 150 spinal cord injured individuals, with confirmed NBD but naïve to TAI therapy who use Navina Smart for 12 months with focus on change in NBD score and quality of life (QoL).

Results:
The literature review confirms that TAI is a useful therapy option among individuals with NBD but that there are inherent challenges related to the technique that often leads to poor compliance over time. It is proposed that greater compliance and better QoL can be delivered by making TAI more user friendly. The first pilot study, is ongoing with clinicaltrial.gov identifier NCT02709395 and will have data ready for presentation in 2016. The long-term study will start recruiting in 2016.

Conclusions:
TAI is a useful therapy option but with challenges related to compliance. Next-generation devices need to focus on user-friendly solutions to address these issues.
Transforming Research and Clinical Knowledge in SCI (TRACK-SCI): Critical care and imaging outcome predictors at a Level 1 Trauma Center

**Professor Michael Beattie**, Professor Geoffrey Manley, Professor William Whetstone, Catherine Suen, Professor Jacqueline Bresnahan, Dr. Jason Talbott, Dr. Jonathan Pan, Dr. Steven McKenna, Professor Graham Creasey, Dr. Adam Ferguson, Dr. Jenny Haefli, Dr. Sanjay Dhall, The TRACK-SCI Investigators

1. UCSF Brain and Spinal Injury Center and Zuckerberg SF General Hospital (ZSFG), San Francisco, United States, 2. Santa Clara Valley Medical Center, Santa Clara, United States, 3. Palo Alto VA Medical Center, Palo Alto, United States, 4. Stanford University Medical School, Stanford, United States

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: Standards of care for acute SCI vary across trauma centers. There are few evidence-based studies of SCI critical care to provide guidance for treatment decisions. Even the best teams do not know what the best practices are. We are in need of more information about the pathophysiology of acute SCI, the variety of critical care treatments employed, and how these variables may relate to long-term functional outcomes and quality of life. The ZSFG provides level 1 trauma care for all SCIs in San Francisco and the upper SF Peninsula, and provides an acute care system that includes rapid admission, imaging and surgical treatment, and an ICU that allows for detailed monitoring of high density physiological data.

Methods: The TRACK-SCI team has assembled retrospective data from over 200 SCI admissions from 2008-2015, and has begun a prospective study aimed at all future admissions, detailing acute care variables, interoperative and ICU monitoring, immune status, and long term outcomes. A RedCap database that includes all of the NINDS-CDEs can be queried to examine predictive value (e.g., ICU MAP as a predictor of impairment at discharge), and has been used to develop a simple scale for rating transverse T2 MR images that predicts impairment.

Results and Conclusions: Retrospective data (N=>200) show links between acute MAPs and impairment. Prospective data (N=24) has confirmed that ZSFG receives and images patients very early after SCI (Mn time to ED = 20.8 min). Multivariate analysis of outcomes will be presented. (Support: DoD CDMRP SC090241 and SC120159)
Birth of the African spinal cord injury network (AFSCIN): a new dawn

Miss Elma Burger, Dr Carlotte Kiekens, Mr Stephen Muldoon

Gauteng Health Department, Johannesburg, South Africa, Physical and Rehabilitation Medicine, University Hospitals Leuven, Brussels, Belgium, Assistant Director: International and Complex Care Development, Livability, United Kingdom.

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction
Persons that sustained a Spinal Cord Injury (SCI) in Africa are likely to experience challenges all along the continuum of care. To establish an African Network to address the challenges for SCI seemed prudent. This paper explores the forming of the network and the use of the International Perspective on Spinal Cord Injuries (IPSCI) from WHO and International Spinal Cord Association (ISCOS) chapter 5 (Health Systems strengthening), as a framework for strategic planning to strengthen services.

Materials and Methods
The African SCI symposium was organised in Botswana in November 2015. The aim was the establishment and launch of African Spinal Cord Injury Network (AFSCIN) as a mechanism to address common challenges in SCI management across Africa, similar to what ASCoN achieved in Asia. A workshop was facilitated to determine a strategic framework using the approach described in the chapter 5 of the IPSCI report. Challenges, opportunities and future strategies were discussed in relation to the 6 building blocks of this approach. 1) Leadership and governance, 2) Service delivery, 3) Human resources, 4) Health technologies, 5) Information systems and research 6) Financing

Results
The participants presented their challenges, successes and other pertinent issues, such as assistive devices and costing models in SCI management.

Priorities and strategies for AFSCIN for each country were established based on Chapter 5 of the IPSCSI report and strategic plan was compiled.

Conclusion
The Health Systems Strengthening approach chapter provided an excellent framework to establish a strategic plan to assist AFSCIN to address the challenges.
E-Consultation: Building Capacity for Spinal Cord Injury Primary Care

Dr James Milligan1,2, Dr. Joseph Lee1,2, Dr. Catharine Craven3,6, Dr. Dalton Wolfe4,5, Dr. Craig Bauman1,2
1Centre For Family Medicine Family Health Team, Kitchener, Canada, 2Department of Family Medicine, McMaster University, Hamilton, Canada, 3Brain and Spinal Cord Rehabilitation Program, University Health Network – Toronto Rehabilitation Institute, Toronto, Canada, 4Parkwood Institute, St. Joseph’s Health Care London, London, Canada, 5Aging, Rehabilitation & Geriatric Care Research Centre, Lawson Health Research Institute, London, Canada, 6Division of Physiatry, Department of Medicine, University of Toronto, Toronto, Canada

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction and Aims:
Community care of patients with spinal cord injury (SCI) is challenging and could be improved with timely access to SCI specialists. This pilot study explored the feasibility of using an e-consultation service to link family physicians with physiatrists to improve family physician access to timely advice regarding SCI care.

Methods: Mixed methods study using questionnaires and interviews. Sixteen family physicians, and two physiatrists were recruited. Family physicians could access physiatrists using a secure e-consultation system. Following pilot testing, participants were invited to complete an on-line survey, using 5-point scales (1 = not at all, 5 = extreme positive) to rate various aspects of the service, and to participate in individual interviews to obtain their perceptions of the service.

Results: Surveys were completed by 8/16 physicians (44%) and 11/16 (61%) completed an interview. Fourteen e-consultations were completed, most frequently for bladder (n=4) and bowel issues (n=4). Mean ratings reflected that the e-consultation process was prompt (M=4.0), helpful (M=3.8), and relevant (M=3.6); physicians were moderately satisfied with the service (M=3.8). Interview analysis generated six themes: (i) improved access to SCI expertise for family physicians, (ii) avoidance of specialist referrals and emergency department visits, (iii) easy and convenient use, (iv) secured system for sharing patient information, (v) use facilitated by dedicated resource support, (vi) system (technological) constraints/limitations.

Conclusions:
A SCI specific e-consultation service can provide family physicians with timely access to advice not otherwise easily accessed to facilitate the management of SCI health issues at a primary care level.
A Collaboration Between the National Spinal Injuries Centre, UK and Kilimanjaro Christian Medical Centre, Tanzania

Mrs Jane Stanbridge, Mr John Reynard, Miss Michelle Clarke, Miss Rachel Harrison, Mrs Joanna Armstrong

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction
Following attendance at a conference in 2011, healthcare professionals from the National Spinal Injuries Centre (NSIC) identified a need for spinal cord injury rehabilitation at Kilimanjaro Christian Medical Centre (KCMC), Tanzania. Spinal cord injured (SCI) patients were located on an overcrowded orthopaedic ward. A dedicated unit had been funded and built by a Dutch charitable organisation on site but this remained unoccupied. KCMC subsequently invited the NSIC to form a collaboration with the aim to provide training in all aspects of SCI management.

Method
An assessment of need was carried out in 2012 to identify the major issues. KCMC receives 60-100 SCI cases annually, the majority are paraplegics due to limited survival rate for tetraplegics. Subsequently, a multidisciplinary team travelled to KCMC to provide training in all aspects of spinal cord injury management (April 2013, November 2013 and November 2015).

Results
A small functioning SCI unit (Orthopaedic Rehabilitation Unit, ORU) has been established at KCMC with improvement in rehabilitation skills, reduced number of pressure sores and improved attitudes towards living with spinal cord injury. Regular peer support is provided by Motivation Africa.

Conclusions
KCMC has the necessary components to become a centre of excellence in spinal cord injury. The NSIC plans to continue to support this project with training in all aspects of SCI management. Challenges limiting the project have included provision of funding for rehabilitation, equipment, long term urinary supplies and medication and staff recruitment for ORU.

This project has been supported by Stoke Mandeville National Spinal Charity.
A new model of community-based care for reducing mortality and improving quality of life after spinal cord injury in Bangladesh

**Professor Sohrab Hossain**<sup>1,2</sup>, Mr Akhlas Rahman<sup>1</sup>, Dr Jocelyn Bowden<sup>3</sup>, Mr Stephen Muldoon<sup>4</sup>, Mr Shofiqul Islam<sup>1</sup>, Professor Robert Herbert<sup>5</sup>, Professor Lisa Harvey<sup>3</sup>

<sup>1</sup>Centre For The Rehabilitation Of The Paralysed, Savar, Bangladesh, <sup>2</sup>Bangladesh Health Practitioners’ Institute, Savar, Bangladesh, <sup>3</sup>John Walsh Centre for Rehabilitation Research, University of Sydney, Sydney, Australia, <sup>4</sup>Livability Ireland, Enniskillen, Ireland, <sup>5</sup>Neuroscience Research Australia, Sydney, Australia

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: People who sustain spinal cord injuries (SCI) in low and middle-income countries (LMIC) often develop life-threatening complications and die within two years of hospital discharge. Established models of community-based support are often not economically feasible in LMIC. This pilot aimed to demonstrate the feasibility of implementing a larger clinical trial to investigate an inexpensive model of community-based care to prevent and manage long-term complications in people with SCI (ACTRN12613001137785).

Methods: Thirty wheelchair dependent people with recent SCI were recruited from the Centre for Rehabilitation of the Paralysed in Bangladesh. They were randomised to a control or intervention group prior to discharge. Intervention participants received a package of care for 2 years following discharge which included regular phone calls from a health worker, and 3 home visits. The health worker provided advice and screened participants for complications. Control participants received usual care. Blinded assessments were conducted prior to discharge and 2 years later in participants’ homes. The primary outcome was all-cause mortality; secondary outcomes were prevalence of complications, quality-of-life and participation.

Results: All participants were located at 2 years, although two participants had died. The intervention was delivered as planned and outcome data were attained on all participants.

Conclusion: This pilot study demonstrated the feasibility of conducting a large randomised controlled trial to investigate the effectiveness of this proposed model of care to manage complications following discharge from hospital after SCI in Bangladesh. The full clinical trial involving 410 participants commenced in mid-2015.

Dr. Apichana Kovindha1, Dr. Pratchayapon Kammuang-lue1, Dr. Siam Tongprasert1, Dr. Napasakorn Komaratat2, Dr. Rungarun Mahachai3, Dr. Chayaporn Chotiyarnwong4

1Department of Rehabilitation Medicine, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand, 2Sirindhorn National Medical Rehabilitation Institute, Nonthaburi, Thailand, 3Department of Rehabilitation Medicine, Ratchaburi Hospital, Ratchaburi, Thailand, 4Department of Rehabilitation Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

Introduction: Epidemiological data of spinal cord injury (SCI) in developing countries were rarely reported. Our objective was to report an epidemiologic data and post-acute rehab outcomes of traumatic SCI (TSCI) and non-traumatic SCI (NTSCI) in Thailand.

Materials and methods: Based on the International SCI core data set, data of new TSCI and NTSCI patients admitted for post-acute rehabilitation were recruited from 4 hospitals. The epidemiologic data and rehab outcomes were analyzed and reported.

Results: There were 87 new TSCI and 35 NTSCI patients. Among TSCI group, mean age at onset was 44 (SD 17) years, 75% were males, road traffic injuries predominately (55%), 44% had associated injuries, 81% were surgically treated, 43% were classified as AIS-D, mean rehab length of stay was 33 days (SD 28.3) and mean SCIM score at discharge was 54.4 (27.8). Among NTSCI, 66% were females, age at onset 51 year (SD 14), 51% had spinal surgery, 64% were classified as AIS-D, mean rehab LOS was 33 days (SD 18.8) and SCIM at discharge 60.1 (SD 19.5). TSCI had higher complication rates than NTSCI (39.0% vs 21.2%), especially urinary tract infection (20.7% vs 8.6%). Both the patients and the rehab teams were satisfied with the rehab outcomes. Nearly all were discharged home.

Conclusion: Road traffic injuries were the most common cause of TSCI. Nearly 30% were non-traumatic SCI patients. TSCI had lower age at onset than NTSCI. Post-acute rehab length of stay was about a month. Rate of complications was still high during post-acute rehabilitation.

Mrs Christiana Cheng1, Dr Susan Urquhart2, Mrs Esther Jacobson3, Mrs Lise Belanger4, Mrs Vanessa Noonan1,5, Dr. Marcel Dvorak5, Dr. Michael Schuetz3

1Rick Hansen Institute, Vancouver, Canada, 2Spinal Injuries Unit, Queensland Spinal Cord Injuries Services, Brisbane, Australia, 3Queensland University of Technology, Brisbane, Australia, 4Acute Spine Program, Vancouver General Hospital, Vancouver, Canada, 5University of British Columbia, Vancouver, Canada

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: Access and timing to care is critical in achieving optimal outcomes following traumatic spinal cord injury (TSCI). Processes ensuring service access across SCI care continuum are not well documented. The study objective was to delineate processes throughout the SCI care continuum in Queensland, Australia, and British Columbia (BC), Canada.

Methods: A 70-item survey containing information on number of admissions/discharges, resources/service availability, and process indicators was completed by acute and rehabilitation facilities (Queensland: Princess Alexandra Hospital, Spinal Injuries Unit (SIU); BC: Vancouver General Hospital, GF Strong Rehabilitation Centre (GFS)). Process map of patient flow across SCI care continuum was developed for each setting. Process indicators selected to reflect care delivery across the continuum were: MRI and spine surgeon available 24/7 to support early surgery; having physiatry consultation within 1 week of acute admission, and acute services available in rehabilitation phase to reflect integrated acute and rehabilitation program; transitional services for patients following discharge in a community setting to facilitate community-reintegration.

Results: Between 2008-2012, on average TSCI admissions were 72/year for Queensland and 117/year for BC. Process maps described additional similarities and differences between the 2 settings. Both settings were similar except Queensland SIU provides acute care and has a transitional rehabilitation program while GFS does not.

Conclusions: Although Queensland and BC have similar care, important differences were observed between settings in the rehabilitation and community phases. This study is expanding to include other countries. Future work will evaluate how differences in processes of care impact outcomes by linking this information to registry data.
Breaking barriers in Paradise Island... Setting up a neuro-rehabilitation centre in Mauritius

Professor Anba Soopramanien¹
¹Royal Bucks Hospital- Aylesbury- Uk, Stanmore, United Kingdom

Introduction
Mauritius is a stunning tropical island where economic and political stability is matched by the great progress in the field of acute medical care. However facilities for post-acute care are non-existent and there is no structure to offer rehabilitation after spinal cord injury or acquired brain injury. I became aware of these limitations during my regular visits to my country of birth and decided to 'act'.

Methods
With the help of the Mauritius Research Council and Ministry of Health in Mauritius, we carried out an assessment of needs, which led to a publication (1). This was followed by a fact-finding mission in November 2015: a group of rehabilitation specialists visited individuals in hospitals, homes and communities, performing a comprehensive assessment of the provision of neuro-rehabilitation services. Areas assessed included equipment, clinical outcomes and experiences of patients.

Results
There was a high incidence of complications: pressure ulcers, bladder (all patients had an indwelling urethral catheters), bowel (they had impaction or accidents). No doctors, nurses or therapists had specialised in neuro-rehabilitation, and there were no wards or units dedicated to neurorehabilitation care.

Conclusions
We have set up a charity to mount a business case in order to act at different levels: work with the government to choose and train rehabilitation 'champions'; with a local charity set up a neurorehabilitation centre and organise a mobile rehabilitation facility.

Challenges in Comprehensive Management of Spinal Cord Injury in India and ASCoN region: Findings of experts, patient and consumer survey

Dr Harvinder Chhabra1, Ms Shruti Sharma1, Mr Mohit Arora2

1Indian Spinal Injuries Centre, New Delhi, India, 2Royal North Shore Hospital, Sydney Medical School-Northern, The University of Sydney,, Sydney, Australia

Objective: To understand prevailing scenario of comprehensive management of spinal cord injuries (SCI) in India and Asian Spinal Cord Network (ASCoN) region especially with a view to document challenges faced and its impact.

Methods: A questionnaire was designed which covered various aspects of SCI management. Patients, consumers and experts in SCI management from different parts of India and ASCoN region were approached to complete the survey.

Results: 60 patients, 66 consumers and 34 experts completed the survey. Difference of opinion was noticed amongst the three groups. All members of recommended multidisciplinary team are generally not available and existing members need to multitask. 57.1% consumers and 46.7% patients used disposable nelaton catheters. For reusable catheter 31.03% experts recommended processing with soap and running water and 45.45% recommended clean cotton cloth bag for storage. Pre-hospital care and community inclusion pose biggest challenges in SCI management. More than 75% of SCI faced problems of access and mobility in community. Lack of awareness about SCI and illiteracy are most important factors hindering pre and inhospital care. Inadequate physical as well as vocational rehabilitation and financial barriers are thought to be major factors hindering integration of spinal injured into mainstream of society. Strong family/spouse/community support, strong religious beliefs, innovativeness and availability of cheap and abundant manpower are main strengths of society which help overcome the challenge.

Conclusions: Our study brought out that SCI in India and ASCON region face numerous challenges which affect access to almost all aspects of comprehensive management and hinder community inclusion.
Considerations for a Targeted Self-Management Program for Individuals with Traumatic Spinal Cord Injury

Dr Sarah Munce1, Dr Michael Fehlings2, Dr Sharon Straus3, Dr Fiona Webster4, Dr Eunice Jang4, Dr Susan Jaglal4

1Toronto Rehabilitation Institute-university Health Network, Toronto, Canada, 2Toronto Western Hospital, Toronto, Canada, 3St. Michael’s Hospital, Toronto, Canada, 4University of Toronto, Toronto, Canada

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Background: Evidence points to the need for increased self-management support efforts to reduce secondary complications in spinal cord injury (SCI). The overall objective of this study was to determine the specific implementation considerations for a targeted self-management program.

Methods: This study used a mixed methods approach with an exploratory design. This is a two-phase sequential design, whereby the results of the first method (qualitative) can help to develop or inform the second method (quantitative). Twenty-six interviews across three stakeholder groups were conducted in Phase I. For Phase II, the results gleaned from Phase I were used to develop a survey on self-management in individuals with traumatic SCI. There were 99 respondents to the survey, with representation from across Canada.

Results: The following self-management program considerations were identified: caregiver involvement/needs, peer support and feedback, timing of support (i.e., introduced at the rehabilitation and/or at the transition from rehabilitation to the community period), independence/self-efficacy, mood, and secondary complications. In order to address the specific secondary complications identified as well as the other program considerations, the following modules for a self-management program were identified: wellness/health promotion, pain management, bladder care, bowel care, preventing injury, addressing depression (including increasing self-efficacy in managing condition and decreasing anxiety), increasing mastery of managing condition, communicating with health care professionals, and communicating with family.

Conclusions: It is anticipated that such a program could have a significant impact on reducing secondary complications in SCI, attenuating caregiver burnout, and enhancing quality of life for individuals with SCI.
Determinants and Variation of Healthcare Utilization in Persons with Spinal Cord Injury

Mr Elias Ronca\textsuperscript{1,2}, Dr. Anke Scheel-Sailer\textsuperscript{3}, Dr. Hans Georg Koch\textsuperscript{4}, Prof. Armin Gemperli\textsuperscript{1,2}

\textsuperscript{1}Swiss Paraplegic Research, Nottwil, Switzerland, \textsuperscript{2}Department of Health Sciences and Health Policy, University of Lucerne, Lucerne, Switzerland, \textsuperscript{3}Swiss Paraplegic Centre, Nottwil, Switzerland, \textsuperscript{4}Swiss Paraplegic Association, Nottwil, Switzerland

Objectives: To investigate annual rates and geographic variation of healthcare utilization in persons with spinal cord injury (SCI), and to identify factors associated with healthcare utilization.

Method: Cross-sectional survey with questionnaires distributed to individuals with chronic SCI (N=579), over 16 years of age residing in Switzerland. Individuals with SCI were matched to a sample of the Swiss general population (N=21,597). Geographic variation was investigated using Bayesian conditional-autoregressive models.

Results: Of 492 participant (85.0% response), a majority (94.1%) visited a health service provider in the preceding year, with most persons visiting GPs (88.4%) followed by outpatient clinics (53.1%) and inpatient hospitals (35.9%). Utilization increased compared to the general population by 1.3, 4.0, and 2.9 fold for GP, outpatient clinic, and inpatient hospital visits, respectively. GP utilization was highest in persons with low income (incidence rate ratio (IRR) 1.85) and old age (IRR 2.62). In the first two years post-injury, health services visits were 1.7 (GP visits) to 5.8 times (emergency outpatient clinic visits) more likely, compared to later. Emergency outpatient clinic visit had the highest geographic variation in healthcare utilization. Persons with SCI living in rural areas visited outpatient clinics less often but more frequently consulted GPs than persons with SCI living in urban regions.

Conclusions: People with SCI more frequently use health services as compared to the general population, across all types of medical service institutions. GP services were used most often in areas where availability of specialized outpatient clinic services was low.
Do Indigenous clients have lifelong access to specialist Spinal Cord injury clinics post inpatient rehabilitation - A retrospective clinical audit.

Miss Sheelagh Donohoe, A/Professor Ruth Marshall

South Australian Spinal Cord Injury Service, Adelaide, Australia

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Background
Clients with Spinal Cord Injuries (SCI) require lifelong care. The South Australian Spinal Cord Injury Service provides inpatient and outpatient rehabilitation to clients from South Australia and Northern Territory. Post discharge clients are seen at the appropriate metropolitan or outreach clinics on an ongoing basis. Given care access limitations in rural and remote areas, this audit focused on ascertaining whether Indigenous clients with SCI have access to lifelong specialist services.

Method
A retrospective audit of medical records of SCI clients admitted for rehabilitation over the past 10 years was completed to obtain data on the number of inpatients who identified themselves as Aboriginal or Torres Strait Islander. Details of demography, SCI classification, functional measures and attendance at SCI specialist clinics were recorded.

Results
Findings from this audit indicate that Indigenous clients with SCI from rural and remote areas may often be lost to follow up and, without timely access to services, have poorer health outcomes. While there may be many reasons for these findings, it may partly be due to a lack of access to culturally appropriate services.

Discussion
The inequity in access to health care services between urban, rural and remote areas is stark. This gap is even more evident between Indigenous and non-Indigenous clients which requires urgent attention.
Don’t look at my wheelchair! The plasticity of longlasting prejudice

Dr. Giulia Galli\textsuperscript{1,3}, Dr. Bigna Lenggenhager\textsuperscript{2}, Dr. Giorgio Scivoletto\textsuperscript{1}, Dr. Marco Molinari\textsuperscript{1}, Dr. Mariella Pazzaglia\textsuperscript{1,3}
\textsuperscript{1}IRCCS Fondazione S. Lucia, Rome, Italy, \textsuperscript{2}Neuropsychology Unit, Department of Neurology, University Hospital Zurich, Zurich, Switzerland, \textsuperscript{3}Department of Psychology, University of Rome ‘La Sapienza’, Rome, Italy

INTRODUCTION Prejudicial behaviour may contribute to discrimination and disparities in social groups. However, little is known about whether and how implicit assumptions and direct contact modulate the interaction and quality of professional interventions in education and health contexts. This study was designed to examine implicit and explicit attitudes towards wheelchair users.

METHODS We investigated implicit and explicit attitudes towards wheelchair users in: 15 patients with traumatic spinal cord injury (SCI); 15 health professionals with intense contact with wheelchair users, and 15 healthy participants without personal contact with wheelchair users. At first, we evaluated whether having an experience with wheelchair users can modulate implicit (IAT measure) and explicit (measure VAS) attitude. To assess the short-term plasticity of prejudices, we used a valid intervention aiming at changing implicit attitudes through brief direct contact with a patient who uses a wheelchair.

RESULTS (i) wheelchair users with SCI held positive explicit but negative implicit attitudes towards their novel in-group; (ii) the amount of experience with wheelchair users affected implicit attitudes among health professionals, and (iii) interacting with a patient with SCI who contradicts prejudices modulated implicit negative bias towards wheelchair users in healthy participants.

CONCLUSIONS The use of a wheelchair immediately and profoundly affects how a person is perceived. However, our findings highlight the dynamic nature of perceptions of social identity, which are not only sensitive to personal beliefs, but also highly permeable to intergroup interactions. Having direct contact with people with disabilities might foster positive and prevent or reduce hidden biases.
Implementing Evidence-based Clinical Practice Guidelines within an 5-year International Cohort Study of the Risk Factors for Sitting-Acquired Pressure Ulcers (AusCAN)

**Professor Jillian Swaine**¹, Mrs. Marianne Mullane², Mr. Luke Brennan², Dr. Karen Campbell³, Professor Michael Stacey⁴

¹University Of Notre Dame Australia, Fremantle, Australia, ²University of Western Australia, Perth, Australia, ³Western University, London, Canada, ⁴McMaster University, Hamilton, Canada

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: This paper presents implementing evidence-based clinical practice guidelines within a research context. A large, multi-site study is being conducted in which developing a pressure ulcer (PU) is the primary outcome. The study requires research assistants (OTs and PTs) and participants to recognize and report clinical signs of PU.

**AIM** The aim was to develop an evidence based, valid and reliable skin checking training activity for identifying and reporting clinical signs of PU, by applying clinical guidelines and a behavioural theory.

**METHODS:** One international published clinical guideline on PUs was identified at the time of development. The guideline recommended a classification system for identifying PUs. Two wound care experts reviewed this classification system to identify key “diagnostic” signs of PU and overlapping signs were noted. Instead of the traditional patient education handout approach, a behaviour theory approach was applied which utilizes specific behaviour change techniques (BCTs) to create behavioural changes. Example BCTs include demonstrating the behaviour and prompts/cues.

**RESULTS:** The skin checking training activity included a printed handout, training video and telephone script for follow up calls. It instructs participants to assess their skin in seven anatomical locations and check for five key evidence-based clinical signs of PU as defined by the guidelines. Eight BCTs were embedded in the skin checking training activity.

**CONCLUSION:** Clinical practice guidelines and BCTs were embedded in an evidence-based, valid and reliable skin checking training activity for OT and PT research assistants/participants to recognise and report clinical signs of PU for the AusCAN study.
Information needs of individuals with spinal cord injury

MA Alexandra Durus\textsuperscript{1,2}, PhD Bruno Trezzini\textsuperscript{1}, MA Mirjam Brach\textsuperscript{1}, PhD Armin Gemperli\textsuperscript{1,2}

\textsuperscript{1}Swiss Paraplegic Research, Nottwil, Switzerland, \textsuperscript{2}Department of Health Sciences and Health Policy, University of Lucerne, Lucerne, Switzerland

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Objective: To identify the information needs of individuals living with chronic spinal cord injury (SCI) and ascertain subgroups with high demands.

Method: Cross-sectional, nationwide survey mailed to 582 individuals living with chronic SCI in Switzerland.

Results: 492 (85\%) questionnaire were returned. Average age was 55 years, 17 years after injury. More than half of study participants reported little needs in all 28 items. Major information needs were reported in the areas of research (46\% of participants reported major information needs), bladder management (44\%) and on revision of disability insurance (42\%). Individuals of younger age, those having support at home or individuals having problems due to their financial situation reported higher information needs in a variety of areas. The associations between reported information needs and overall life satisfaction or the rating of local availability of SCI specific medical services was low.

Conclusions: Major information needs persist in individuals with SCI in areas that were supposed to be covered via readily available health care services, such as information on bladder and bowel management. In order to target areas for improvement particular subgroups must be targeted as no area of information is consistently important for the entire SCI population. Most notably, counseling on finance and insurance topics for those in financial hardship, and instructing on professional life, sexuality, pregnancy and birth for younger individuals.
Introduction and Aims: Depression, anxiety, and substance abuse are common following spinal cord injury (SCI) and go largely undiagnosed and untreated. The purpose of this study is to gather patient perspectives of a screening protocol to identify mental health issues for use in primary care.

Methods: The protocol consists of standardized screening tools for depression, anxiety, substance abuse, social isolation, somatoform disorder, functional status, chronic pain, and cognitive impairment. Following the screening, patients were invited to complete a questionnaire assessing the acceptability of screening (5-point scale: not at all - very acceptable), and level of agreement (5-point scale: strongly disagree – strongly agree) with various statements about screening and intentions to follow resulting treatment recommendations (not at all, maybe, definitely).

Results: One patient screened positive for anxiety, one for social isolation, two for functional impairment, and 11 for chronic pain. Surveys were completed by 13 of 15 patients (87%) who completed the screening. The screening was rated as “very acceptable” by 92% of respondents. The majority of respondents agreed (sum of agree and strongly agree ratings) that the screening was worth the extra time involved (92%), a valuable addition to regular care (85%) and is important to identifying conditions that were not previously known (69%). All but one respondent intended to follow resulting treatment recommendations (69% definitely).

Conclusions: Patients perceived mental health screening as valuable and acceptable in primary care. Identification of mental health issues is critical to ensuring access to effective interventions and improving health outcomes.
Introduction: Few clear guidelines for optimizing locomotor ability exist and specific practice patterns are typically not well documented. Moreover, there is limited understanding of how recent advances in technology might be applied in a systematic and integrated fashion to create a more individualized therapeutic approach. Therefore, we sought to develop and implement an algorithmic clinical decision support and data management system (CDSS) that integrates and optimizes locomotor training to improve mobility outcomes in persons with SCI.

Methods: The Parkwood Program for Rehabilitation Innovations in Movement Enhancement (PRIME) CDSS has been informed by: 1. literature review of existing treatment protocols and methods of capturing clinical practices (e.g., taxonomies); 2. chart reviews to summarize prior practice patterns; 3. consultations with subject matter experts; and 4. application of the algorithm on patients, with systematic data collection followed by iterative practice reflection.

Results: An initial prototype incorporating features of existing protocols and locomotor training principles (e.g., optimizing sensor input, enhancing normal movement, minimizing compensation, task specificity) was developed as the basis for continued iterative, end-user directed development and feasibility testing. PRIME prototypes encompass manual and robotic overground and treadmill-supported approaches, but further development and improvement cycles continue. Preliminary needs analysis has identified 18 specific use-cases to be addressed within PRIME.

Conclusion: The clinical treatment and assessment procedures embedded in PRIME will enable systematic tracking of practices and related outcomes, thereby representing a practice-based research platform to serve both quality improvement and research purposes.
Public financing of support of individuals with spinal cord injury in Switzerland

MA Lukas Studer\textsuperscript{1,2}, Cordula Ruf\textsuperscript{3}, Dr. iur. LL.M. Hardy Landolt\textsuperscript{4}, MA Mirjam Brach\textsuperscript{3}, PhD Armin Gemperli\textsuperscript{1,2}

\textsuperscript{1}Swiss Paraplegic Research, Nottwil, Switzerland, \textsuperscript{2}Department of Health Sciences and Health Policy, University of Lucerne, Lucerne, Switzerland, \textsuperscript{3}Swiss Paraplegic Centre, Nottwil, Switzerland, \textsuperscript{4}University of St. Gallen, St. Gallen, Switzerland

Background: The Swiss financial aid system is old, historically grown and convoluted. Financial aid is mostly granted based on individual, comprehensive applications, what demands a high level of sophistication by applicants. It is in question if the many subsidiary instruments function for the good of its target audience, and how the petitioners deal with the complexity of the system.

Objective: To investigate the understanding of the Swiss public financing system by individuals with spinal cord injury, with respect to aids relevant to their functioning.

Methods: A community survey on financial aid received was analyzed for consistency in reports.

Results: Of 453 study participants (8% missings), 130 (29%) reported to not receive public financial support. Of the remaining 323 participants, 224 (69%) filled out a complete report. At least 74% of the financial declarations comprised mistakes, indicating that the claimant, although partially successful, did not fully understand the funding instruments. Sixty-two of 67 declarations on nursing care reimbursement were evidently false. The lack of understanding was not associated with personal factors such as age, sex or lesion characteristics. There was regional variation with significantly lower understanding (minus 14%) of persons in the French region as compared to German speakers.

Conclusions: Inequity caused by incomprehension is pervasive and successful funding dependent on luck or counseling support. In near-term counseling initiatives should be expanded to individuals who do not actively seek a service and are unaware of their miscomprehension. In the long-term the public funding system has to be simplified.
Retrospective analysis of assessments during first rehabilitation of spinal cord injured patients in a specialized acute care and rehabilitation clinic

Patricia Lampart¹², PhD Birgit Prodinger²³, PhD Armin Gemperli²³, Dr. med. Michael Baumberger¹, Ines Bersch¹, Klaus Schmitt¹, Dr. med. Anke Scheel-Sailer¹²

¹Swiss Paraplegic Centre, Nottwil, Switzerland, ²Department of Health Sciences and Health Policy, University of Lucerne, , Lucerne, Switzerland, ³Swiss Paraplegic Research , Nottwil, Switzerland

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Objectives: There are different internationally discussed standards concerning time and choice of assessments during the rehabilitation after a spinal cord injury (SCI). The aim of this study is to get an overview of the currently applied assessments by different professionals during the first rehabilitation after SCI including the frequency and differences of the application among relevant patient sub-groups.

Methods: Retrospective chart review of patients after SCI, aged 18 and older, admitted to a specialized SCI acute care and rehabilitation clinic between 12/2014 and 12/2015 to identify the assessments. Descriptive analysis of all selected and applied assessments for patients divided into four groups (paraplegia/tetraplegia, complete/incomplete lesion). For assessments used in both paraplegic and tetraplegic patients differences in number of assessments among groups were calculated based on the Chi-square test.

Results: In total 53 assessments were screened in 119 patients and 40 assessments were actually applied, of which ten had a mean equal or bigger than one. The most frequently used assessments overall were Spinal Cord Independence Measure (SCIM) III (mean=7.71), Skin Assessment (mean=3.59) and Manual Muscle Test (MMT) (mean Lower Extremities=3.24; mean Upper Extremities=2.47). The American Spinal Injury Association (ASIA) Impairment Scale (AIS) was applied 1.85 times on average. The most significant variations of assessment application occurred in the tetraplegic population when comparing patients with complete versus incomplete lesion.

Conclusion: In order to improve the quality of rehabilitation, a meaningful standard assessment toolbox should be defined and implemented. The choice of assessments should be relevant for clinical management and outcome reporting.
Integrating rehabilitation professionals into the UK International Emergency Medical Team (UKEMT); a multi-disciplinary team that deploys as part of the British Government’s medical response to international emergencies has been part of a Handicap International’s approach. This is part of a wider WHO initiative to improve the standards and coordination of foreign medical teams who deploy to disasters. In January 2016, HI proposed to include the development of specialist Spinal Cord Injury response into this framework.

To date no Spinal Injury Specialist Cell exists, and WHO have not defined what a spinal injury specialist cell would consist of. Learning objectives through specific presentations include:

- Defining an SCI specialist cell, within the existing UK-EMT
- The procurement of equipment to enable standalone deployment or alongside an existing local medical facility.
- Recruitment and training of NHS staff to form defined teams as multi-disciplinary teams in challenging environments.

Existing WHO standards in emergency deployments include FMT and Minimum Rehabilitation standards. They need SCI specialist input to answer complex SCI needs.

Following tools and principles will be presented in 5 sessions:

- What are Emergency medical teams doing with SCI?
- Foreign Medical Team guidelines in disasters
- Minimum rehabilitation standard in disaster management
- What principles and guidelines need to be build out to cover the needs for SCI comprehensively in disaster management in the future according specific scenarios

The time for discussion at the end of the workshop presentations will cover the following issues:

Deployment decision making process, worldwide mapping of SCI care capacity in disaster risk zones, defined scope of operation, HR and skills requirements, Equipment, (operational, medical, consumable, rehabilitation and pharmacological), SCI specific patient record system, inter-disciplinary training requirements of the team to adapt their roles for humanitarian work needs of patient/caregiver information leaflets and checklists.
Stakeholder Consultations to Inform Development of a pan-Canadian Self-Management Program for Persons with Spinal Cord Injury (SCI)

Miss Lindsay Sleeth¹, Dr. Dalton Wolfe¹, Dr. Susan Jaglal², Dr. Sonya Allin³, Dr. Sarah Munce², Karen Anzai⁵, Peter Athanasopoulos⁶, Dr. Gary Linassi³, Dr. Vanessa Noonan⁶, John Shepherd², Dr. Jennifer Tomasone⁷
¹Lawson Health Research Institute, London, Canada, ²University of Toronto, Toronto, Canada, ³University of Saskatchewan, Saskatoon, Canada, ⁴Spinal Cord Injury Ontario, Toronto, Canada, ⁵GF Strong Rehabilitation Centre, Vancouver, Canada, ⁶Rick Hansen Institute, Vancouver, Canada, ⁷Queen University, Kingston, Canada

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction
Although self-management (SM) skills are recognized as critical, there is no shared understanding of the best SM approach for persons with SCI in managing health. We undertook multiple consultative processes to inform development of a pan-Canadian SM program. These consultations had two distinct objectives: 1) identifying viable and sustainable use cases across various stakeholders and 2) obtaining feedback on potential solutions associated with iterative prototype development.

Methods
Consultation process 1 addressed nine questions associated with the Business Model Canvas (Osterwalder & Pigneur, 2010). This included individual consultations with commercialization think-tanks, SCI consumer agencies, researchers, clinicians and consumers (n=30 across these stakeholders). This culminated in a consensus-seeking face-to-face meeting. Consultation process 2 involved iterative focus groups (n=15 persons with SCI, n=4 SCI clinicians) to provide feedback and guidance on prototype development.

Results
Consultation process 1 resulted in narrowing the field to 3 specific use cases: Peer health coaching; Post-discharge planning; Identifying consumer needs and healthcare utilization. This also enabled identification of key partners. Key findings from the focus groups have led to an emphasis on the post-rehabilitation period, supporting healthcare interactions and employing peer coaching. Initial prototypes have addressed bladder and bowel management in addition to general wellness (e.g., physical activity).

Conclusions
These consultations will inform a validation trial of this pan-Canadian program. A key aspect has been to consider the value propositions and evolving business model that might ensure sustainability.
The Expanded Role of the SCI Clinical Research Liaison Officer.

Mrs Melinda Millard¹, Mrs Janette Alexander¹, Associate Professor Doug Brown², Dr Andrew Nunn¹

¹Victorian Spinal Cord Service, Austin health, Heidelberg, Australia, ²Spinal Research Institute, Kew, Australia

INTRODUCTION
The Clinical Research Liaison Officer (CRLO) is a single point of contact for patients for all spinal cord injury (SCI) research trials. This minimises patient confusion and stress in the acute phase and avoids multiple study coordinators approaching each patient. The role has expanded to be more than the interface between patients and researchers. It now provides major support to clinicians and new researchers in the development of research questions and project feasibility and assisting them with grant and ethics applications.

METHOD
The value of the role was assessed by analysing the subject recruitment data. Patients who were eligible to participate in acute trials from 1.1.2015 to 9.2.2016 were approached to complete a survey reviewing the CRLO role.

RESULTS
In the six and a half years to 31st March 2016, the CRLO supported 38 projects. For the 13 acute trials, 442 acute admissions were screened. Forty-eight percent (n=194) were eligible for one or more studies, with 80% (n=154) of these recruited into one research trial and 31% (n=60) enrolled in two or more.

Of 36 participants surveyed, 18 responded. The majority (94%, n=17) were satisfied or very satisfied with the support they received to participate in studies.

CONCLUSION
The CRLO role has enabled efficient research processes which protect the patients and support clinical and research staff, thereby creating a strong research culture.

Since its inception the role has expanded to provide major assistance to clinicians and new researchers to develop research proposals, funding applications and navigate ethics requirements.
The practice of spinal cord injury cardiovascular function data collection among Chinese physicians

Dr Nan Liu¹, Dr Xiaowen Li¹, Dr Huayi Xing¹, Professor Mouwang Zhou¹, Professor Fin Biering-Sørensen²

¹Peking University Third Hospital, Beijing, China, ²Clinic for Spinal Cord Injuries, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: This study aims to investigate the practice of spinal cord injury (SCI) cardiovascular function data collection by Chinese physicians to determine the clinical feasibility of using International SCI cardiovascular Function Basic Data Set (ISCICFBDS) during daily practice.

Methods: During a SCI workshop, a survey questionnaire was administered to 51 physicians from 25 provinces of China. The questions were developed based upon the data elements within the ISCICFBDS.

Results: Except from the item “time performed” of objective cardiovascular data (24% were reported to be collected) and two items regarding date of cardiovascular function before and after SCI (35% and 59%, respectively), other data elements in ISCICFBDS were reported collected consistently by more than 60% of the attendees. Otherwise those with the lowest reported collection rates were: hypotension before SCI (63%), dependent oedema after SCI (61%), antihypotensives on the day of examination (67%), position during testing (61%), and use of abdominal binder (61%) or pressure stockings (61%) during the testing. For the remaining data elements the reported collection rates were 75-94%.

Conclusion: Although the reported collection of cardiovascular function data are above 60% for most elements within the ISCICFBDS among Chinese physicians, the guidelines included in the ISCICFBDS should be emphasized before the use of ISCICFBDS in clinical practice in order to collect the cardiovascular function data in individuals with SCI in a uniform and worldwide comparable manner.
Training Program about Spinal Cord Injury Rehabilitation in R type Closed Prison

MD Belgin Erhan1,2, MD Ebru Yilmaz Yalcinkaya3, MD Evrim Coskun Celik1, MD Nurgul Elbas3, Nurse Nigar Capkan1, Nurse Banu Katran1, Dr Guven Urgan4

1Gop Taksim Training And Research Hospital, Istanbul, Turkey, 2Okmeydanı Training And Research Hospital, Istanbul, Turkey, 3Istanbul Aydın University, Faculty of Health Sciences, Istanbul, Turkey, 4Ord.Prof Dr Sulhi Donmez Training Centre, Ministry of Justice, Istanbul, Turkey

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

There is one rehabilitation type (R type) closed prison for disabled inmates and prisoners in Istanbul. The aim of this preliminary study was to evaluate the knowledge level of health workers about SCI in these prisons and to evaluate the difference in their knowledge before and after training.

Methods: The trainers in the rehabilitation team were composed of four physiatrists, two nurses and two physiotherapists who were experienced in SCI rehabilitation. The duration of the program was 1.5 day training. The topics were about the neurogenic bladder and bowel, pressure sores, spasticity, nutrition, sexual dysfunctions, autonomic dysfunctions, pain, positioning and basic physiotherapy program. Four nurses and 8 health officers, working in prison, were the trainers. Pre and post tests were applied to the trainees. Exam involved 15 questions about the course subject. The distribution of subjects of the questions were as follows: neurogenic bladder and bowel (3), physiotherapy (3), pressure ulcer (3), cardiovascular complication (2), nutrition (1), hygiene (1) and pain (1). Each question was 1 point.

Findings: Mean age of the trainees was 39.9 years (22-56). Most of them were male (n=11 91.7%). Average correct answer score was 7.6/15 before the course and 12.6/15 after the course. It was significantly increased after course. The least score was 4 before the course and 9 after the course.

Conclusion: Short training programs help to increase the knowledge about SCI rehabilitation and this will improve the quality of life of the disabled inmates.
Using Implementation Science to support Best Practice Implementation in SCI Rehabilitation: Experiences of the Spinal Cord Injury Knowledge Mobilization Network

Mrs Heather Flett1,2, Mr. Saagar Walia3, Dr. Cyndie Koning4, Ms. Anna Kras-Dupuis5, Dr. Colleen O'Connell6, Dr. Carol Scovil1,2, Dr. Dalton Wolfe3, SCI KMN

1University Health Network - Toronto Reahb, Toronto, Canada, 2University of Toronto, Toronto, Canada, 3Lawson Health Research Institute, London, Canada, 4Glenrose Rehabilitation Hospital, Edmonton, Canada, 5St. Joseph's Health Care London, London, Canada, 6Stan Cassidy Centre for Rehabilitation, Fredericton, Canada

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Best practice implementation in health care settings remains a challenge. It is often stated that it takes approximately 17 years to translate research into practice (Institute of Medicine, 2001) and that this translation may be incomplete or unsustained. Additionally, it has been noted that only 14% of research is translated into practice (Balas & Boren, 2000). The SCI Knowledge Mobilization Network (SCI KMN), a community of practice of seven Canadian rehabilitation centres, aims to facilitate the utilization of best practices to improve health outcomes for persons with SCI.

The SCI KMN identified several practices emanating from two pressure ulcer prevention and two pain management clinical practice guideline (CPG) recommendations. The evidence-informed implementation methodology from the National Implementation Research Network (NIRN) was employed to operationalize CPG recommendations and guide implementation of complex, interprofessional practices.

The SCI KMN adapted the NIRN implementation process and the following activities have been identified to facilitate effective implementation in rehabilitation settings:

1) Develop implementation team(s)
2) Operationally define the practice
3) Assess implementation drivers
4) Develop evolving action plans
5) Use indicators to inform continuous improvement

An evaluation (2012-2014) demonstrated improved completion of pressure ulcer risk assessment (pre=62%; post=87%) and reduced pressure ulcer incidence during rehabilitation (pre=17%; post=13%). Using this methodology, the SCI KMN has also been successful in developing implementation capacity at all participating centres. This capacity has further enabled centres to apply these principles to other areas of interest (within and beyond SCI) and to successfully address organizational priorities (e.g. Accreditation).
24-hours personal assistants help for SCI patients with high cervical lesion in the domestic environment

Dr Rajmond Šavrin¹, Dr Nataša Puzić¹, Vanja Skok¹
¹University Rehabilitation Institute, Republic of Slovenia, Ljubljana, Slovenia

Introduction
Persons after SCI to the upper cervical spine segments remain dependent even after the completion of medical rehabilitation and require 24-hours assistance of relatives or other persons. In the case that the assistance cannot be guaranteed, SCI persons can benefit from the program of personal assistance up to a maximum of eight hours daily, provided by the Slovenian Paraplegic Association.

Methods
59 years old male with spastic quadriplegia ASIA A fell from a height and injured spinal cord of C4-5. More than a year after the injury, he could not be released into the home environment due to his state of health, the need for assistance and care. All institutional bodies have refused admission because the patient did not meet the criteria for admission. In cooperation with the patients and his family it had been decided that the patient was discharged in a rented flat with a guaranteed continuous 24-hour presence of personal assistants with additional several times daily assistance and home care service provided.

Results
A month before discharge we perform a special training program of personal assistants, which consisted of an individualized program of learning all the necessary nursing interventions including the implementation of aspiration via endotracheal cannula and assisted expectoration.

Conclusions
24-hours of personal assistance in the home environment for persons with SCI can be a good alternative to placement them in one of the possible institutional facilities.
Active Rehabilitation - 40 years of community peer-based programs in 19 countries: profile of organisations and international variations

Dr Anestis Divanoglou, Dr Tomasz Tasiemski, Dr Marika Augutis, Dr Katarzyna Trok

Physiotherapy Program, CQUniversity Australia, Rockhampton, Australia, University School of Physical Education in Poznań, Poland, Poznań, Poland, Research and Development, Västernorrland County Council, Sundsvall Hospital, Sweden, Sundsvall, Sweden, Spinal Cord Injury Unit, Karolinska University Hospital, Sweden, Stockholm, Sweden

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction
The Active Rehabilitation (AR) approach provides intensive, goal-oriented, individualised training opportunities for individuals with Spinal Cord Injury. Training involves formal and informal interactions between participants, peer-mentors and non-disabled assistants. The AR approach also includes contact of the newly injured with a matched peer-mentor during the acute phase, as well as follow-ups after the AR camps to provide on-going support. The AR approach started in Sweden in 1976, and despite currently being present in 19 countries, it has received little attention in the scientific literature.

Aims
To explore and describe: (1) the profile of the organisations that use the AR approach; (2) the international variations in the focus and type of training; and (3) the characteristics of the consumers and the personnel involved.

Methods
Data were collected through an electronic survey that was sent to all 19 organisations using the AR approach.

Results
Despite the overall aims of the training being to achieve independence, autonomy and quality of life, the results of the current study show that the focus varies between countries based on prevailing needs. In countries with high-quality rehabilitation services, the camps focus on the transitional adjustment from inpatient care to community. In other countries, the camps focus on patient education and training of basic skills necessary for survival. Results relevant to the other study aims will also be presented.

Conclusions
This is the first study to describe international aspects of the AR approach, thus potentially stimulating multinational collaborations in terms of functional operation and research.
How Happy You Are: Survey of SCI patients using Oxford Happiness Questionnaire Tool

Dr Jyotindra Nirmal1, Dr. Tun Oo1, Mr. Bakul Soni1
1North West of England Spinal Injuries Centre, Southport, UK, Southport, United Kingdom

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Synopsis:
Different assessment tools are available to measure happiness in individuals. Oxford Happiness Questionnaire is one of the tools which is popular among the general public and has been available to all through newspapers, magazines and internet.

We selected 20 spinal cord injury patients with wheelchair mobility and have adjusted to their disability and are integrated into the society. These patients were selected from the spinal outpatients when they had come for their routine general follow up.

All patients were asked to fill in with answers to the Oxford Happiness Questionnaire of 29 questions as per their current state of mind. They were then asked to go through the questionnaire again and record the answers what they would be before the spinal cord injury. They were also asked to put their thoughts on their understanding of happiness and how they have achieved it in the form of a free text essay.

The results show how these patients perceive their happiness quantum has changed due to the spinal cord injury. Also some excerpts of interesting thoughts on happiness by these patients are mentioned here.
Incidence of traumatic spinal cord injuries (TSCIs) in Switzerland: Identifying potential coverage bias of a population-based study using administrative data

Miss Jonvieve Chamberlain\textsuperscript{1,2}, Mr. Elias Ronca\textsuperscript{1,2}, Dr. Martin WG Brinkhof\textsuperscript{1,2}

\textsuperscript{1}Swiss Paraplegic Research, Nottwil, Switzerland, \textsuperscript{2}University of Lucerne, Luzern, Switzerland

Introduction: Inferences from population-based cohort studies may be inaccurate due to biased coverage of the target population. We investigated coverage bias of the Swiss Spinal Cord Injury (SwiSCI) cohort study representing specialized rehabilitation centers on the estimated national incidence rates (IRs) of traumatic SCI (TSCI).

Methods: TSCI-related ICD-10 codes [S14.0, S14.1, S24.0, S24.1, S34.0, S34.1, S34.3, T.060, T.061, T.093, T91.3] were used to identify incident TSCI cases in 2012 and 2013 using nationwide, administrative hospital data collected by the Swiss Federal Statistics Office (SFSO). SFSO data were directly compared to SwiSCI data, and factors associated with receiving rehabilitation in a SwiSCI center were statistically investigated. Age- and sex-specific IRs were estimated using SFSO data. Different ICD-10 coding combinations were used in sensitivity analyses.

Results: In total, 564 administrative cases were identified; 213 cases were identified in SwiSCI centers. Of the SFSO cases, roughly 20% were tetraplegic. SFSO data differed from SwiSCI data with respect to age (p=0.003) and type of TSCI (p<0.001). Men, paraplegics, complete lesions, younger persons, and high lesions (C1-C4) were more likely to visit a specialized rehabilitation center. The overall IR using all TSCI-related codes was 49.7 per one million population (95% CI=45.4-54.0). IRs were elevated for men, older ages, and paraplegia.

Conclusion: Specialized rehabilitation centers within Switzerland risk missing incident TSCI cases of TSCI among the elderly and persons with less-severe SCIs. Acknowledging reliability issues of administrative data, future sensitivity analyses can use results from this study to inform national epidemiological estimates of TSCI.
Needs of informal caregivers: Qualitative analysis of perceptions and reported experiences at discharge from Spinal Cord Injury Unit

Ms Silvia Mozzone, Mr Alessio Conti, Mrs Patrizia Maitan, Mrs Maria Vittoria Actis, Mrs Lorenza Garrino
1 A.O.U. Città della Salute e della Scienza Hospital of Turin, Moncalieri, Italy, 2 University of Rome "Tor Vergata", Rome, Italy, 3 University of Turin, Turin, Italy

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction:
Spinal cord injuries (SCI) are one of the most complex and disabling disorders, implying severe consequences on aspects of life of affected people and their caregivers. The aim of our study was to explore the condition of informal caregivers of people with SCI at discharge from a Spinal Injury Care (SIC) Unit as regards special needs, emotional experience, difficulties and subsequent rebound to the discharge.

Methods:
Eleven caregivers were interviewed on patients’ discharge home from our SIC Unit and 6 months later. The semi-structured interviews were analysed using a qualitative phenomenological methodology, as described by Giorgi.

Results:
Five main themes emerged from the caregivers’ experience including their implicit and explicit needs. Issues regarding communication with healthcare professionals and the need for an relevant multidisciplinary taking charge of caregivers, in order to support their new role, emerged above all.

Conclusions:
Our observation suggests that a wider involvement of the caregiver in the rehabilitation process and their training for discharge are highly required. Communication with healthcare professionals needs to be enhanced. It could be useful to organize a structured system of follow-up visits after discharge to assess the effectiveness of the intervention, and evaluate the maintenance of the acquired skills.
Peer-Supported, Self-Directed Care Initiatives Improve Patient Satisfaction, Increase Self Efficacy, and Reduce Healthcare Utilization After Spinal Cord Injury

Dr. Michael Jones¹, Miss Julie Gassaway¹
¹Shepherd Center, Atlanta, United States

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Patient-centered care, which includes peer-supported care initiatives, has become a cornerstone of healthcare improvement initiatives. Multiple aspects of promoting peer-supported, self-directed education and mentoring will be demonstrated or described so that audience participants can envision replication in home environments. Challenges of replication will be discussed.

Learning Objectives
1. Realize the value of peer mentorship as a form of patient-centered care as demonstrated by research presented
2. Understand importance of patient-owned vs. system-owned supports for self-management.
3. Develop take-home ideas for how to enhance peer-supported self-directed care in home institutions.

This workshop will demonstrate the value of peer mentorship promoting self-directed care in SCI rehabilitation by discussing the results of a randomized control trial (n=158) that found persons in the experimental group receiving ‘intensive’ peer mentorship had significantly fewer unplanned rehospitalizations after discharge (p=.011) and higher growth rates of self-efficacy scores (p<.0001) compared to the control group receiving traditional care. Next, we will describe adaptations of Stanford’s Chronic Disease Self-Management model to fit inpatient SCI rehabilitation, enhance interactive content, and put peers at the center of education processes. Frequency of engagement in peer-facilitated classes was significantly greater (p<.001) compared to traditional style classes. Patients report greater participation and gaining more information from peer-led classes, and unplanned rehospitalizations were significantly reduced following full implementation of the peer-facilitated classes (p=001). Finally, we will demonstrate a patient-owned Engagement Portal that provides an electronic platform to manage lifelong needs/issues associated with SCI. Users can invite others to access their portal so that new providers in home communities (physicians, therapists, caregivers, etc.) can review documents, injury information, and medications. User ownership is a unique feature of this Portal and sets it apart from traditional patient portals that are ‘owned’ but healthcare systems.

We will present the multiple aspects of peer-directed self-management approaches, and involve the audience in think tank type discussions to envision how methods can be replicated in home environments. Emphasis will be placed on the importance of organizational support for these programs that enhance the patient experience, result in fewer rehospitalizations after rehabilitation discharge and increase satisfaction and self-efficacy.
Predictors of Life Satisfaction in Persons with Spinal Cord Injury

Professor Allen Heinemann¹, Professor Sherri LaVela², Ms. Bella Etingen², Dr. Sara Locatelli², Mr. Scott Miskevics²

¹Rehabilitation Institute Of Chicago, Chicago, United States, ²Hines VA Hospital, Hines, United States

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: Satisfaction with life (SWL) may reflect social relationships, independence in roles, and myriad other factors. Persons with SCI may experience low SWL due to health conditions; hampered independence; sense of grief or loss; and lack of social support. This study examined variables associated with SWL in persons with SCI.

Methods: This cross-sectional national survey was conducted with a random sample of community-dwelling Veterans who used VA healthcare in the prior year. The survey assessed demographic and injury characteristics, chronic conditions, symptoms, SWL (Diener scale), social support, grief/loss, and independence. Multivariate logistic regression evaluated factors independently associated with low SWL (<20) [reference: average/high SWL 21-35].

Results: A total of 896 Veterans responded (62% response rate). Average age was 63 years, the majority were male (94%), Caucasian (72%), had education beyond high school (72%), and had a paraplegic level of injury (62%). Controlling for demographic and injury characteristics, chronic conditions, symptoms, independence, social support, and feelings of grief/loss due to injury, SWL was associated with higher of social support (OR=0.98, p=0.001) and better perceptions of independence (OR=0.92, p<0.0001). Odds of low SWL were 2 times higher with pain symptoms and 1.2 times higher with feelings of grief/loss due to injury.

Conclusion(s): Pain and feelings of grief/loss were associated with low SWL, while self-perceived independence and social support were associated with better SWL. Along with addressing symptoms, e.g., pain, and facilitating independence and social support, interventions to improve SWL should help individuals deal with feelings of loss due to injury.
Profile of spinal cord afflictions in a South African public sector academic hospital

Miss Elma Burger, Prof M Lukhele, Prof L Rispel
1School of Public Health, Faculty of Health Sciences, University of the Witwatersrand, Gauteng Health Department, Johannesburg, South Africa, 2Head of Department of Orthopaedics, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa, 3Head of Department Public Health, School of Public Health, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Study design: This was a five-year retrospective record review conducted for the period 1 January 2008 until 31 December 2012.
Objective: To determine the profile of patients with spinal cord affliction.
Setting: A public sector academic hospital in the Gauteng Province of South Africa.
Background: South Africa is grappling with a quadruple burden of disease, which includes injuries, communicable and non communicable diseases. In light of the dearth of information on the epidemiology of spinal cord injuries, this study was conducted to determine the profile of patients with traumatic spinal cord afflictions in a South African public sector academic hospital.
Methods: A descriptive study was done, based on a retrospective record review of all patients admitted to the selected hospital between January 2008 and December 2012.
Results: A total of 269 records were reviewed. Of these 45% (108) were due to traumatic spinal cord injuries (TSCA). Males accounted for 78% (80) of the TSCA sample. The mean age, median and standard deviation for patients with TSCA was 35, 33 and 13 respectively.
Road traffic accidents (RTA) accounted for 66% (69) of TSCA, violence related injuries (stab wounds/gunshot wounds) for 25% (26). Falls contributed to 8% (9). Thoracic injuries (T7-T12) were the highest at 32% (31)
Most RTAs occurred in the months of August (13%) and September (12%). However 35% of violence related TCA occurred in December.
Conclusion: There is a need to enhance road safety initiatives in order to reduce the incidence of TSCA caused by road traffic accidents.
Introduction: Rock climbing is developing traction among persons with disability, hence the advent of events such as the Paraclimbing World Championships (Paris, September 2016). Currently there is no published research about climbing in persons with spinal cord injury (SCI). In this case series of two climbers with paraplegia, we present and compare possible benefits and risks of two methods of adapted climbing.

Methods: Case series of two men with T7 (climber A) and T11 (climber B) complete SCI. Information gathered through questionnaires.

Results: Climber A was injured in a motorcycle accident 27 years ago. He performs indoor, “top-rope” style rock climbing with belayer assistance. During 5 years of climbing up to 16 hours a week, he has suffered only one function and mobility-limiting injury: a wrist fracture from a low-level ground fall. He reports multiple minor shoulder, forearm and finger tendinopathies. Climber B acquired his SCI in an outdoor climbing accident 34 years ago. He began adapted climbing 7 years thereafter with a pull-up ascender bar system with no direct use of the rock face. He has climbed up to 20+ hours a week, without any function or mobility-limiting injuries. He reports overuse injury and arthritis of his fingers. Both climbers endorse benefits including increased strength, endurance, confidence, and community participation.

Conclusion: Rock climbing is a physically and mentally challenging physical activity that requires further study in the SCI population to clarify the benefits and potential risks, including upper extremity injuries, bony injuries, and skin injuries.
Sexual abuse in people with spinal cord damage: a preliminary investigation.

Dr Peter New

1Spinal Rehabilitation Service, Caulfield Hospital, Alfred Health, Caulfield, Australia, 2Epworth-Monash Rehabilitation Medicine Unit, Southern Medical School, Monash University, Melbourne, AUSTRALIA

Introduction

People with spinal cord damage (SCD) are especially vulnerable to sexual abuse. There are very few reports regarding sexual abuse in this population. This project aimed to perform a preliminary investigation of sexual abuse and its impact in people with SCD.

Methods

Comprehensive survey (August 2013 – June 2014) of able-bodied controls (n= 220) and people with SCD (n=154) living in the community, Australia.

Results

Most people with SCD were male (n=101, 65.6%), had an average age of 47.8 years (SD=14.2) and were median 10 years (IQR 4 – 20) after the onset of SCD. Of 136 SCD participants who answered the questions regarding sexual abuse, 19% (n=26) reported previous sexual abuse. There was no difference regarding the reporting of previous sexual abuse between able-bodied and those with SCD (P=0.1). Those with SCD who were sexually abused were more likely to be female (73%; 23% male, 4% transgender; P<0.001), younger (sexual abuse mean 40.1 [95%CI 34.5 – 45.8, SD=14.0] years vs no sexual abuse mean 47.4 years [95%CI 44.9 – 49.8, SD=13.1]; t = -2.5, P=0.01) and more likely to have experienced the abuse before their SCD (69%). There was no significant difference between those with SCD who reported sexual abuse and those who didn’t regarding their quality of life as a whole (z=-1.2, P=0.2), their physical health (z=-0.7, P=0.5) or psychological health (z=-1.5, P=0.1).

Conclusion

Further research is needed into the prevalence, prevention, management and impact of sexual abuse in people with SCD.
The association between physical capacity and participation in persons with long-term spinal cord injury.

Mr Rutger Osterthun¹,², Ms Elisabeth van Overbeeke³, dr Floris van Asbeck³, Mrs Jacinthe Adriaansen³, dr Casper van Koppenhagen³, prof dr Marcel Post²,⁴¹ Jeroen Bosch Hospital, Tolbrug Rehabilitation Centre, 's Hertogenbosch, the Netherlands, ²University of Groningen, University Medical Center Groningen, Department of Rehabilitation Medicine, Groningen, the Netherlands, ³De Hoogstraat Rehabilitation, Utrecht, the Netherlands, ⁴Brain Center Rudolf Magnus and Center of Excellence in Rehabilitation medicine, University Medical Center Utrecht and De Hoogstraat, Utrecht, the Netherlands

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: Remaining physically fit and maintaining participation levels are two important challenges for persons with long-term spinal cord injury (SCI). Little is known on the effect of physical capacity on participation in this patient group. The purpose of this study was to describe the association between physical capacity and participation in persons with long-term SCI in the Netherlands.

Methods: A cross-sectional multicentre study in 263 persons with a SCI with a time since injury of at least 10 years. Inclusion criteria: age at injury between 18 and 35 years, current age between 28 and 65 years and wheelchair dependency. Information was gathered on demographics, participation levels, physical capacity, injury characteristics, secondary health conditions, functional independence and psychosocial factors. A maximum exercise test was performed to determine the physical capacity (POpeak). Participation was measured with the Restriction scale of the Utrecht Scale for Evaluation of Rehabilitation-Participation.

Results: There was a moderate correlation between a higher physical capacity and better participation (Pearson’s correlation 0.42; p<0.001). With multivariate backward regression analyses 40% of the variance of restrictions in participation could be explained. Three percent (squared partial correlation) of the variance was determined by physical capacity (beta 0.209; p<0.01). Other independent determinants were gender, functional independence, self-efficacy and mental health.

Conclusion: Although physical capacity only explained a small part of the variance of participation levels, a better physical capacity was independently associated with a better participation in persons with long-term SCI in the Netherlands. This supports the importance of improving and maintaining physical fitness.
The challenges of returning home
Interview with TSCI patients before discharge, 1 month and 1 year after hospital rehabilitation

Mrs Bodil Bjørnshave Noe1,2, Mrs Merete Bjerrum2, Mrs Sanne Angel2

1Research and Education Centre, Hospital of Westjutland, Herning, Denmark, 2Department of Nursing, Institute of Public Health, Aarhus University, Aarhus, Denmark

Individuals who sustain traumatic spinal cord injury (TSCI) meet barriers and problems when they attempt to resume everyday life after hospital rehabilitation. We aimed to explore patients` expectations, wishes and worries before discharge as well as their experiences post-discharge in order to inform and improve clinical practice. Eight Danish residents aged 25-75 years, admitted for initial rehabilitation at the Spinal Cord Injury Center of Western Denmark, participated in an individual interview before discharge and out of these seven patients also participated in follow-up interviews 1 month and 1 year post-discharge. The transcribed interviews were analyzed according to inductive content analysis.

Main findings; At pre-discharge patients´ wishes and worries centred on close relations. Therefore professionals need to initiate dialog with patients on how SCI may impact on close relations. At 1 month post-discharge patients experience, that returning home is more complicated than expected. We found, that timing in establishing training possibilities and providing equipment is of crucial importance as setbacks and delays threaten patients´ hope for progress. At 1 year post discharge, an appropriate balance between clarification related functioning, work and insurance and patients´ perceived threats on core-competencies characterise a positive life situation. In contrast low degree of clarification and high degree of threats on core-competencies influence the life-situation negatively. This exploring follow-up interview study identified important aspects of returning home after TSCI, and has generated hypothesis to be investigated in experimental studies.
The free legal service for spinal cord injury patients at the London Spinal Cord Injury Centre

Dr Jan Gawronski¹, Mrs Charlotte Tan¹, Mr Charles Edwards¹

¹Stewarts Law LLP, London, United Kingdom, ²Royal National Orthopaedic Hospital NHS Trust, London, United Kingdom

Introduction

Spinal cord injury causes unanticipated and life-changing circumstances which lead to financial, housing, insurance, legal and employment issues for patients and their families.

A national law firm, Stewarts Law LLP, has worked with the London SCI centre to develop a free and comprehensive legal service for SCI patients and their families.

Methods

In 2004, a legal service was established for SCI patients at Royal National Orthopaedic Hospital NHS Trust. Referrals are usually made by a case manager and it operates within a strict ethical framework. A retrospective analysis of the activity of this legal service between June 2004 and February 2016 was undertaken.

Results

423 spinal cord injury patients and their families were seen by the legal team at the London SCI Centre. Over 2,000 hours of free legal advice were provided on non-compensation issues, including welfare benefits (35% of referrals), insurance (25%) and care (23%). In 61% of cases, potential compensation claims were also identified. Consultations are conducted in hospital and feedback from participants has been positive.

Discussion

This initiative demonstrates a need for access to legal advice for patients who have suffered SCI, and their families, to address a range of non-compensation issues. Early identification and management of these issues can help to alleviate the anxiety experienced by patients and their families and may assist with recovery and rehabilitation.

References

A common SCI Medical Quality Registry for the Nordic Countries, "The challenges and opportunities"

Mrs Annette Halvorsen 1,2, Mrs Ann Louise Pettersen 2, Dr Aki Vainionpää 3, Dr Páll E Ingvarsson 4, Prof Fin Biering-Sørensen 5

1 Spinal Cord Injury Unit, St Olavs University Hospital, Trondheim, Norway, 2 Department of Medical Quality Registries, St Olavs Hospital, Trondheim, Norway, 3 Spinal Cord Injury Unit, Oulu University Hospital, Oulu, Finland, 4 Department of Rehabilitation, Medicine Landspitali University Hospital, Reykjavik, Iceland, 5 Clinic for Spinal Cord Injuries, Neuroscience Centre, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction:
A Nordic cooperation on highly specialized treatments was established by the Nordic council of ministers in 2013. The Norwegian SCI Registry (NorSCIR) was requested to initiate a pilot project, to establish a Nordic SCI quality registry (NordicSCIR).

Methods:
The registration is electronic, web based on Medical Registry System (MRS). A license for processing personal health data in NordicSCIR is granted by the Norwegian Data Protection Authority. Due to Norwegian law, written informed consent must be obtained before entering data into the NordicSCIR. Information is sent through the Norwegian Health Network, providing efficient, secure electronic exchange of patient information. Data controller is St. Olavs University Hospital, Trondheim, Norway. NordicSCIR is based on the International Spinal Cord Injury Data Sets. The MRS platform is adapted to multilingual use.

Results:
There are signed agreements for cooperation in NordicSCIR between Denmark, Iceland and Norway. Finland will sign the agreement when juridical doubts are clarified. The SCI units in Stockholm and Linköping will be included as a pilot. The NordicSCIR will be in operation from January 2017. Funding is by the Central Norway Regional Health Authority and the participating hospitals.

Conclusion:
It is possible to develop a Nordic quality registry, despite the differences in legal terms and conditions. It is a benefit that the Nordic countries have similar healthcare systems and robust administrative routines. The NordicSCIR will provide representative longitudinal data essential for identifying incident trends, important for prevention programs and improvement of SCI care in the Nordic countries, with population of 26.6 million.
A comparison of women and men with spinal cord injury.

Dr Kadriye Öneş¹, Dr Mustafa Aziz Yıldırım¹, Dr Ayşenur Bardak¹, Dr Fatma Nur Kesiktas¹, Dr Ekin Ilke Şen¹

¹Istanbul Physical Medicine and Rehabilitation Education and Research Hospital, Istanbul, Istanbul, Turkey

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

INTRODUCTION: The aim of this study was to investigate the effects of gender on rehabilitation outcomes during the initial rehabilitation stay of adults SCI.
To investigate the relationship between gender and a range variables in patients with spinal cord injury (SCI).

METHOD:
Participants were a consecutive series of 60 (30 woman, 30 men) adult patients with SCI undergoing initial rehabilitation. The variables of interest were demographic characteristics, Clinical features, complications, and Functional Independence Measure (FIM) scores. SF-36 has been used to evaluate the quality life of the patients while Beck Depression Scale has been used to evaluate the level and the intensity of the depression.

RESULTS: Results: There were 30 (50%) women with a mean age (43±9.82) and 30 (50%) men with a mean age of 40±10.12 years. As a result of our study, we didn’t detected any difference between 2 groups on either social-demographic properties and handicap and life quality measures. Females are significantly involved in more automobile crashes than males, while males are involved in more galls than females. Men were younger than women, but the difference was not statistically significant. There was no statistically significant relationship between gender and the following: American Spinal Injury Association grade, level of injury, many SCI complications.

There were no significant relationships between gender and FIM subscale scores.

CONCLUSIONS:
Gender do not significantly influence most aspects of rehabilitation in patients with SCI.
An algorithm for identifying Non-traumatic Spinal Cord Disorder in Canadian administrative health data

**Prof. Susan Jaglal**¹², Dr. Jennifer Voth³, Dr. Chester Ho³, Dr. Vanessa Noonan⁴, Prof. Sara Guilcher¹, Ms. Nicole McKenzie¹³, Dr. Yan Chen⁵

¹University of Toronto, Toronto, Canada, ²Toronto Rehabilitation Institute, Toronto, Canada, ³Hotchkiss Brain Institute University of Calgary, Calgary, Canada, ⁴Rick Hansen Institute, Vancouver, Canada, ⁵Alberta Health, Calgary, Canada

Introduction: The lack of consensus on the best methodology for identifying cases of non-traumatic spinal cord disorder (NTSCD) in administrative health data limits the ability to determine the burden of disease and provide evidence informed services and policy. The purpose of this study was to develop an algorithm to identify cases of NTSCD in Canada.

Methods: Data was provided by the Canadian Institute for Health Information (CIHI) which linked all hospital, day surgery, ambulatory, and inpatient rehabilitation records of patients with acute paraplegia, acute tetraplegia, and cauda equina syndrome between April 1, 2004 and March 31, 2010. The research team developed and applied a number of algorithms using diagnostic codes under the International Classification of Diseases and Related Health Problems, 10th Revision Canada (ICD-10-CA) to identify NTSCD.

Results: NTSCI was defined by two main criteria: (1) one hospital record with a classified NTSCD etiology diagnostic code that was either the reason for admission or existed prior to admission, and (2) an additional record from any database indicating neurological presentation within the seven year study period. Of a possible 31,909 records, 5,593 cases met final criteria for a NTSCD diagnosis.

Conclusions: The proposed algorithm identifies an acute inpatient NTSCI cohort that is limited to patients with paralysis. There is a need to validate and refine this algorithm using Canadian and International administrative data. Future investigations are advised to collect a minimum of five year follow-up data to document the onset of neurological impairment.
An epidemiological picture of 10 years admissions in Spinal Unit: what’s new?

Dr Marco Postiglione\(^1\), Dr Gabriele Righi\(^1\), Dr Pierangela Liotta\(^1\), Dr Tiziana Valentino\(^1\), Dr Giulio Del Popolo\(^3\)

\(^1\)Spinal Unit Florence University Hospital, Florence, Italy

Introduction
In the last decade change is reported in epidemiological characteristics of Spinal Cord Injury (SCI) patients as regards age, neurological level and degree of injury requiring new approaches to their care as well as adequate resources.

Objective
To provide an up-to-date picture of SCI patients admitted to the Spinal Unit (SU) during a period of 10 years.

Material and methods
A database search and an analysis was made of all new cases of SCI patients referred to our SU between January 2003 and December 2012.

Patients were divided in 4 groups based on expected autonomy outcome according to the neurological level at admission on ASIA classification as follows: group1 C1-C5; group2 C6- D1, group3 D2–L2 and Group4 L3-S4. Gender, age at moment of lesion and AIS grade were singled out.

Results
585 patients with complete data recording out of a total of 663 were analyzed for the period under study (group1:113, group2:112, group3:299, group4:61) with the following results: M/F ratio 3/1, Para/Tetra ratio 1.6/1, AIS A 34,6% (mostly in group3), AIS B 10%, AIS C 14,1% and AIS D 41,3% (mostly in group1 and2), median age 65 years.

Conclusions
Results showed an increased incidence of frail and older SCI patients, with more comorbidities and increased time-demanding care.

Our data are in agreement with literature, SCI patient characteristics at admission have changed compared to the last decades, with a need to develop new rehabilitation pathways for incomplete and elderly people to optimize resources allocation and patient outcomes.
Epidemiology of spinal cord injury in the national rehabilitation institute of Mexico (INRLGII) in the period 2011-2015

MD Ana Dávila, MSC Quinzaños Jimena, MSC Tatiana Chávez, MD Ramiro Pérez, MD Aida Barrera

NATIONAL REHABILITATION INSTITUTE OF MEXICO "Luis Guillermo Ibarra Ibarra" (INRLGII), Mexico City, Mexico

Objective: To describe the epidemiology of the spinal cord injury (SCI) in INRLGII from 2011 to 2015.

Study design: Observational, transversal and descriptive.

Methods: Consecutive SCI cases admitted from January 1st, 2011 to December 31st, 2015 were studied.

Analysis: Descriptive statistics were performed.

Results: Of the 1106 cases, 67.3% were traumatic (TSCI) and 32.7% non traumatic (NTSCI). The aetiology for TSCI was transit accidents in 37%, falls in 20%, shotgun in 15.6% and work accidents in 3.7%. For NTSCI the cause was cancer in 17.4%, degeneration in 7.1% and infections in 5.2%. Of the TSCI 76.3% were men. In NTSCI 55% were men. In TSCI, 50.8% were between 16 and 30 years old, while in NTSCI the most frequent age group was 46-60. 64% of the TSCI were classified as AIS A, 11% B, 13% C and 12% D. 31% of the NTSCI were AIS A, 13% B and 20% D. The neurologic level in the TSCI and NTSCI was: cervical in 34% and 25%, high thoracic in 25% and 33%, low thoracic in 33% and 31% and lumbar in 8% and 11%. The great majority were poor (83 and 80%). Almost all the subjects worked before the injury but the minority worked after the injury (30 and 34%). 90% of the TSCI presented complications and 67% of the NTSCI. Walking was achieved in 23% of the TSCI and 49% of the NTSCI.

Conclusion: Epidemiology of SCI in INRLGII is similar to others countries.
Non-Traumatic Spinal Cord Injuries in Finland

Dr Aki Vainionpää, Dr Eerika Koskinen, Ms Nelli Saijets, Mrs Eija Väärelä, Prof Markku Alen, Prof Mauri Kallinen

1Department of Medical Rehabilitation, Oulu University Hospital, Oulu, Finland, 2Department of Neurosciences and Rehabilitation, Tampere University Hospital, Tampere, Finland, 3Faculty of Medicine, University of Oulu, Oulu, Finland, 4Centre for Life-Course Health Research, University of Oulu, Oulu, Finland

Introduction: Incidence of non-traumatic spinal cord injuries (NTSCI) have not been previously studied in Finland. The aim of the study was to determine the incidence and aetiology of NTSCI in the catchment areas of Oulu and Tampere University Hospitals that covers nearly 2/3 of the area of Finland and total population of 1853437 (34% of the population of Finland).

Methods: The population-based prospective study was performed from 1/1/2013 to 31/12/2015. The rehabilitation teams of SCI centers evaluated all adult (>18y) patients with a newly diagnosed NTSCI and persisting neurological symptoms. Progressive neurological diseases and congenital disorders were not included. Data was recorded according to the International SCI Core Data Set and ICD-10 codes were obtained.

Results: During the 3-year period, 306 new NTSCI were found. The mean annual incidence was 69.3 per million. The mean age of the patients was 62.9 years and 58% were male. Tetraplegia was found in 41% of the cases and ASIA Impairment Scale classifications were: A-C 20%, D 74% and unknown 6%. The most common aetiologies were vertebral column degenerative disorders (51%), malignant (19%) and benign (10%) tumours. The mean length of stay was 28 days. Surgical operations and intensive care were needed in 86% and 8% of the cases, respectively. During the discharge, 65% of the patients were ambulatory.

Conclusions: The annual incidence of NTSCI was 69.3 per million that is higher than previously published in Europe. Vertebral column degenerative disorders were the most common aetiology causing more than half of the new NTSCI.
Plasticity, motor learning and functional recovery after task-oriented training of the upper extremity in tetraplegia – multiple single case study

Dr Hanneke Bouwsema1,2, PhD Annemie Spooren3, PhD Amanda Kaas4,5, MD Helma Bongers6, MSc Diana Vanmulken6, PhD Henk Seelen1,2

1 Adelante Centre of Expertise in Rehabilitation and Audiology, Hoensbroek, The Netherlands, 2 Maastricht University, Department of Rehabilitation Medicine, Research School CAPHRI, Maastricht, The Netherlands, 3 PHL University College Hasselt, Department of Healthcare, Hasselt, Belgium, 4 Maastricht University, Faculty of Psychology and Neuroscience, Department of Cognitive Neuroscience, Maastricht, The Netherlands, 5 Maastricht University, Faculty of Psychology, Maastricht Brain Imaging Centre, Maastricht, The Netherlands, 6 Adelante Rehabilitation Centre, Hoensbroek, The Netherlands

Introduction: While task-oriented training is often provided during rehabilitation of persons with a cervical spinal cord injury (C-SCI), the underlying mechanisms are unknown.

Objectives: to a) develop a high-field fMRI study-design to investigate brain changes; b) evaluate suitability of the study-design to detect training-related changes; and c) examine effects of training and contribution of training structure (variable or constant practice).

Methods: Following a multiple single-case-experimental-design (A-B-C) with therapy-as-usual A, intervention-B (3-weeks of variable-practice) and intervention-C (3-weeks of constant-practice), participants received task-specific client-centred arm-hand training; 5 days/week, 2x/day, 30’/training. VLT-SF, SCIM-self-care, UEMS, hand-held dynamometry, Semmes-Weinstein Monofilaments, and surface-EMG were assessed at each phase (A-B-C). Neuroimaging (fMRI) was assessed in 2 patients.

Results: 5 C-SCI patients completed the training (4 males, 1 female, mean(SD) age: 62.8(8.89), lesions ranging from C2-C7, all ASIA-D). Significant improvements over time were found on SCIM, VLT-SF, and grip strength (p’s<.05). No significant differences were found between the two training types. Preliminary EMG-analyses revealed no large changes in dominant phases of muscle activity in the arm over the 6-week period. Preliminary fMRI-results show that functional reorganization resulting from the SCI may be present. Further analyses on EMG and fMRI-data are currently being performed.

Conclusions: This pilot experiment shows it is feasible to use the set of functional, kinematic and fMRI-data to track changes on arm-hand skilled performance, motor control, and neural plasticity during task-oriented training by people with a C-SCI. Additional analyses on EMG and fMRI-data will allow us to draw conclusions about the brain mechanisms underlying SCI rehabilitation.
Introduction
Since 2011, the population of AR of Syria is facing a tremendous man made humanitarian disaster, resulting in forced displacement and injured persons as a consequence of armed violence. This has a disastrous effect on the lives of people and more specifically the vulnerable and disabled. Spinal Cord Injuries are a significant part of these victims and as a complex injury.

Methods
This data was collected from project’s activities statistics over a period of 3 years linked to support programs for vulnerable and injured persons living in Syria and surrounding countries. Through a questionnaire on biodata, main injury description, cause of injury and functional status data, information was compiled in spreadsheets. No standardized SCI measure scales were used, only certain elements of the SCI basic data core set.

Results
The database could extract around 350 individuals with SCI. Main cause of injury is related to armed violence. Children under 12 and woman are represented in a proportion that is not adequate with the global gender and age balance. Context of care and follow up services are not coping with the needs. Caretakers of SCI victims have difficulties in coping with the aftermath of SCI in their family.

Conclusion
SCI profile of victims of the Syrian crisis shows a great concern regarding future needs that can not be addressed within the actual situation. More intervention on focused care and psychosocial support is needed to avoid further deterioration of the situation.
Responsiveness to body weight support: Insights from a spinal cord injury cohort

Dr Marc Bolliger¹, Dr Luca Traini¹, Dr Chris Schmidt¹, Dr Lea Awai², Prof Armin Curt¹

¹Spinal Cord Injury Center Balgrist, University Zurich, Zurich, Switzerland, ²Sobell Department of Motor Neuroscience and Movement Disorders, Institute of Neurology, University College London, London, England

Background: Regaining walking capacity is one of the fundamental goals in spinal cord injury (SCI) rehabilitation. In the past, body weight supported (BWS) treadmill training has been applied as a useful adjunct to enhance locomotor function after motor incomplete spinal cord injury. Recent research however provides growing evidence that overground training is superior. We provided dynamic BWS during overground walking using a novel 3-dimensional robotic system to evaluate the effect of unloading on patient gait patterns.

Methods: Whole-body kinematics were recorded from 14 SCI patients during overground walking at 1 km/h at 6 different levels of BWS (0, 10, 20, 30, 40, and 50% body weight). Spatiotemporal parameters, joint angles and multi-joint coordination were determined for a more and a less impaired group.

Results: The less impaired group demonstrated a dose-dependent BWS response analogous to a healthy control group. This was manifested through decreases in hip range of motion and a shift toward prolonged single stance phase at higher BWS levels. More impaired walkers on the other hand retained their baseline gait pattern and were relatively unperturbed by increased BWS. Both groups showed a progressive reduction of body oscillations in the frontal plane.

Conclusions: Reducing loading and weight bearing necessity induced adapted gait patterns in the less impaired group. This adaptive ability was compromised in the more impaired group. Response patterns were however highly variable in both groups, strengthening the indication that body weight support may be best adapted on an individual basis for rehabilitation.
Traumatic spinal cord injury: a change in the paradigm of patient’s age and etiology

Dra. Ana Mirrado1,2, Dra. Filipa Faria1
1Centro de Medicina de Reabilitação de Alcoitão, Lisbon, Portugal, 2Hospital Pedro Hispano, Matosinhos, Portugal

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Background: In the nineties, the epidemiological data showed that traumatic spinal cord injury (tSCI) affected primarily young adults. However, in the recent past, there seems to be a change, with tSCI affecting mostly the elderly.

Purpose: To characterize the tSCI inpatient population admitted to the “Centro de Medicina de Reabilitação de Alcoitão”, between January 2010 and December 2015 and to correlate these data with the functional gains during rehabilitation.

Methods: Descriptive and retrospective study with 144 patients, at their first admission to our Center. Neurological Examination and SCI classification was conducted according to American Spinal Injury Association criteria and the Functional Independence Measure was used to assess functional status.

Results: 73% of the patients were male, and age distribution peaked at 66-80 years old (27%) and 35-50 years old (26%). Falls were the leading cause of tSCI (58%), followed by traffic accidents (32%). Most of the falls occurred at home and when falling from the patient’s own height, specially in older patients. The functional progression was favorable, particularly in patients admitted to our Center in less than 3 months after the SCI occurred.

Conclusion: We found that tSCI is more prevalent in the elderly population, and falls are the main cause. The presence of chronic diseases, diminished exercise capacity, among others, may increase the risk for falls in this group. We also found that even in the elderly timely rehabilitation contributes to functional relevant gains. In the future, prevention and rehabilitation programs need to be directed to this elderly population.
Ambulation following Spinal Cord Injury & Its’ Correlates

Dr Anupam Gupta, Dr. Nitin Menon, Dr. Meeka Khanna, Professor Arun Taly

National Institute of Mental Health & Neuro Sciences NIMHANS, Bengaluru, India

Objectives
To assess walking ability of spinal cord injury (SCI) patients and observe it’s correlation with functional and neurological outcomes.

Patients & Methods
The present prospective, observational study was conducted in a tertiary research hospital in India with 66 patients (46 males) between January 2012 and December 2013. Mean age was 32.62 ±11.85 years (range 16 - 65 years), mean duration of injury was 85.3 ±97.6 days (range 14-365 days) and mean length of stay in the rehabilitation unit was 38.08 ±21.66 days (range 14-97 days) in the study. Walking Index for spinal cord injury (WISCI-II) was used to assess ambulation of the SCI patients. Functional recovery was assessed using Barthel Index (BI) & Spinal Cord Independence Measures (SCIM). Neurological recovery was assessed using AIS (ASIA impairment scale). We tried to correlate ambulatory ability of the patients with functional & neurological recovery.

Results
Ambulatory ability of the patients improved significantly using WISCI-II (p<0.001) when admission and discharge scores were compared (1.4±3.5 vs 7.6±6.03). Similarly functional (BI: 31.7±20.5 vs 58.4±23.7 & SCIM: 29.9±15.1 vs 56.2±20.6) & neurological recovery were found to be very significant (p<0.001) when admission vs discharge scores were compared. Improvement in WISCI II scores was significantly correlated with improvement in neurological (using AIS scores) and functional status (using BI and SCIM scores) (p<0.001)

Conclusions
Significant improvement was seen in WISCI II, BI & SCIM scores after in-patient rehabilitation. Improvement in WISCI II scores also significantly correlated with functional and neurological recovery.
Are commonly administered physiotherapy interventions effective? A Systematic Review of 22 interventions

Dr Jocelyn Bowden¹, Dr Joanne Glinsky², Professor Lisa Harvey¹

¹John Walsh Centre for Rehabilitation Research, University of Sydney, St Leonards, Australia

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: There are many systematic reviews and clinical practice guidelines summarising the effectiveness of physiotherapy interventions for people with spinal cord injuries (SCI). However, many include non-randomised studies which are highly vulnerable to bias or interventions not routinely administered in clinical practice. This study aimed to provide an unbiased and accessible summary of the current evidence underpinning 22 common physiotherapy interventions for people with SCI.

Methods: 22 pairs of key interventions and their primary outcome were identified prior to commencement. Each intervention and outcome pair was considered independently, resulting in 22 “brief reviews” within one large systematic review. Interventions investigated were hand-, wheelchair-, seated mobility-, fitness-, strength- and gait-training, electrical stimulation, passive movements, stretch, exercise, cycling, and transcutaneous electrical nerve stimulation (TENS). Interventions were compared to no or sham treatment, usual care or another physiotherapy intervention. Primary outcomes included: seated or wheelchair mobility, hand function, gait, strength, joint mobility, fitness and pain. Data were extracted to determine mean-between group differences or odds ratios (95% CI). Where possible, results were pooled in meta-analyses.

Results: 37 randomised controlled trials met the inclusion criteria, but only 15 were relevant to the brief reviews selected. Four interventions were clearly effective: fitness-, hand- and wheelchair-training, and TENS. The strength of evidence however was not high. No other interventions were clearly effective.

Conclusion: There is initial evidence to support four physiotherapy interventions but considerable work is still needed to establish a strong evidence base for the range of physiotherapy interventions commonly used for SCI rehabilitation.
Assessment of the reliability of the Infinite Horizon contusion injury device

Marion Fournely1,2, Yvan Petit2,3,4, Eric Wagnac2,3,4, Virginie Callot2,5, Pierre-Jean Arnoux1,2
1Aix-Marseille Université, IFSTTAR, LBA UMRT 24, France, 2iLab-Spine, France, Canada, 3ETS, Montreal, Canada,
4Research Center, Hôpital du Sacré-Cœur, Canada, 5Aix-Marseille Université, CNRS, CRMBM UMR 7339, France

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction
Due to a lack of uniformity in the force-displacement data obtained in similar mice contusion models, we propose to investigate the ability of a force-controlled contusion device (Infinite Horizon, PSI) to produce reliable contusion injuries during an ongoing experimental campaign of spinal cord contusions on mice.

Methods
30 kDyn (0.3 N) cervical hemi-contusions were performed on seven C57BL/6 adult mice. Two possible sources of bias are considered: the movement of the vertebral clamping system which is frequently reported as defective and the inaccuracy of the contact detection device which is triggered by a 20 kDyn (0.2 N) contact force. Determining the true instant where the impactor and the spinal cord made contact via a high speed video control allowed us to obtain the real imposed displacement and to propose a spinal cord compression measurement.

Results
Real displacement was always higher than the one estimated by the force-triggered device. The average spinal cord displacement error was 64%. No vertebral or clamp movements have been detected except in one case, when the actual compression was higher than the spinal canal width.

Conclusions
Our results suggest that this force-triggered device might be improved from video measurement to provide reliable data for mouse contusion models. More generally a compression ratio criterion should be preferred to quantify the injury for two major reasons: the tip diameter directly affects the displacement and the neural tissue damage is strongly correlated to its strain.
Characterization of local field potential oscillations recorded in the mesencephalic locomotor region during locomotion

**Dr Brian Noga**, Dr Francisco Benavides, Dr. Ioan Opris, Dr. Francisco Sanchez, Dr. Luz Villamil, Professor James Guest, Professor Stefan Kasicki, Professor Urszula Slawinska, Professor Larry Jordan

1 University of Miami, Miami, United States, 2 Nencki Institute of Experimental Biology, Warsaw, Poland, 3 University of Manitoba, Winnipeg, Canada

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: Oscillatory rhythms in local field potentials (LFPs) are thought to coherently bind cooperating neuronal ensembles to produce behaviors, including locomotion. A variety of frequency bands are observed in LFPs recorded during locomotion, and have been used as a basis for identification of appropriate targets for deep brain stimulation (DBS) neuromodulation methods to enhance locomotor recovery in patients with gait disorders (Parkinson's Disease and spinal cord injury or SCI). There is sparse information available, however, about the LFPs that occur in the functionally defined mesencephalic locomotor region (MLR) during locomotion.

Methods: Electrodes were implanted in the MLR of rats to induce locomotion, and the oscillatory activity associated with spontaneous locomotion was recorded from the same functionally defined sites. Confirmatory experiments were conducted in the Yucatan minipig after developing a stereotaxic MRI-based targeting protocol of electrode implantation. Electromyographic recordings from agonist/antagonist muscles in 4 limbs were used to monitor locomotor activity.

Results: Theta frequency oscillations predominate in LFPs recorded from the lowest threshold MLR sites and show significant correlation to locomotor speed. No peak of LFP oscillations in the Gamma band was observed. LFPs from low threshold sites in rats with SCI also show enhanced Theta activity during locomotion.

Conclusion: Results are consistent with earlier observations that the onset of locomotion is characterized by Theta frequency oscillations of the LFPs in hippocampus and the subthalamic locomotor region and posterior hypothalamus. These results indicate that Theta and not Gamma band oscillation is a suitable biomarker for identifying the functional MLR for DBS.
Community-focussed activity-based therapy for independence, mobility and seated balance for people with spinal cord injuries

Miss Camila Quel De Oliveira¹, Dr James Middleton², Dr Kathryn Refshauge¹, Mr David MacDonald³, Professor Glen Davis¹

¹Faculty of Health Sciences, The University Of Sydney, Sydney, Australia; ²John Walsh Centre for Rehabilitation Research, Kolling Institute, Sydney Medical School Northern, The University of Sydney, Sydney, Australia; ³Faculty of Medicine and Health Sciences, Macquarie University, Sydney, Australia

INTRODUCTION: Activity-based therapy (ABT) refers to a group of multimodal interventions, which aim to activate the neuromuscular system below the level of spinal lesion, promoting reorganisation and recovery of specific motor tasks through neuroplasticity. The purpose of this study was to investigate the effects of an ABT exercise program upon mobility, independence and sitting balance in individuals with spinal cord injury.

METHODS: This study utilised a retrospective, multicentre, non-controlled research design. Clinical data from 91 adults who independently enrolled in four community-based ABT exercise centres in Australia was analysed. The participants attended a multimodal ABT program for three to 12 months, one to four times per week. Assessments were undertaken every 3 months, and included Modified Rivermead Index (MRI), Spinal Cord Independence Measure (SCIM) and seated reach distance (SRD). A linear mixed model analysis was used to determine time-based and other predictors of change.

RESULTS: There was a significant effect for time for all outcome measures, with a change score of 4 points in the SCIM (95%CI: 2.7-5.3), 2 points in the MRI (95%CI: 1.2-3.3) and 0.2 in the SRD (95%CI: 0.1-2.2). The largest improvements occurred in the first 3 months after ABT intervention. There was no interaction effect with the level of injury, AIS classification, or time since injury for most outcomes, except for AIS and time since injury upon independence and sitting balance, respectively.

CONCLUSION: A community-based ABT exercise program can lead to improvements in mobility, independence and balance in sitting, with greater improvements occurring early during intervention.
Determinants of functional outcome following physiotherapy based rehabilitation in spinal cord injury

Conor Stout¹, Paul Griffin², Ronan Langan², Catriona Molony, Irene Galligan², Dearbhla Burke¹, Dr Paul Carroll², Dr Olive Lennon¹

¹University College Dublin, Dublin, Ireland, ²National Rehabilitation Hospital, Dublin, Ireland

Introduction: No published data on determinants of outcome from physiotherapy-based rehabilitation after spinal cord injury, from an Irish perspective, exist.

Methods: This study examines the change in Spinal Cord Independence Measures (SCIM) from admission to discharge of all patients admitted to the national rehabilitation centre for SCI between September 2014-15. Within cohort change scores were examined by Wilcoxon Signed Ranks test (alpha 0.05). Hierarchical linear regression models explored predictive ability of demographic factors (age; gender), injury related factors (traumatic/non-traumatic; AIS classification; time to admission; number of co-morbidities; pain on admission; shoulder pain on admission) and therapy related indices (length of stay(LOS); number of physiotherapy sessions; total number of physiotherapy and adjunct sessions) on improvement in SCIM during in-patient stay.

Results: 99 charts were reviewed. 61 (62%) patients were male, mean age 51(sd18) years. 57 (58%) had a traumatic injury, 16%(n=16) were classified as AIS A, 59(59%) B-E. No classification was documented in 25% of cases. The median change score from admission to discharge in the SCIM was 18(range51), p<0.001. Age gender and LOS accounted for 12.7% of the variance in SCIM change scores. Controlling for these variables, only number of physiotherapy sessions (R²=0.106, p=0.003) and total number of physiotherapy and adjunct sessions (R²=0.122, p=0.003) made a positive and significant contribution to the predictive ability of their models. Shoulder pain on admission impacted negatively on outcome (R²=0.068, p=0.02).

Conclusion: Physiotherapy dosage (+/- adjuncts) predicts functional improvement and the presence of shoulder pain predicts poorer functional outcome following in-patient SCI rehabilitation in Ireland.
Evaluation of personal care training of spinal cord injury patients after initial rehabilitation

Carolin Klein¹, Adrian Wyss¹, Madeleine Bernet², Kathrin Sommerhalder², Claudia Mischke²

¹Swiss Paraplegic Centre, Nottwil, Switzerland, ²Bern University of Applied Sciences, Health Division, Bern, Switzerland

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: As a core function of the nursing profession, patient education should contribute to the ability of spinal cord injured persons to reorganize their everyday lives and return to being a productive part of society. How effective patient education programs actually are for this target group is still uncertain. This applies as well to the program that was developed and introduced in 2009 in the Swiss Paraplegic Center. The aim of the study was to investigate the use of personal care training from the perspective of the patient.

Methods: Ten (10) Men between the ages of 19 and 67 participated in two semi-structured interviews: shortly before discharge and six months after discharge. The data was then evaluated according to the Mayring Method of Content Analysis.

Results: In order to develop and strengthen personal skills, the practical part of personal care training is extremely relevant. Confidence in the nursing personnel and interdisciplinary team, the attitude of the nurses in regards to personal responsibility, and personalization of the entire learning and rehabilitation process stood out as crucial catalysts. Consultations and conversations with case managers or peers about physical or psychological concerns are perceived as valuable support.

Conclusion: An active collaboration with the peers as a fundamental component of successful personal care training should be expanded to the time after discharge. Personal care training programs should integrate facets of the individuals psychological situation and strengthening of personal responsibility.
Feasibility study investigating effects of transcranial magnetic stimulation (TMS) to treat upper limb spasticity in patients with spinal cord injury

Dr Ram Hariharan, Mr Ali Gharooni
Sheffield Teaching Hospitals NHS Trust, Wakefield, United Kingdom

Background:
Spasticity affects approximately 70% of people with SCI and leads to reduced function, pain, contractures, ulcers, posture disorders, impaired activities of daily living and quality of life. Current management of spasticity includes the use of physical factors, physiotherapy, pharmacotherapy, intrathecal agents and surgery, which all have disadvantages. One alternative treatment includes Intermittent Theta Burst Stimulation (iTBS), which is a form of repetitive transcranial magnetic stimulation shown to have promising results for MS patients. This study will investigate iTBS as an alternative non-invasive treatment for spasticity in the upper limbs of SCI patients.

Method:
20 SCI patients with a MAS upper limb spasticity score of 2 or above will be recruited to this blinded cross-over randomised controlled study at the Sheffield SCI Centre. Patients will be randomised to receive either iTBS or sham intervention 10 times over 2 weeks followed by a 2 week rest period. After this the patient will receive the alternative intervention 10 times over 2 weeks. Patient outcomes (MAS, RoM, LASIS, VAS-spasticity, VAS-pain, MTS, ASIA, SCIM) will be assessed before, during and after the treatment.

Results/Findings:
Funding was awarded by Spinal Research to Dr Hariharan to conduct the study. Ethical approval has been obtained from the Sheffield REC. The study has been reviewed by the Trust’s Scientific Advisory Board and PPI Panel. PPI feedback was incorporated into the study design. Recruitment to the study is going well.

Conclusion:
This study will determine feasibility to treat SCI spasticity with iTBS and provide preliminary outcome data.
Functional outcome of Neuromyelitis Optica patients undergoing a multidisciplinary rehabilitation treatment – a Rehabilitation Center experience of 8-years

Miss Maria Pais Carvalho, Miss Anabela Ferreira, Mr Carlos Pereira

Centro Hospitalar Tondela-viseu, Viseu, Portugal, Centro de Medicina de Reabilitação de Alcoitão, Cascais - Lisboa, Portugal

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: Neuromyelitis optica (NMO) is an uncommon, idiopathic, inflammatory disease affecting the spinal cord and the optic nerve. Due to its rarity and, until recently, lack of clear cut diagnostic criteria, there is scarce evidence of the effectiveness of a holistic rehabilitation treatment. We evaluated a rehabilitation program efficacy of NMO patients, comparing clinical and functional outcomes.

Methods: Retrospective study of 7 patients, with 12 hospitalizations at a Rehabilitation Center, occurring in the last 8-years. Clinical assessment considered American Spinal Injury Association Impairment Scale (AIS), level of injury, Functional Independence Measure (FIM) andExpanded Disability Status Scale (EDSS). Effectiveness was determined by comparing admission and discharge FIM and EDSS scores, among other parameters.

Results: Patient’s mean age at first admission was 44 +/- 17 years, they were all females. Six presented tetraplegia and only one paraplegia, since during the study, 2 patients progressed to tetraplegia, due to disease relapses. Only one patient worsen its ASIA classification level. Patients improved on functional scores – mean FIM admission: 84.5 +/- 24.4; discharge: 101.4 +/- 21.4; mean EDSS admission: 7.6; discharge: 6.7. The FIM parameters with more progression were sphincters and gait. The most frequent complications were urinary tract infections and pain. Four patients had relapses (mainly motor and sensation deficits), being immediately transferred to neurology departments.

Conclusion: To NMO patients, rehabilitation brings successful outcomes in function. Although gains may be lost to disease relapses, recent immunomodulatory intervention may augment the benefits of rehabilitation, making it key to the disease management.
Implementation of a screening-tool for malnutrition in a rehabilitation centre

Dr Peter Felleiter
SPZ Nottwil, Nottwil, Switzerland

Quantitative and qualitative malnutrition are common, under-recognised and under-treated problems in hospitals and rehabilitation centres. Early recognition of these problems is very important, because malnutrition not only increases morbidity and mortality, but also prolongs hospitalisation. To identify patients with malnutrition early and systematically we implemented the Spinal Nutritional Screening Tool (SNST) in our rehabilitation centre. We evaluated the use of this tool and its first results.

The SNST was included into the standardized patient interview for all patients referred to our rehabilitation centre. After an introduction phase of six months we reviewed the data of all adult patients that were referred to our centre over a period of 17 months and evaluated, whether the tool had been used properly and what results had been documented.

During the observation period 913 patients were referred, of which 19 were under the age of 18 years. The average age of the 894 adult patients was 53 years (18-92 years). In 31% of cases the screening-tool had not been used correctly. For the other patients in 59% a low risk for malnutrition was found, a moderate risk in 30% and a high risk in 11%.

Malnutrition is of significant importance in acute care and rehabilitation. The high number of patients with moderate or high risk for malnutrition is relevant, additional diagnoses have to be documented and resulting therapies have to be prescribed. We consider the implementation of a screening tool for malnutrition to be a useful measure in a rehabilitation centre.
Is there a time difference in conducting a 10 meter walking test depending on whether you start/stop statically or dynamically

Mrs Elisabeth Luthman\textsuperscript{1,} Mrs Gunilla Frykberg\textsuperscript{2}

\textsuperscript{1}Dep of Rehabilitation Medicine, Uppsala University Hospital, Uppsala, Sweden, Uppsala, Sweden, \textsuperscript{2}Dep of Neuroscience/Rehabilitation Medicine, Uppsala University, Uppsala Sweden, Uppsala, Sweden

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Background
It is of great importance to use valid and reliable tools when evaluating interventions (with patients) as well as in research. The 10 meter walking test (10MWT) is an international commonly used tool for measuring gait speed. In the literature and in clinical practise we often see different ways how the 10 MWT is conducted.

Purpose
The aim was to investigate whether different ways of conducting the 10 MWT influence the time measured in the test, which in the present study meant to evaluate a dynamic start in relation to a standing start and a dynamic finish to stopping at a set end line.

Method
Thirty persons with neurological disorders were recruited from three patient groups (MS, traumatic brain injury or spinal cord injury at least AIS D) ten in each group, from outpatient clinics at Uppsala University Hospital, Sweden. Clinical assessments included e.g. 5sit-to-stand, standing on one leg or level of spasticity. In addition, 30 persons without disability were recruited to match with respect to age, sex, height and weight. All participants were assessed by the 10MWT during eight different conditions.

Results
Statistical analyses are ongoing
The results will be presented and the following questions will be discussed

Is there a time difference in conducting the 10MWT depending on whether you start/stop statically or dynamically?
If there is a time difference between persons with and without disability and also between the patient groups, which are the differences and what might contribute to the differences?
Introduction: Controlled leg-cycling modulates H-reflex activity after spinal cord injury (SCI). Preserved cutaneomuscular reflex activity is also essential for recovery of residual motor function after SCI. Here the effect of a single leg-cycling session was assessed on cutaneomuscular-conditioned H-reflex excitability in relation to residual lower limb muscle function after incomplete SCI (iSCI).

Methods: Modulation of Soleus H-reflex activity was evaluated following ipsilateral plantar electrical stimulation applied at 25-100ms inter-stimulus intervals (ISI’s), before and after leg-cycling in ten healthy individuals and nine subjects with incomplete SCI (AIS C-D, neurological level C5-T10).

Results: Leg-cycling in healthy subjects increased cutaneomuscular-conditioned H-reflex excitability between 25-75ms ISI (p<0.001), compared to a small loss of excitability at 75ms ISI after iSCI (p<0.05). In addition change in cutaneomuscular-conditioned H-reflex excitability at 50ms and 75ms ISI in subjects with iSCI after leg-cycling predicted lower ankle joint hypertonia and higher Triceps Surae muscle strength, respectively.

Conclusions: Leg-cycling modulates cutaneomuscular-conditioned spinal neuronal excitability in healthy subjects and individuals with iSCI, and is related to residual lower limb muscle function. Cutaneomuscular-conditioned H reflex modulation could be used as a surrogate biomarker of both central neuroplasticity and lower limb muscle function, and to benchmark lower-limb rehabilitation programs in subjects with iSCI.

Acknowledgement: This project was funded by “Consolider-Ingenio 2010 Hyper” from the “Ministerio de Ciencia e Innovación” (CSD2009-00067).
Measuring balance in high-functioning individuals with incomplete spinal cord injury: The Community Balance and Mobility Scale

Ms Katherine Chan1,2, Ms Kristina Guy1,3, Ms Garima Shah1,4, Mr Jonathan Golla1, Ms Heather Flett3,5, Mr Josh Williams3,5, Dr Kristin Musselman1,2,5

1SCI Mobility Lab, Toronto Rehabilitation Institute-University Health Network, Toronto, Canada, 2Rehabilitation Sciences Institute, University of Toronto, Toronto, Canada, 3Brain & Spinal Cord Rehabilitation Program, Toronto Rehabilitation Institute-University Health Network, Toronto, Canada, 4Dept. of Neuroscience, University of Toronto, Toronto, Canada, 5Dept. of Physical Therapy, University of Toronto, Toronto, Canada

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: Individuals with incomplete spinal cord injury (iSCI) often fall while walking. Currently there is no measure of ambulatory balance validated for iSCI. The Community Balance & Mobility Scale (CBMS) was developed to meet this need in the brain-injured population. Our objectives were to evaluate the use and convergent validity of the CBMS in individuals with iSCI during inpatient rehabilitation.

Methods: Inpatient charts at a SCI rehabilitation center from 2009-2015 were reviewed. Inpatients were excluded if they were >65 years, did not complete a CBMS or did not have an iSCI diagnosis. CBMS score, demographics and injury-related characteristics were extracted. Scores on the Berg Balance Scale (BBS), 6-Minute Walk Test (6MWT) and 10-Meter Walk Test (10MWT) were retrieved if performed within one week of the CBMS. Convergent validity was evaluated by correlating CBMS scores with BBS, 6MWT, and 10MWT scores (Pearson’s correlation). Chi-square tests were used to identify CBMS items with uniform distributions, suggesting good discrimination between participants.

Results: Thirty-two individuals were included (25 male, 38.4±14.8 years old, 3 AIS-C, 28 AIS-D, C1-L4, 17 traumatic). Scores on the BBS were ≥52/56, whereas CBMS scores showed a greater range (27-82/96). The CBMS correlated strongly with the 6MWT and 10MWT (r=0.61-0.67, p<0.002-0.004) and moderately strongly with the BBS (r=0.438, p=0.041). Tandem walking, lateral foot scooting, forward to backward walking and descending stairs showed uniform distributions.

Conclusion: The CBMS is a valid measure of ambulatory balance in high-functioning iSCI. Prospective studies are needed as retrospective studies have limitations (e.g. varying data quality).
Perceptions of exercise professionals and clients with spinal cord injury during the SCIPA-Com intervention

Ms Professor Beatriz De Oliveira¹, Ms Melanie Cheah², Professor Alexandra McManus³, Professor Sarah Dunlop³, Professor Mary Galea⁴, Professor Garry Allison¹

¹School of Physiotherapy and Exercise Science, Curtin University, Bentley, Australia,
²The University Of Western Australia, Crawley, Australia,
³Faculty of Health Sciences, Curtin University, Bentley, Australia,
⁴Department of Medicine (Royal Melbourne Hospital), The University of Melbourne, Parkville, Australia

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: Physical activity after spinal cord injury (SCI) is usually low with increased risk of chronic diseases and physical capacity decline. We have shown that a bi-national (Australia and New Zealand) community-based program involving a training framework for exercise professionals and delivery of tailored exercise programs over 8 -12 weeks to participants living with SCI (Spinal Cord Injury and Physical Activity – Community: SCIPA-Com) increased leisure time physical activity and quality of life. Here we examined perceptions of exercise professionals and participants regarding barriers and facilitators to undertaking exercise in SCIPA-Com.

Methods: Exercise professionals (10) and clients (37: range ASIA Impairment Scale AIS A-C, C5-C8; AIS A-C, T1-S4/5) were assessed through semi-structured interviews after participation in SCIPA Com.

Results: Exercise professionals perceived lack of motivation from clients, time and knowledge as the main barriers. They were motivated to assist due to their desire to help, because they enjoyed their job or due to personally knowing someone affected by SCI. The main barriers reported by participants with SCI were lack of accessible equipment, physical and psychological issues and costs. Facilitators comprised adequate assistance, information, mental wellbeing, accessibility and financial support. Overall, structured programs delivered by trained exercise professionals acted as catalysts encouraging participation, whereas perceived health benefits and community support enhanced motivation.

Conclusion: Rehabilitation professionals, SCI networks and health care systems should intensify dissemination of information regarding exercise after SCI as well as increase opportunities and financial support for structured physical activity community programs that are supervised by trained exercise professionals.
Perspectives on Intensive Locomotor Training from Canadian Participants with Sub-acute Spinal Cord Injury

Hardeep Singh1,2, Meeral Shah1, Heather Flett1,3, Dr. B. Catharine Craven1,2,4, Prof Molly Verrier1,2,3, Dr. Kristin Musselman1,2,3

1Toronto Rehabilitation Institute - University Health Network, Toronto, Canada, 2Rehabilitation Sciences Institute, Faculty of Medicine, University of Toronto, Toronto, Canada, 3Dept. of Physical Therapy, Faculty of Medicine, University of Toronto, Toronto, Canada, 4Division of Physical Medicine and Rehabilitation, Faculty of Medicine, University of Toronto, Toronto, Canada

Introduction: Intensive locomotor training (ILT) can achieve substantial therapeutic outcomes, yet rarely have patients’ perspectives about ILT been studied. This study was part of a larger study exploring the feasibility and effectiveness of ILT in a Canadian rehabilitation context. This study aimed to describe the experiences of participants; specifically, how participation impacted their lives, the challenges encountered, and how ILT could be improved.

Methods: Seven individuals with sub-acute SCI (6 AIS-D, 1 AIS-C, C4-T5) participated in ILT for six hours/week for 74-197 hours in total. ILT provided three times the amount of standard outpatient therapy. Semi-structured interviews consisting of open-ended questions were conducted at program completion. Following member-checking, transcribed interviews were analyzed using conventional content analysis. Two researchers independently identified codes from participants’ responses which informed construction of themes through team discussions. Trustworthiness was further enhanced through data analysis trail and verbatim quotes.

Results: Participants highlighted factors that motivated their participation, and perceived benefits and challenges experienced. Three themes emerged. 1) Motives for participating: beliefs that higher intensity leads to quicker recovery of prior function. 2) Perceived benefits: positive health outcomes (e.g. physical and psychological well-being), favorable structure and composition of ILT (e.g. treadmill), and empowerment to self-manage their rehabilitation. 3) Perceived challenges: neglect of other commitments (e.g. no energy for socializing), acquiring services to enable participation (e.g. accessible transportation, bladder care), limited transferability to daily walking, and rigid structure of ILT.

Conclusions: Overall participants reported positive experiences with ILT. The reported challenges suggest areas where ILT should be improved.
Physical examination findings of elbow joints in para athletes participating in Oita International Wheelchair Marathon Race.

MD Mari Kakita1, MD Yukihide Nishimura1, MD Yusuke Sasaki3, MD Takeshi Nakamura2, MD Hideki Arakawa1, MD Takahiro Ogawa1, MD Yuki Mukai1, MD Yoshi-ichiro Kamijo1, MD Fumihiro Tajima1

1Department of rehabilitation medicine of Wakayama Medical University, Wakayama-city, Japan, 2Department of rehabilitation medicine of Yokohama City University, Yokohama-city, Japan, 3Department of rehabilitation medicine of Gifu Municipal Hospital, Gifu-city, Japan

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Para athletes of wheelchair sports (Para-athletes) commonly experience elbow pain and most of them have a big concern about elbow joint injury induced by wheelchair propulsion. However there have not been enough reports about elbow joint injury in Para-athletes. To investigate elbow injury and clinical practice, we studied physical examination in elbow joints of Para-athletes. Sixty-three Para-athletes in Oita international wheelchair marathon race participated in the present study from 2013 to 2015. Motion pain, tenderness, Tinel’s sign, ulnar nerve palsy and range of motion on elbow were recorded by well trained physicians. Thirteen athletes had motion pain and 19 athletes had tenderness in either elbow. The 79% of pain lesions was on left lateral epicondyle of humerus and significantly greater than right side. Eleven athletes had Tinel’s sign in cubital tunnels of 10 right and one left side. Tow athletes had left ulnar nerve palsy. In all subjects, range of motion of elbow joint was normal. The present findings suggested that almost half of Para-athletes had humerus epicondyle tenderness or cubital tunnel symptoms and the left side would be dominant instead of normal range of motion of elbow joint.
Rehabilitation of walking function: content and duration of treatment in acute incomplete spinal cord injury

Miss Martina Franz¹, Dr. Markus Wirz², Miss Lea Richner¹, Miss Ulla Bergner³, Miss Anne von Reumont⁴, Prof. Dr. med. Norbert Weidner⁵, Prof. Dr. med. Armin Curt¹,5
¹Balgrist University Hospital, Spinal Cord Injury Center, Zurich, Switzerland, ²Zurich University of Applied Sciences, Winterthur, Switzerland, ³Trauma Center Murnau, Murnau, Germany, ⁴University Hospital Heidelberg, Spinal Cord Injury Center, Heidelberg, Germany, ⁵University Zurich, Zurich, Switzerland

Introduction: In most spinal cord injury (SCI) trials physiotherapy builds the backbone of rehabilitation while being a rather less understood confounder. Conventional physiotherapy likely varies from patient to patient with limited standardization of rehabilitation programs across centers. Therefore, the ongoing study “Mapping of Locomotor Training (MALT)” within the EMSCI network analyses physiotherapy in acute incomplete SCI.

Methods: Six rehabilitation centers recruited participants while any physiotherapy during the acute rehabilitation was documented using the Spinal Cord Injury – Intervention Classification System (SCI–ICS). Supplementary, the Spinal Cord Independence Measurement (SCIM) score of mobility was captured weekly completed by information from the EMSCI database. 51 subjects (AIS B–D, either lesion level) or 6780 therapies were recorded. The analysis focused on the first (T1), middle (T2) and last (T3) stages of rehabilitation (covering five consecutive days). Non-parametric statistical methods were applied.

Results: From first (T1) to later stages (T2/T3) of rehabilitation the amount of physiotherapy significantly increased (p<0.01, +181min/+100min) towards more group therapies (p<0.0001, +15%/+16%). The content of therapy in participants with a SCIM score for mobility indoor ≤2 involves significant more respiratory and transfer but less walking therapy (p<0.0001). Overall, muscle strength therapy was the most frequent (median: 25.3%, range: 50.8%) intervention followed by walking therapy (12.5%, 34.8%).

Conclusion: Therapy content is adjusted by time and patients’ ability during rehabilitation but comparison between centers is still restricted due to limited number of participants per center. Clinical outcome studies may account for differences in conventional therapy according to different abilities or stages of rehabilitation.
Relation Genital Sensation with Sexual Satisfaction in Male Patients with Spinal Cord Injury

Professor Jae-sik Kim, professor Seon-jeong Oh, professor Jin-young Lee, Professor Yoon-Tae Kim
1 National Traffic Injury Hospital, Yangpyeung-gun, South Korea

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction; Most male patients with spinal cord injury (SCI) do not have any sensation in penis. We hypothesized degree of genital sensation have a role in satisfaction of sexual actions.

Methods; 11 male patients with SCI was enrolled. we used biothesiometry for detecting sensation of penis as feeling of vibration at rt.(lt.) penile root, shaft and glans. We analysed questionnaire for sexual satisfaction.

Results; 4 patients had no erection and no sensation of penis. All of Lumbar lesion patients are able to erect penis and have sensation of penis. Patients having sensation of penis satisfied with sexual actions and are more interested with sex. Moreover, his quality of life (QoL) seems to be improved.

Conclusions; We should be getting concern about improvement of QoL as satisfaction of sexual actions. According to our study, we should focus on patients having sensation of penis for sexual rehabilitation. Our study has limitations of small numbers of patient and evaluation of erectile dysfunction. We suggest more data need to be accumulated and analyzed in future.
Right arm swing reduction under cognitive load in patients with thoracic SCI.

**Dr. Christopher Schmidt Easthope**, Mr. Tim Killeen, Dr. Linard Filli, Prof. Dr. Armin Curt, Dr. Marc Bolliger, Dr. Björn Zoerner

*Balgrist University Hospital, Zurich, Switzerland, University Hospital Zurich, Zurich, Switzerland*

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Background: Adding a cognitive dual task to treadmill walking in healthy subjects distorts arm swing symmetry by reducing right arm swing as cognitive load increases. We applied a modified Stroop word/color discrimination paradigm to investigate this effect in spinal cord injured (SCI) patients.

Methods: SCI patients (AIS D) with cervical (n=6, cSCI) and thoracic lesions (n=6, tSCI) and 12 healthy, matched controls underwent 3D gait analysis while walking normally at a comfortable speed on a treadmill (NW) and when performing an additional congruent (Easy) and incongruent (Hard) Stroop task. An arm swing asymmetry index (ASI) was calculated based on the 3D wrist center trajectories of both arms (ASI>0 is left-dominant).

Results: In controls, ASI increased (NW:13.7±6.3, Easy:16.6±6.4, Hard:19.6±7.8) as the cognitive task became more demanding. A larger, right-driven (p=0.014) response was seen in tSCI patients (NW:15.8±6.0, Easy:23.4±3.8, Hard:30.7±4.4). Conversely, patients with cSCI showed a small reduction in mean ASI with high inter-individual variability (NW:14.2±10.7, Easy:9.3±13.5, Hard:6.0±12.9). Patients’ ASI response to cognitive load was agnostic to UEMS or LEMS score laterality in degree and direction. The effect of the Hard task on ASI compared to NW was significantly different between tSCI (+12.5±6.3) and cSCI (-8.2±6.0) patients (p=0.011).

Conclusion: The predominantly left-hemisphere Stroop task reduces right arm swing. Disruption of the long propriospinal connections coordinating arm and leg movements during walking may explain the heightened sensitivity of ASI to cognitive load in tSCI, with the more robust automaticity in cSCI due to impaired supraspinal inputs in the context of preserved intraspinal pathways.
A different method: Measurement of thermoregulatory responses to heating blanket in a tetraplegic man

MD Rikke Middelhede Hansen¹, MD,Ph.D Ellen Merete Hagen¹²

¹Spinal Cord Injury Center Of Western Denmark, Department Of Neurology, Regional Hospital Of Viborg, Denmark, Viborg, Denmark, ²Autonomic Unit, National Hospital for Neurology and Neurosurgery, University College London Hospital, Great Britain, London, Great Britain

Poster Viewing with refreshements. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction:
Conventional thermoregulatory sweat testing requires specialized equipment and can be time-consuming and inconvenient for the patient. We measured thermoregulatory responses to heat in a tetraplegic man using a heating blanket (BARRIER EasyWarm).

Methods:
BARRIER EasyWarm is a self-warming blanket that opened and unfolded heats to 44°C within 30 minutes and maintains a constant temperature for up to 10 hours. A 38 year old male seen 12 years after traumatic SCI (C6, AIS A) described anhidrosis since his injury and felt unwell during sport activities and in hot environment.

Results:
Data collected during preheating, heating and post heating was, respectively:
Mean systolic blood pressure (SBP): 146 mmHg, 90 mmHg and 105 mmHg
Mean diastolic blood pressure (DBP): 60 mmHg, 41 mmHg and 38 mmHg
Mean heart rate (HR): 54 beats per minute (bpm), 49 bpm and 50 bpm
The changes in SBP, DBP and HR were all statistically significant.
Auricular temperature rose from 36.1°C to 36.9°C during heating and rose further after the blanket was removed to max 37.4°C 37 minutes after removal of the heating blanket. Only minor sweating was registered on the forehead during testing.
During the test the patient felt unwell (nausea, dizziness, tight chest) and developed spasms at the end. The symptoms continued for 30 min post heating.

Conclusions:
A simple and low cost heating blanket made for straightforward objective assessment of temperature related fall in SBP, DBP and HR in this tetraplegic patient and might be a useful testing strategy in this patient group.
Human umbilical cord blood mononuclear cell therapy improves locomotion recovery after spinal cord injury.

Dr Sergey Ryabov, Dr Vladimir Smirnov, Dr Andrey Green, Dr Vladimir Krylov, Dr Marina Zvyagintseva, Dr Vladimir Smirnov

1 Lab. of stem cells, Institute of Experimental Cardiology, Moscow, Russia., Moscow, Russian Federation., 2 Department of Neurosurgery, N. V. Sklifosovsky Research Institute of Emergency Care, Moscow, Russia., Moscow, Россия

Introduction: One of the consequences of spinal cord injury (SCI) is a disorder of motor function. Problem of restoration of motor function after SCI may be solved by the methods of cell therapy. The aim of the study was to use human umbilical cord blood mononuclear cells (HUCBMCS) for restoration motor function after SCI. Methods: The study was performed on Sprague-Dawley rats (200-250g). Severe contusion was performed by “weight-drop method”, T9 level, 10 g/25 mm (corresponding ASIA level A/B in human). HUCBMCS (CryoCenter, Moscow) in a dose of million cells/animal were injected into the vein or million cells/animal into the epicenter of the injury. Visualization of the SCI was performed by MRI, anatomical and histological techniques. Behavioral testing of hind limb locomotion was performed weekly during 8 weeks post injury used Basso-Beattie-Bresnahan (BBB) functional scale. Results: In the control group (self-healing) BBB scores ranged between 4 and 5 points after 8 weeks. When the HUCBMCS was used, BBB scores rose to 7-8 points. This was significantly better then control group (p≤0.05). Injection of HUCBMCS improves locomotion recovery up to 14-16%. Day of injection (1st or 5th) did not affect the result of recovery. Injection of HUCBMCS into the injury site of the spinal cord improves the recovery of motor function up to 7-8 points BBB, too. Conclusion: The application of single intravenous and/or intra spinal injection of HUCBMCS can improve restoration motor function of the hind limbs after a severe SCI. Supported by Russian Science Foundation (grant No 14-15-00802).
Management of spinal pain-a case report

Dr Pradeep Deshpande

Derby Teaching Hospitals, Derby, United Kingdom

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction- Treatment of spinal pain due to caord lesion can be very difficult. This case shows an interdisciplinary approach towards the problem.

Method- a case report of a 71 year old female patient with co-morbidities, presenting with spinal pain post operatively after surgery for arteriovenous malformation in lumbar region. She had paraparesis after removal of lumbar spinal arteriovenous malformation. She had other co-morbidities such as ischaemic heart disease and oesophageal web causing dysphagia. A combination of neuropathic pain medications were used including Gabapentin, Duloxetine and Morphine sulphate. In spite of this, she had severe neuropathic pain which restricted her physiotherapy exercises. A combination of pain psychotherapy, gentle mobilisation and use of short acting benzodiapines were used to improve her pain tolerance. Due to preexisting coronary heart disease her exercises were restricted but she reported a benefit after a few weeks of above treatment combined with psychotherapy interventions.

Conclusion- Spinal pain, particularly persistent pain, is a complex phenomenon, and it is very real to the person experiencing it. Persistent pain has both physical and psychosocial components. Accordingly, there is an evolving trend toward matching care to both the physical and psychosocial components of a patient’s pain experience. This implies determining the patient’s care needs, be these physical and/or psychosocial, and matching them with the best available evidence-based active and passive treatments.

The biopsychosocial model of care, which is characterized by multidisciplinary, multimodal care, is now a widely accepted strategy for the management of persistent pain.
Measure or estimate energy expenditure in paediatric patients with spinal cord injuries? Comparison of indirect calorimetry and predictive equations.

Dr Samford Wong1,2,3, Ms Kirsten Hart1, Mr Paul Subong1, Mr Mofid Saif1, Dr Allison Graham1

1National Spinal Injury Centre, Aylesbury, United Kingdom, 2School of Health Sciences, City University London, London, United Kingdom, 3Institute of Liver and Digestive Health, University College London, London, United Kingdom

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: Little is known about the energy expenditure in children with spinal cord injury (SCI). Commonly used predictive equations tend to overestimate resting metabolic rate (RMR) by 5-32%.1 The objective of this study is to (1) measured 15-minutes energy expenditure to determine 24-hours RMR (m-RMR) using QUARK indirect calorimeter; (2) compare the m-RMR with estimated RMR (e-RMR) using predictive equations.2-5

Methods: Sixteen children with SCI (CwSCI) (median age: 12, range 3-18 years, median BMI: 19.4, median onset of SCI: 1249 days; 43.8% tetraplegia; 25% complete SCI) had their RMR measured during June 15 to December 15.

Results: All four predictive equations were found to be over-estimated m-RMR in CwSCI by 12.2 to 31.5% (Harris-Benedict: 31.5%, p=0.014; Mifflin-St-Jeor equations: 12.2%, p=0.126; Oxford-Henry: 27.9%, p=0.028; Schofield: 27.4%, p=0.011). No significant difference was observed when comparing the onset of SCI (p=0.834) and m-RMR (0.748) in tetraplegic and paraplegic sub-group analysis. No significant difference was observed when compared m-RMR and e-RMR in tetraplegic and paraplegic sub-group analysis. All 4 predictive equations were overestimated RMR in both tetraplegic patients (7.8 to 28.7%) and paraplegic patients (32.3 to 43.5%).

Conclusion: There is high variability in RMR in children with SCI. Our findings highlight the importance of IC to adequately estimate RMR in this vulnerable population. Given the limited sample size in this study, further RMR study with a larger sample size is warranted. To prevent obesity, SCI centre should consider to have children’s RMR measured via indirect calorimeter when they admitted to SCI centre.
Muscle excitability scale – a novel tool for evaluation of spastic motor behaviors in spinal cord injury patients

Dr Jiří Kríž1, MSc Zuzana Hlinková1
1University Hospital Motol, Prague, Czech Republic

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Objective
To create a simple tool for the evaluation of spinal spasticity which would provide a scale of muscle susceptibility to spasms and/or clonus. To record its level on a scale from 0 to 4, by analogy, as in the Modified Ashworth Scale (MAS). To set up the exam algorithm for both scales simultaneously.

Patients and Methods
The muscle excitability scale (MES) evaluates a motor response (muscle spasms or clonus) to a sensory or motor stimulus in spinal cord injury (SCI) patients. A sensory stimulus is created by thumb and forefinger compression of cutaneous tissue on the inside part of the middle thigh and calf. A motor stimulus is created by passive movement of the lower limb to flexion and extension. The movement is developed to the first half followed by full range of motion in the hip and knee, each phase lasting one second. During this phase there is also the option to subtract the MAS grade.

Results
The MES grades from 0 to 4 reflect the muscle spastic or clonic tendency and the extent of this motor response (from isolated to generalized). When rated using the MAS (which assesses the increase of muscle tone), the propensity to spasticity is determined. It is possible to employ both scales simultaneously to monitor the effect of therapeutic interventions to spinal spasticity.

Conclusion
The MES is an appropriate additional tool for evaluation of spinal spasticity. When used together with the MAS it provides a more comprehensive characterization of spasticity in SCI patients.
Patient-centred Data Collection: Trialling Mobile Applications in the SCI Domain

Professor Richard O. Sinnott\textsuperscript{3}, Mr Anthony Stell\textsuperscript{3}, Ms Marnie Graco\textsuperscript{1}, Dr David Berlowitz\textsuperscript{1,2}, Mr Zhi Zheng\textsuperscript{3}

\textsuperscript{1}Institute for Breathing and Sleep, Austin Health, Melbourne, Australia, \textsuperscript{2}Faculty of Medicine Dentistry and Health Sciences, University of Melbourne, Parkville, Australia, \textsuperscript{3}Department of Computing and Information Systems, University of Melbourne, Parkville, Australia

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

The Spinal Care And Research Excellence (SpinalCARE, https://spinalcare.org.au) registry is currently supporting spinal injury researchers and care providers in Victoria and New South Wales in Australia. This system supports an extensive range of data that is collected across the lifetime of spinal cord injury (SCI): from original accident details, through to ICU and hospital treatment and subsequent discharge of patients into the community, ambulatory care and the health and social challenges that people living with SCI may face.

Increasingly there is a need to capture data directly from people living with SCI regarding their ongoing management, support and potential complications that may arise. This work focuses on the development and roll out of mobile applications for the SCI patient communities across Australia. We focus on showing how both iOS and Android devices can now be used for capturing and validating self-reported information from patients. These data include many of the ISCoS datasets, SCIN and FIM. We show how this information can be captured, validated and including into centralised databases for analysis alongside the data captured in the clinical setting. Importantly, we show how the apps can be securely provided (activated) by clinicians for the patients they manage/care for. Thus anyone can download the app, but to use the app and have the data captured into the centralised database requires a uniquely generated access code. This solution offers a new paradigm for data collection that can greatly help SCI patients and the way in which they are managed.
Preliminary Validity of Online Home Modification Assessment Performa and its Pilot application on subjects with Spinal Cord Injury in India

Dr Chitra Kataria, Ms. Nishu Tyagi
Indian Spinal Injuries Centre, New Delhi, India

Objectives: To develop the Online Home Modification Assessment Performa and its application for persons with spinal cord injury (SCI)

Study Design: Phase 1: Clinimetric, Phase 2: Pilot Testing

Setting: TeleHealth Unit Indian Spinal Injuries Centre

Methods: Phase 1: Following a comprehensive literature review and semi-structured interviews, a 10 domains based questionnaire was drafted targeting ‘Front Entry’, ‘Back Entry’, ‘Bedroom barriers’, ‘Kitchen Barriers’, ‘Living Room Barriers’, ‘Bathroom Barriers’, ‘Laundry Barriers’, ‘Parking Barriers’ and ‘Baranda/Balcony Barriers’ mainly. Content validity was established both qualitatively and quantitatively.

Phase 2: After pre-discharge teletraining session, the Home modification assessment performa was sent to 6 SCI clients with different characteristics related to age, time since injury and geographical location. The subjects completed the same and sent back their responses through commonly used softwares such as Viber, WhatsApp and email. Home modifications were then advised.

Results: Phase 1: Expert panel opinion and content validity ratio (CVR) validated the content of the Online Home Modification Assessment Performa.
Phase 2: All six clients reported a positive feedback on the criteria of content covered in the Performa, technological mode, difficulty while sending the pictures, recommending other spinal cord injured individuals for home accessibility needs and repeatability.

Conclusion: Online Home Modification Assessment Performa is a valid, self/interviewer-rated tool that can help inform the rehabilitation team about the clients’ home accessibility through the use of freely available common tele-technology. Suitable Home modifications can be advised even to patients in remote locations who cannot reach the hospital.
Validation of the modified Spinal Nutrition Screening Tool (SNST-2) in patients with Spinal Cord Injuries.

Mrs Lorna O'Connor¹, Dr Eimear Smith¹, Mr Sajimon Cherian¹, Ms Siobhan Carrig¹, Dr Samford Wong²,³
¹National Rehabilitation Hospital, Dublin, Ireland, ²School of Health Sciences, City University London, London, United Kingdom, ³Institute of Liver and Digestive Health, University College London, London, United Kingdom

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: A modified disease specific nutrition screening tool: the Spinal Nutrition Screening Tool (SNST-2) based on eight parameters (body mass index; age; level of SCI; presence of co-morbidities; skin conditions; diet; appetite and ability to eat) has been developed for use in spinal cord injury centres (SCICs). Its validity requires investigation.

Methods: Patients' baseline clinical data, anthropometric measurements and SNST-2 score were assessed in a SCIC in the Republic of Ireland during February 2014 to December 2015. The validity of SNST-2 was tested by (i) comparison with the previously validated SNST-1 (concurrent validity) and (ii) an additional SNST-2 was completed by the research dietitian and ward nurses to assess inter- and intra-rater reliability. Agreement was tested using Cohen’s k-statistics.

Results: 89 patients (aged 18-90 years, median 54 years, 35.9% female; 48.8% tetraplegic) were studied. Using SNST-2 on admission, 24 patients (27.6%) were at risk of undernutrition and 45 patients (51.7%) were classified as overweight using a body mass index cut-off of 25 kg/m². The SNST-2 had “substantial agreement” with SNST-1 (κ: 0.888, 95% CI: 0.781-0.995). The SNST-2 had substantial reliability (inter-rater reliability: dietitian vs nurse, κ: 0.695, 95% CI: 0.522-0.868). The dietitian using SNST-2 was superior to nurses in sensitivity (95.2% v 87.9%) and negative predictive value (88.5% v 68%).

Conclusion: Malnutrition is common in patients with SCI. The SNST-2 is acceptable (valid and reliable) nutrition screening tool and it could be use in identifying SCI patients at risk of malnutrition. Further investigation is warranted to test its predictive validity.
Chronic abdominal pain in long-term spinal cord injury: a follow-up study

Mr Steffen Dam Nielsen1, Dr Pia Møller Faaborg2, Professor Peter Christensen2, Professor Klaus Krogh1, Professor Nanna Brix Finnerup3

1Neurogastroenterology Unit, Department of Hepatology and Gastroenterology, Aarhus University Hospital, Aarhus, Denmark, 2Pelvic Floor Unit, Department of Surgery, Aarhus University Hospital, Aarhus, Denmark, 3Danish Pain Research Center Department of Clinical Medicine, Aarhus University, Aarhus, Denmark

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: Abdominal pain is a serious sequela to spinal cord injury (SCI). This longitudinal, postal-survey study aims to evaluate prevalence and characteristics of abdominal pain in long-term SCI.

Methods: In 2006, a questionnaire about chronic abdominal pain or discomfort was sent to all 284 members of the Danish SCI association, who had been members for at least 10 years. 203 responded. An almost identical questionnaire including questions on intensity and interference within the past 7 days, descriptors and treatment was sent to surviving members in 2015. All ranges and levels of SCI were included.

Results: Among 178 surviving members, 130 (73%), responded and 125 answered the question on chronic abdominal pain. The mean time since injury was 30.5 (9.8) years. Chronic abdominal pain or discomfort was reported by 32.8% (41/125) in which 23% had been at least moderately bothered by this the past week. Abdominal pain or discomfort was more common in women and in those with self-reported constipation. The median intensity (NRS) was 6.0 (range 3 to 10). It was often associated with autonomic symptoms. Nine (8%) individuals of 115 who responded in both 2006 and 2015 had developed new abdominal pain or discomfort, 30 (26%) no longer reported it, and 28 (24%) reported it at both time points with a similar intensity.

Conclusions: Chronic abdominal pain and discomfort is common and bothersome in long-term SCI. It has a late onset, but the prevalence and severity does not seem to further increase between 20 and 30 years following SCI.
mHealth for Low Back Pain Rehabilitation In Resource Limited Environment of Rural India: Opportunity or Challenge

Miss Nishu Tyagi\textsuperscript{1}, Dr Chitra Kataria\textsuperscript{1}, Dr. Vedant Vaksha\textsuperscript{1}, Miss Ruby Aikat\textsuperscript{1}
\textsuperscript{1}Indian Spinal Injuries Centre, Delhi, India

Introduction: In Low Back Pain (LBP), 40% clients continue to report symptoms 3 months later and develop chronic LBP. The need for continuing supervised care is of great importance.

Objective: To evaluate the effectiveness of utilizing smart phones for treating LBP in resource limited environment.

Methodology: 100 Mechanical LBP participants were randomly selected for Mobile Technology (mHealth; Group 1) and received video based intervention on 'Core Strengthening & Core Stabilization' through What'sApp (What'sApp Inc. California (U.S.A), twice a week for four weeks, including one follow up call every week. Mobile app ‘Postural Corrector’ was downloaded in each participant’s smartphone. Also few participants received telemedicine services as well. Pre and post assessment using Oswestry Disability Index (ODI) Version 2 and Numerical Pain Rating Scale (NPRS) scores were taken at the end of every week. For Non mHealth; Group 2, 100 randomly selected LBP participants were telephonically surveyed about their low back care.

Result: In Group 1, there was a significant reduction in pain and ODI scores pre and post treatment with z values -6.15 and -6.17 respectively(p<0.05). In Group 2, 67.5% reported having pain in varying degrees, 42.5% reported severe disability on ODI scores and 90% reported lack of exercises follow-ups. On comparing the NPRS and ODI scores post 4 weeks of both groups, significant difference was seen with t value -7.88 and -6.03 respectively(p<0.05), with group 1 showing better results.

Conclusion: mHealth has the potential to enhance access and delivery of rehabilitation for Low Back Pain in a resource limited environment.
Effect of botulinum toxin A in spinal cord injury associated neuropathic pain

Dr Dae Heon Song
The Catholic University Of Korea, St. Paul's Hospital, Seoul, South Korea

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: We present a case of traumatic spinal cord injury neuropathic pain treated with botulinum toxin A injection.
Methods: A case report
Result: A 51-year-old man with C3 AIS B tetraplegia(American Spinal Injury Association Impairment Scale B) visited our outpatient clinic due to severe ongoing neuropathic pain and associated allodynia and dysesthesia of the lower limbs. He had suffered a traffic accident two years ago and the neuropathic pain appeared one day after trauma onset. The pain was a below level neuropathic nature and was both spontaneous and evoked. The spontaneous neuropathic pain occurred continuously in the lower limbs with paroxysmal bursts below the ankles. The intermittent bursts of pain occurred on an average of 3-6 times a day randomly. Temporal variations were present with neuropathic pain worsening nocturnally. He had previously tried combinations of pregabalin, gabapentin and oxycontin but all failed to alleviate his neuropathic pain. He was treated with subcutaneous injections of clostridium type A botulinum toxin into 10 most painful sites of each sole. The patient was reassessed at four and eight weeks after his injection with botulinum toxin with significant improvement of his neuropathic pain.
Conclusions: Subcutaneous injection of type A botulinum toxin was effective without side effects, on one case of refractory neuropathic pain due to spinal cord injury. Further randomized control trials are needed to confirm type A botulinum toxin’s effect on centrally acting neuropathic pain.
Neuropathic pain and quality of life in patients with chronic spinal cord injury

Dr Dae Heon Song¹
¹The Catholic University Of Korea, St. Paul's Hospital, Seoul, South Korea

Introduction: We study to evaluate the relationship between neuropathic pain and the quality of life in chronic spinal cord injury (SCI) patients.

Methods: Retrospective review of forty nine patients with chronic spinal cord injury and forty one healthy adults admitted to outpatient clinic at the university hospital. Outcome measures included the World Health Organization Quality of Life (WHOQOL) -BREF, a detailed questionnaire addressing matters of quality of life (QOL) and Visual analogue scale (VAS).

Results: The scores of all domains on WHOQOL-BREF for patients with SCI were significantly lower than those for healthy people. Among the four domains of WHOQOL-BREF, physical health factor domain had the lowest score (23.33 ± 13.02), followed by social relationships (32.24 ± 17.08), psychological (32.39 ± 17.25) and environmental factor (38.47 ± 14.58) in patients with SCI. The scores of total QOL and domain of physical health factor were significantly lower in the moderate to severe neuropathic pain group (VAS > 40 mm) than those in the mild neuropathic pain group (VAS score ≤ 40 mm).

Conclusions: Neuropathic pain reduces QOL in patients with chronic SCI and has more influence on physical health factor than the other domains of WHOQOL-BREF, reducing the overall QOL scores.
Pain and Medication Assessment In Spinal Cord Injured Patients

M.D. Ji-Cheol Shin¹, M.D. Shin-Hye Chang², M.D. Han-Kyul Park³, R.N. Ji-Young Yun², R.N. Sooin Hyun²

¹Department and Research Institute of Rehabilitation Medicine, Yonsei University College Of Medicine, Seoul, South Korea,
²Division of Nursing, Severance Rehabilitation Hospital and Research Institute of Rehabilitation Medicine, Yonsei University College of Medicine, Seoul, South Korea

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction
Pain is a common and significant problem for individuals with spinal cord injury (SCI). Even though SCI patients take various pain-relieving medications, most of the patients have insufficient information about pain after spinal cord injury and the effectiveness of the drugs. Therefore, we evaluated change of the patient’s subjective pain score and the dosage of pain-relieving medications after providing information about pain and the medication.

Methods
Data of all patients with SCI treated from January 2013 to May 2014 have been collected. We reviewed the medical records including pain score (Visual Analogue Scale, VAS) and the pain-relieving medications at the time of admission and discharge. The analgesic medications were classified into 9 categories: Acetaminophen, NSIADs, Opioids, Gabapentin, Pregabalin, other anticonvulsants, Tricyclic antidepressants (TCA), Serotonin selective (or norepinephrine) reuptake inhibitors (SSRI or SNRI), others.

Results
A total of 156 patients (114 men and 42 women) with mean age 49.2 ± 15.2 years were included. 129 (82.3%) patients took more than one type of pain-relieving medications. Number of medications decreased from 1.8 to 1.0 during hospitalization, while the average VAS decreased from 4.6 ± 2.2 to 3.5 ± 1.8 (p<0.01). After non-pharmacologic intervention such as education and stretching exercise, most of patients can reduce their medication dosage.

Conclusion
Most of the patients take many pain-relieving medications without sufficient information nor education about pain management. Clinicians must keep in mind that the first step of pain management in SCI patients is careful explanation and education, not just adding medications on and on.
Pediatric spinal cord injuries within habilitation centers in Sweden - a survey

Dr Marika Augutis
Västernorrland County Council and Karolinska Institutet, Sundsvall, Sweden

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

The incidence of pediatric traumatic spinal cord injury (TSCI) has been established as less than 5 children/year in Sweden. The incidence of non-traumatic injuries (NTSCI) is unknown. There are no national guidelines regarding care of pediatric spinal cord injury (SCI) in Sweden. Care and rehabilitation is fractioned and non-systematized. Children with SCI may be referred to a nation-wide organization of Habilitation centers that provide services, typically for children with congenital conditions, mainly on an outpatient basis. The aim was to describe the presence of pediatric SCI in the Habilitation centers in Sweden.

Method
Centers were first contacted in 2013, and those serving any child (0-17 years) with SCI were asked to submit de-identified data. Several follow-up attempts were made. The survey was approved by the ethical committee in Umeå.

Result
So far 25 youth with SCI have been identified, 14 boys/11 girls, injured 1992-2014. Average age at injury was 5.8 years (SD=4.4, range=0-14.5). TSCI (n=12) included mostly traffic injuries (n=5); for NTSCI (n=13), tumor (n=7) was the most frequent cause. More detailed data will be presented at the conference.

Discussion
It was difficult to gather responses from centers, so the presence of SCI is likely underreported. Even so, pediatric SCI is rare, and many centers reported a lack of knowledge around caring for these youth. This confirms the need to create national guidelines, improve cooperation with adult SCI care-providers in Sweden, and increase collaboration between countries. This would likely benefit professionals but most important children with SCI and their families.
Spinal Injury in Indian Children: Review of 204 Cases

Dr ML Bansal, Ms Rajesh Sharawat, Dr Harvinder Singh Chhabra

Indian Spinal Injuries Centre, New Delhi, India

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Background: Spinal injury includes injury to spinal column and spinal cord. Spinal injury in children accounts for 1-10% of the total spinal injuries and even rarer in children under 5 years of age. The mechanism of injury, the gender distribution and the level of injury in children is different from the adult population. The purpose of the study was to analyze the incidence, type of spinal injuries and epidemiological parameters in Indian children with spinal injury admitted at Indian Spinal Injuries Center (ISIC).

Methods: The data was retrospectively reviewed from 2002-2015. There were 204 cases with spine injuries out of 1660 pediatric cases.

Results: The average age of children with spine injury was 15.69 years, ranging from 3 to 18 years. The data was categorized into three groups A (0-9 years), B (10-14) and C (15-18) having 15 (3%), 27 (6%), and 162 (21%) patients respectively. There were 157 (76%) boys and 47 (23%) girls. Children attaining junctional (19) level injuries had mainly fractures (15). The incidence of multilevel and noncontiguous injuries in the different age groups was significantly different (p<0.01). SCIWORA was in 13 (6%).

Conclusion: Fall from height was the major mode of injury. The boys injured, were three times more common than the girls. We were able to establish a positive correlation between junctional level injuries and severity of injuries. SCIWORA incidences are in the same line as of other published literature.
Early introduction of Assistive Technologies: from ICU to home, case report of an 8y.o. high level SCI, ventilator dependent child.

Mrs Elisabeth Clark, Dr. Marie Laberge-Malo
St. Justine's University Hospital, Montreal, Canada

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Assistive technologies are known to increase independence and social participation. Studies with adult tetraplegics report about satisfaction and the importance to introduce technologies early in the rehabilitation process. Person’s needs in ICU, organizational, and training issues are known. What’s the situation for children? They want to play. They need parent’s comfort in times of difficulties. Consequently, parents are crucial partners in the rehabilitation and introduction of solutions. The child’s comprehension of the situation and anxiety must be considered.

Donations and governmental programs where combined in a timely fashion to provide services and technical equipments to facilitate child development of skills and support return to home. In the turmoil of ICU care priorities and in terms of logistics and adaptation for child, family, team members, introducing assistive technologies was a big success one day and a huge challenge the next one.

Medical management plan will be presented: from ventilator dependency toward partial and, hopefully soon, complete discontinuation; management of spasticity, dysreflexia, bowel and bladder, phonation.

Functional rehabilitation plan as well as technological solutions will be presented, among those: special access to powered mobility, motorized postural components, computer access, video gaming, robotic arm assistance, electronic aids to daily living (EADLs), and home adaptations. Pictures, videos of the child and parents interview are available.

The child is now at home and progressively returning to school. The present focus, 20 months post, is on psychological adaptation, school and social integration, and future solutions such as upper extremity exoskeleton.
The effect of continuous positive airway pressure on changes in spirometry and lung function after acute quadriplegia

**Dr. David Berlowitz**¹, Miss Marnie Graco¹,², Dr. Rachel Schembri¹,²

¹Institute For Breathing And Sleep, Melbourne, Australia, ²The COSAQ Collaborative, Melbourne, Australia

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Quadriplegia significantly impairs respiratory function which incompletely recovers over time. In particular, the partial recovery of vital capacity (VC) is driven by both an improvement in inspiratory capacity and a reduction in residual volume. Obstructive sleep apnoea (OSA) is highly prevalent acutely in quadriplegia and the usual treatment is nasal continuous positive airway pressure (CPAP). Overnight CPAP could theoretically affect VC recovery by either maintaining end-expiratory lung volume (reducing the VC improvement), increase the total lung capacity (increasing the VC improvement) or some combination. To test this, monthly measures of spirometry were made during the recently completed, 3-month, multi-centre, randomized controlled trial of CPAP versus usual care for OSA after acute quadriplegia (COSAQ). Respiratory function tests were conducted in supine at baseline, 1, 2 and 3 months. 149 people with acute, traumatic quadriplegia and OSA completed the COSAQ study (134 men, age 46±34, 81±57 days post-injury). Both the CPAP and usual care groups improved over time, but no difference attributable to group allocation was seen (mixed model group*time interaction effect, p=0.35). Average (standard deviation) vital capacity at baseline, one, two and three months were: CPAP 2.83(0.86), 3.07(0.85), 3.04(0.84), 3.07(0.87) and usual care 2.91(1.04), 3.07(0.93), 2.96(1.04), 3.03(1.05). A per-protocol with respect to CPAP adherence analysis also found no significant group*time interaction (p=0.96). These data confirm that the VC increases after injury and suggest that using CPAP to treat OSA in acute quadriplegia has no ill effects on this measure. Additional analyses will examine the effect on other lung volumes.
Continuous Positive Airway Pressure (CPAP) adherence rates and influencing factors following acute, traumatic tetraplegia

Ms Marnie Graco1,2,4, Dr. Rachel Schembri1,3,4, Dr. David Berlowitz1,2,4

1Institute For Breathing And Sleep, Melbourne, Australia, 2The University of Melbourne, Melbourne, Australia, 3RMIT University, Melbourne, Australia, 4The COSAQ collaboritive, Melbourne, Australia

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Prevalence of obstructive sleep apnoea (OSA) following acute tetraplegia is up to 83%. CPAP is the first-line treatment however its effectiveness may be limited by poor adherence.

Aim
To determine the rate and the factors associated with CPAP adherence in people with acute tetraplegia and OSA.

Methods
Analysis of CPAP adherence in a multinational randomized controlled trial of 3 months of auto-titrating CPAP or usual care for OSA after acute quadriplegia. Participants were only randomised if they could tolerate CPAP for greater than 4 hours on 1 of 3 nights. Those in the CPAP arm were “adherent” if they tolerated CPAP for >4 hours per night for 5-7 nights a week for at least 50% of the study. Univariate analyses were undertaken to determine associations between baseline factors and adherence.

Results
11 centres participated in the study. 149 participants (134 men, age 46+34, 81+57 days post-injury) completed the study. 78% of participants with an Apnoea Hypopnoea Index (AHI) >10 passed the initial 3 night CPAP trial (164/211) and were randomized. Of the 79 participants receiving CPAP, 23 (29%) were adherent. Assuming those who did not pass the initial trial would not have been adherent, overall CPAP adherence was 18% (23/126). Factors associated with CPAP adherence included higher AHI (p=0.01), higher abdominal girth (p=0.003) and site (p=0.02).

Conclusion
Adherence to CPAP following acute quadriplegia is poor. Those with a higher AHI and abdominal girth are more likely to adhere. Clinician support and expertise with CPAP implementation is likely to be important.
Effects of Bionic Ambulation on Heart Rate Variability during Head Up Tilt in Persons with Spinal Cord Injury

MD Carsten B Baunsgaard, PhD Jennifer L. Maher, M.S. Jan V Gerven, DMSc Fin Biering-Sørensen, Ph.D., FACSM Mark S. Nash

1Department Of Spinal Cord Injuries, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark, 2The Miami Project to Cure Paralysis, University of Miami, Miller School of Medicine, Miami, USA, 3Radboud University, Nijmegen Medical Center, Nijmegen, The Netherlands, 4Department of Neurological Surgery and Department of Rehabilitation Medicine, University of Miami, Miller School of Medicine, Miami, USA

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: Heart rate variability (HRV) is a proxy of tone. To assess acute adaptations of sympathetic/parasympathetic balance in persons with spinal cord injury (SCI), after a 45 min session of standing and walking in an exoskeleton, HRV was examined during a head up tilt test (HUT), before and after the intervention.

Methods: Study population was 8 males with SCI (age 18-54, NLI T2-T12, AIS A-D) and 6 able bodied, age-matched male controls (CON). None of the participants had a history of cardiovascular disease, hypo- or hypertension. Within and between subject effects was tested with a Mixed Model ANOVA of low frequency (LF) and High Frequency (HF) ratio (LF:HF) in the frequency domain and the standard deviation of NN intervals (SDNN) in the time domain.

Results: Both the SCI and CON group maintained stable Blood Pressure during HUT without incidences of hypotension. There was a significant rise in LF:HF-ratio and fall in SDNN during HUT at angles supine-30°-60°-90°. At each stage, LF:HF mean values were higher between first and second HUT, but only significant for the supine and 30°. No significant main effects or interactions were found between the standing and walking procedure or between the two groups.

Conclusions: The study is still ongoing until 20 participants have completed testing. Orthostatic stress was detected with HRV analysis and these preliminary data suggests acute adaptions in autonomic control after standing and walking in an exoskeleton. Limitation is low number of NLI above Th6 and absence of orthostatic dysregulation in the study population.
Feasibility Study to set an Obstructive Sleep Apnoea Service in a Spinal Injuries Centre

Professor Chinnaya Asari Thiyagarajan¹, Doctor Anitha Naidoo², Doctor Anjani Prasad³

¹National Spinal Injuries Centre, Stoke Mandeville Hospital, Aylesbury, United Kingdom, ²National Spinal Injuries Centre, Stoke Mandeville Hospital, Aylesbury, United Kingdom, ³National Spinal Injuries Centre, Stoke Mandeville Hospital, Aylesbury, United Kingdom

Introduction: The prevalence of Obstructive Sleep Apnoea (OSA) in individuals with spinal cord injury (SCI) is high relative to the general population. OSA can lead to poor participation in rehabilitation. Polysomnography (PSG) and Continuous positive airway pressure (CPAP) are the diagnostic tool and treatment of choice respectively. The restrictions to utilizing PSG are its availability only in specialized regional respiratory centers and lengthy waiting lists. Therefore, a feasibility study with oximetry and nasal air flow measure (Limited Sleep Study (LSS)) instead of complex PSG as a diagnostic screening tool and Auto CPAP as a therapeutic screening tool to prescribe appropriate CPAP settings has been developed to perform sleep studies in a Spinal Injuries Centre (SIC). We present the interim results.

Methods: This is a retrospective analysis of clinical records of 15 patients with SCI referred for a sleep study in a six month period. All underwent diagnostic and therapeutic screening in a SIC using LSS and Auto CPAP.

Results: Patients’ age range: 51-74 years; male:female ratio:11:4; neurological level: cervical-9, thoracic-6; AIS: A-6, B-3, C-1, D-5; Apnoea/Hypopnoea Index (AHI) range: 6-56. Ease of performance of LSS as measured with visual analogue scale in all cases was 8/10; accuracy of diagnosis and therapeutic efficacy as measured with AHI was high.

Conclusion: Advantages of LSS and Auto CPAP are ease of performance, no input from Sleep study centre required, and ability to prescribe appropriate CPAP settings. A much larger, multinational study is underway looking at similar aspects of OSA in SCI.
Locomotor Training With Exoskeleton EKSO-GT in Patients With Incomplete Motor Spinal Cord Injury in a Hospital Setting- Preliminary Results

**Dr Enrica Bonatti**¹, Dr. Ilaria Baroncini¹, Ft. Claudio Nalon¹, Dott. Tiziana Giovannini¹, Psychologist Norma Mazzoli¹, Dott. Roberta Falcone², Dr. Jacopo Bonavita¹

¹Montecatone Rehabilitation Institute, Imola, Italy, ²Statistical Department - UNIBO, Bologna, Italy

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

**Introduction**

The aim of this observational, non-controlled study is to describe the responses to rehabilitative training with the robotic exoskeleton EKSO-GT™ in patients with incomplete motor SCI.

**Materials and method**

20 patients admitted to Spinal Unit of Montecatone were enrolled. Each of these patients had a rehabilitation cycle with use of EKSO-GT®, in addition to conventional treatment. The data were recorded at the beginning of training (T0), on the 12th session (T1), on the 18th session (T2) and 45 days after the end of treatment (T3).

The primary object is to assess motor function in the lower limb, kinetic characteristics and locomotion endurance (10-meter, 6-minutes, WISCI-II, SCIM-III). The secondary endpoints evaluate the degree of safety and tolerability of the treatment, any reduction in pain and/or spasticity, the perception of QoL and the patient's mood before and at the end of the training.

**Results**

The preliminary data show an improvement in the motor function. The training proved to be safe and well tolerated. Overall patients were satisfied with the robotic treatment that, although "hard", did not create pain or cardio-respiratory problems: all the patients recommend the use of EKSO in similar situations.

**Conclusions**

The recorded preliminary data show a functional improvement in patients underwent this training, show a good tolerability and safety, and a high level of subjective satisfaction; further results are require to optimize the benefits obtainable from this rehabilitative tool as much as possible.
A study exploring the clinical effects of a short-duration exoskeleton rehabilitation programme on key physiological markers in spinal cord injury

Miss Kirsty Luard¹, Mrs Helen Hobbs¹, Mr Louis Martinelli¹, Dr James Faulkner²

¹Hobbs Rehabilitation, Winchester, United Kingdom, ²University of Winchester, Winchester, United Kingdom

ABSTRACT FOR POSTER:
Introduction: The Ekso Bionic robotic exoskeleton is a therapeutic device which may improve clinical outcomes when used in the rehabilitation of patients with spinal cord injuries (SCI). This study aims to explore the effect of a short duration Ekso Bionic exoskeleton rehabilitation programme on key physiological markers within SCI. Methods: Currently four individuals with SCI (mean age 27±6 y; ASIA classifications of T9A, T12A, C6B, T1C) have taken part in a 5-day training programme. The programme consisted of daily 1 hour physiotherapy sessions, followed by 1.5 hours of gait training in the exoskeleton. Various exoskeleton settings were used to progress the participants from passive (therapist activated) to active gait patterns (patient initiated through their weight transfer or hip flexion). Prior to and following the 5-day programme, bladder and bowel function, ankle swelling, spasticity, gait parameters and vascular health were measured. Results: All participants increased their walk time, up time and steps in the exoskeleton over the week. Improvements in bladder and bowel function and a decrease in peripheral and central systolic blood pressure were observed. Minimal changes to ankle swelling and spasticity were recorded however. Conclusion: This pilot study suggests that the robotic Ekso Bionic exoskeleton may be a useful adjunct to rehabilitation in patients with SCI. Further research, including a more robust study design, is needed however to confirm its value in the treatment of patients with SCI.
Discharge to nursing home after inpatient hospitalization in persons with chronic SCI: risk factors and comparison to the general population

MA Anastasia E. Ford1,2, PhD Armin Gemperli1,2
1Swiss Paraplegic Research, Nottwil, Switzerland, 2Department of Health Sciences and Health Policy, University of Lucerne, Lucerne, Switzerland

Objective: To identify the relative frequency and risk factors of nursing home admissions after inpatient hospitalization for community living individuals with spinal cord injury (SCI) as compared to the general population.

Methods: Secondary data analysis of a nationwide registry of all inpatient hospitalizations in Switzerland for the years 2007-2011.

Results: Of 15,425 hospital discharges in persons with chronic SCI and 4,414,314 discharges in the general population, 1,016 (6.6%) and 86,876 (2.0%) were discharges to nursing homes for the two groups, respectively. Individuals with SCI were discharged to nursing homes at younger age (64.1 ±18.4 vs. 74.7 ±17.0 years in the general population). Risk factors for discharge to a nursing home in individuals with SCI were old age (odds ratio (OR) 5.23 in age 81+ as compared to ≤40 years of age), female sex (OR 1.16), emergency admission (OR 1.71 vs planned admission), more than 6 comorbidities (OR 1.48 compared to none), dementia (OR 2.05), and tetraplegia (OR 2.76 compared to paraplegia). Regional, cultural characteristics were important in the decision to discharge to nursing homes. Contrary to the general population, there was no association of discharge to nursing homes with nationality, rural residence, or prior hospitalizations.

Conclusions: Persons with chronic SCI were three times more likely discharged to nursing homes after an inpatient hospitalization for secondary complications. The existence of regional differences in rates of discharge to nursing homes suggests that discharge planning not only concerns the hospital care team, but is an issue for policy at large.
LOCOMOTOR TRAINING ON ROBOTIC EXOSKELETON IN PEOPLE WITH INCOMPLETE SPINAL CORD INJURY: THE ROLE OF FES

PT Rachele Menosso¹, PT Elisa Zardini¹, PT Rosmary Blanco¹, PT Cristina Malisan¹, MD Emiliana Bizzarini¹, MD Agostino Zampa¹

¹Department of Rehabilitation Medicine, Spinal Unit - Physical Medicine and Rehabilitation Institute, Udine, Italy

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction
Aims of the study was verify if the use of robotic exoskeleton (REx) together with Functional Electrical Stimulation (FES) could allow locomotion training (LT) spinal cord injured persons (SCI) for longer time and at higher intensity.

Methods
Five ASIA C SCI persons (mean age 54±18.26 years) performed an LT with REx: 3 minutes pre-FES - 30 minutes FES locomotion (one limb) - 3 minutes post-FES. We studied surface electromyography signal (sEMG) of biceps femoris (BF), rectus femoris (RF), tibialis anterior (TA) and medial gastrocnemius (GM) during pre-FES and post-FES periods. Scores at the maximum voluntary isometric (MVI) testing identified the weaker inferior limb to electrostimulate. sEMG signals were acquired. We compared muscles power (RMS adjusted with RMS at MVI) and fatigue (median frequency rates), in electrostimulated limb (REx+FES) vs contralateral (REx).

Results
1. RMS were not significantly different for all muscle groups after REx + FES LT. In pre-FES phase, the weaker side develops higher RMS than the contralateral.
2. In post-FES vs pre-FES for BF (71.6±29.6 vs 66.5±28.7 Hz, p<.05) and TA (80.9±26.5 vs 67.9±30.9 Hz, p <.05) there is muscle fatigue, but not in RF and GM. For all muscles tested, with exception of BF, we verified post-FES a more reproducible muscles recruitment.

Conclusions
The combination of REx and FES ensures LT for longer time suggesting a reduction of physiological fatigue induced by FES in the knee and hip muscles, whose action is supported by robotic orthosis. We registered post-FES a more reproducible gait cycle.
Introduction: Muscle atrophy (MA) is the common complication after cervical spinal cord injury (SCI). MA is associated with the ability to walk and is recently reported that may cause heart diseases etc. In addition, several trials of new therapies for SCI already started to walk again. On the other hand, few studies reported about MA after cervical SCI. However, most of them were retrospective or cross-sectional studies. To evaluate the changes of the body composition longitudinally is important for understanding MA. The purpose of this study was to investigate the influence of cervical SCI on body composition within six months after SCI. Methods: 12 patients (ASIA A; 5, C; 3, D; 4) were recruited from February 2013 to February 2015. These patients were 8 males and 4 females with a mean age of 55 years (range: 18-70 years). Body composition was assessed using dual-energy X-ray absorptiometry at 1 and 6 months after injury. Results: There were decreases 9.0% in upper limb muscle mass, 12% in lower limb muscle mass, 10% in fat mass, 9.3% in body weight respectively between 1month and 6 months after injury. There were significant differences in upper limb muscle mass, lower limb muscle mass, fat mass and body weight between 1month and 6 month after injury (p<0.05). Conclusions: This study suggested that there was significant MA within 6 months after cervical SCI. These data is thought to be a very important basic data for comparison of effect to MA by the new therapies.
Rehabilitation robot for the paretic upper extremity of cervical myelopathy; a case report

*Dr Takashi Mizutani*, Dr Naohisa Miyakoshi, Dr Toshiki Matsunaga, Dr Kimio Saito, Dr Norimitsu Masutani, Dr Ryota Kimura, Dr Yosuke Iwamoto, Dr Jupei Iida, Dr Yasuhiro Takahashi, Mr Satoaki Chida, Mr Kazutoshi Hatakeyama, Mr Motoyuki Watanabe, Mr Yusuke Takahashi, Mr Junki Ishikawa, Mr Takehiro Iwami, Dr Yoichi Shimada

Department of Orthopedic Surgery, Akita University Graduate School of Medicine, Akita City, Japan, Department of Physical Medicine and Rehabilitation, Akita University Hospital, Akita City, Japan, Akita University Graduate School of Engineering Science, Akita City, Japan

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction/ Aims
Most of rehabilitation robots for paretic arm are expensive and unredeemable type. We developed a new rehabilitation robot that was able to exercise and measure function of paralysis arms on the desk easily. The aim of this report is to measure the kinematics of the myelopathy arms by the new rehabilitation robot.

Materials and Methods
A 24-year-old male with myelopathy arms due to neurofibromatosis was participated in this study. Robotic evaluation was performed on the day of post operation 3 weeks. We studied the tracks of this robot, and evaluated swing width, speed, and Jerk cost (X, Y). Jerk cost is an index of smoothness.

Results
Mean swing width (R, L) without force were 10.6mm and 7.4mm (p=0.08), with force were 19.8mm and 25.5mm (p=0.428). Jerk cost X (R, L) without force was 2.6 and 0.2 (p=0.289), with force was 7.9 and 9.3 (p=0.552). Jerk cost Y (R, L) without force was 5.5 and 8.6 (p=0.386), with force was 13.1 and 15.8 (p=0.488).

Discussion and Conclusions
Even though the paralysis was worse in the right side, evaluation values that we measured by the robot showed no significant differences between right and left side. The participated volunteer’s dominant side was right, that may be the reason of statistical results. The new rehabilitation robot was useful to evaluate the function of upper extremity. Further study is needed to clear the accuracy of evaluation and robotic therapeutic effects.
Results after six months of therapy using new robotic devices after spinal cord injury: a case study

Mrs Joanna Roziak\textsuperscript{1}, Mrs Joanna Ogonowska\textsuperscript{1}, Mr Krzysztof Cygoń\textsuperscript{1}

\textsuperscript{1}Rehabilitation Center, Gliwice, Poland, Gliwice, Poland, \textsuperscript{2}Rehabilitation Center, Gliwice, Poland, Gliwice, Poland, \textsuperscript{3}Rehabilitation Center, Gliwice, Poland, Gliwice, Poland

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction
Spinal cord injuries (SCI) cause permanent changes in human body: paralysis of the upper limbs, loss of muscle mass and severe atrophy of the muscles of the lower limbs. Treatment of spinal cord injury is still one of the greatest challenges of modern medicine.

Description of this study shows how the six-monthly individual therapy with the additional use of modern equipment in the rehabilitation process, such as the exoskeleton EKSO GT, G-EO System, treadmill baroresistive Zebris and Stimulette den 2x, affected the functional state of the patient.

Material and methods
The study involved a patient, aged 30. Damage to the spinal cord as a result of a traffic accident (2006), at the level of L5. From the moment of the accident the patient has been rehabilitated for 8 years in the other rehabilitation centers but with no significant results.

Start of complex rehabilitation in July 2014. In addition to daily individual therapy using mainly PNF techniques added treatment on the latest systems: G-EO System (3x / week), reeducation walk with the exoskeleton EKSO GT (2x / week) and workout on the treadmill baroresistive Zebris. After 2 months of therapy included electrical stimulation of denervated muscles - 6 times a week, 15 minutes each muscle groups.

Results
After 6 months of therapy there was a significant improvement in the functional status of the patient as learning to walk independently with the help of elbow crutches and orthopedic equipment in the form of orthopedic scales. With the structural changes we can distinguish a reduction in contracture of muscles and improve muscle strength: muscle tensor fasciae latae, muscle sartorius, iliopsoas, gluteus maximus, gluteus medium, quadriceps (the Lovett scale from 2 to 4). In the imagine examination there is a visible increase in muscle tissue within the muscles of the lower limbs. Changes in these parameters influenced the possibility of a more controlled and longer stay in upright position.

Conclusions
Rehabilitation with the use of modern technical device can be an excellent supplement to conventional therapy and significantly contribute to the improvement of its efficiency by achieving results in less time.
Safety and Efficacy of High-Dosage Use of Exoskeleton in Home Environment for Chronic SCI: A Pilot Study

Dr Katherine Strausser
Ekso Bionics, Richmond, United States

Three medically cleared subjects with paralysis used Ekso, a bionic exoskeleton, to walk 4-6 days/week with a companion spotter for at least a one year period. A companion spotter is trained to an approved competency level to assist the subject once the subject reached a specified skill level. Subject & spotter safety, use statistics, health, and emotional well-being were monitored to determine the effects of consistent Ekso usage for patients with chronic spinal cord injury.

All subjects benefited from use of Ekso. The SCIM scores of 2 subjects improved primarily due to an improvement in bowel & bladder control. One subject showed an increased quality of life in all three categories of the AIS QOL and decreased fecal incontinence. Another subject, with an incomplete SCI, saw dramatic reduction in chronic pain allowing him to eliminate pain medication, as well as improvement in muscle strength and decreased time for defecation. The third subject showed statistically significant gains in bone density. The three subjects were all able to use the exoskeleton safely in their home environment.

The only adverse event reported was aggravation of pre-existing carpal tunnel syndrome that was exacerbated by using crutches.

This pilot study shows that consistent use of Ekso may help facilitate improved health and quality of life for many patients with spinal cord injury. The decreased need for medication, decreased pain, and improved bowel and bladder health contribute greatly to the overall health and quality of life for these individuals and shows promise in a larger cohort.
Adherence to ‘Pressure relief’ regimen for pressure ulcer (PrU) prevention in spinal cord injury (SCI)

Dr Liang Qin Liu¹, Dr Sarah Chapman², Mrs Rachel Deegan³, Professor Helen Allan¹, Professor Michael Traynor¹, Dr Angela Gall³

¹Middlesex University, London, United Kingdom, ²University College London, London, United Kingdom, ³Royal National Orthopaedic Hospital, London, United Kingdom

Objectives: 1) To explore whether people with SCI follow advice on ‘pressure-relief’; 2) to evaluate views on performing ‘pressure-relief’ for PrU prevention and identify barriers to following pressure-relief advice in SCI.

Method: Mixed methods pilot study. Wheelchair-users with SCI were recruited. A questionnaire was used to assess concordance to pressure-relief advice, perceived necessity, concerns and barriers to performing pressure-relief and perceptions of PrU. To explore patients’ views in-depth, semi-structured telephone interviews were carried out.

Results: 31 SCI aged 44.7yr±14.4 were surveyed. Average duration of injury was 16.7years±16.2, 58% experienced a PrU, 94% PrU were gluteal/sacral. Although most respondents (84%) performed pressure-relief daily, only 22% performed the amount recommended. Poor concordance to advice is illustrated by adherence score, 25±4.6 (maximum 35). Perceived Necessity score was low (1.7±0.6); Concerns about pressure-relief were high (4.1±0.8) indicating patients typically had concerns about potential negative events of pressure-relief. Practical barriers were also frequently reported (score was 3.5±0.7). Despite this, PrU were viewed as serious threatening as shown by the brief IPQ score of 64±9.3 (maximum 80). Five individuals participated in interviews. Analysis identified 4 themes: lack of knowledge and support, unawareness of impact of PrU soon after SCI, perceptions that pressure-relief is unnecessary, and practical barriers in tetraplegia.

Conclusion: We found poor concordance with pressure-relief advice in SCI. Lack of knowledge, doubts in the necessity of pressure-relief, concerns about the negative effects and practical barriers of performing pressure-relief could contribute. Future early education and tailored interventions are warranted for PrU prevention in this population.
Improving pressure ulcer risk assessment during inpatient spinal cord injury rehabilitation

Mr Jude Delparte¹, Mrs Heather Flett¹,², Ms Carol Scovil¹,³, Dr Anthony Burns¹,⁴

¹Brain and Spinal Cord Rehabilitation Program, University Health Network - Toronto Rehabilitation Institute, Toronto, Canada, ²Department of Physical Therapy, University of Toronto, Toronto, Canada, ³Department of Occupational Science and Occupational Therapy, University of Toronto, Toronto, Canada, ⁴Division of Physiatry, Department of Medicine, University of Toronto, Toronto, Canada

INTRODUCTION: Pressure ulcer (PU) risk assessment helps identify individuals who require additional preventative strategies. To reduce burden, assessment tools should minimize false negatives (individuals considered low risk who develop a PU) yet maintain a clinically relevant number of at-risk cases.

METHODS: PU risk models were developed using recursive partitioning (RP) and logistic regression. Modeling employed a retrospective cohort of individuals participating in inpatient spinal cord injury (SCI) rehabilitation (n=615). Variables included demographics, injury information, and Functional Independence Measure (FIM) items. Both models were validated using a separate retrospective validation cohort (n=192). The two models were compared to existing measures for PU risk assessment - Braden scale (n=100) and SCI Pressure Ulcer Scale (SCIPUS, n=603).

RESULTS: RP included current/history of PU, ambulation, FIM Toileting, and FIM Bed to Wheelchair Transfers. Logistic regression incorporated motor completeness (AIS A/B), FIM Toileting, FIM Bed to Wheelchair Transfers, and FIM Comprehension. Initial sensitivities (RP=0.98, logistic=0.97) and negative predictive values (RP=0.99, logistic=0.98) were excellent. Specificities (RP=0.53, logistic=0.50), positive predictive values (RP=0.39, logistic=0.38), and c-statistics (RP=0.78, logistic=0.73) were acceptable. For the validation cohort, models had similar sensitivities (RP=0.93, logistic=0.93) and specificities (RP=0.63, logistic=0.61). Both models outperformed the Braden and SCIPUS since fewer people were designated at risk while minimizing false negatives.

CONCLUSION: RP and logistic regression outperformed existing scales for PU risk assessment. RP employed only four variables, resulting in a risk assessment model that could be easily implemented in clinical settings. Models will benefit from further validation, both prospective and in other centres (generalizability).
Co-design and implementation of a decision-support tool to improve assessment and management of pressure injuries in people with SCI

Professor James Middleton1,2,3, Lyndall Katte1,2,4, Dr Janet Long5, Dr Peter Bragge6, Professor Dalton Wolfe7, Elizabeth Dallaway1, Louise Kelly8, Frances Monypenny3

1John Walsh Centre for Rehabilitation Research, Kolling Institute, Sydney, Australia, 2Sydney Medical School Northern, The University of Sydney, Sydney, Australia, 3State Spinal Cord Injury Service, NSW Agency for Clinical Innovation, Sydney, Australia, 4NSW Spinal Outreach Service, Royal Rehab, Sydney, Australia, 5Centre for Healthcare Resilience and Implementation Science, Macquarie University, Sydney, Australia, 6Behaviour Works Australia, Monash Sustainability Institute, Monash University, Melbourne, Australia, 7Knowledge Mobilization Network, Parkwood Institute, London, Canada, 8Spinal Cord Injury Unit, Royal North Shore Hospital, Sydney, Australia

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction
Pressure injuries (ulcers) are common in people with spinal cord injury (SCI), causing significant morbidity and mortality. Providing timely and appropriate pressure injury (PI) care and support to a person with SCI in the community is challenging with multiple barriers to best-practice.

Methods
A theory-informed knowledge translation framework and co-design process was employed to develop tools supporting a flexible, comprehensive implementation strategy based on best-practice principles (BPPs) for PI assessment and management. Stakeholder focus groups/interviews (n=90); expert forum (n=19); process mapping of two regional centres (n=9,10) and one metropolitan community nursing service (n=7); and social network analysis (n=58) were conducted. Online decision aides were co-developed with a state-wide multidisciplinary group of ‘clinical champions’ (n=40) based on latest research and guidelines.

Results
Current practice varied according to service setting, resource capacity and individual health professional knowledge and skill. BPPs were defined and translated into context-specific standards of care, with implementation drivers explored in detail. Two interactive online decision-support tools were developed for use in primary care and community practice to improve access to SCI-specific information for clinicians at point of care; the SCI Pressure Injury Toolkit and the Hunter New England Health Pathways Pressure Injury in SCI resource. Early user acceptability testing and content evaluation of the tools reveals the importance of co-design and stakeholder engagement as a strategy to bridge the evidence-to-practice divide.

Conclusions
A Knowledge Translation Framework guides exploration of context and strategic development of targeted tools to support best-practice implementation across health and community care settings.
Effect of pressure ulcers on quality of life of people with spinal cord injury (SCI)

Dr Ioannis - Alexandros Tzanos¹, Dr Andreas Mavrogenis², Dr Evanthia Mitsiokapa², Dr Ioannis Kapralos¹, Dr Konstantina Gioti¹, Dr Nikolaos Groumas¹, Dr Panagiotis Papaggelopoulos²
¹National Rehabilitation Centre, Ilion, Greece, ²Attikon Hospital, Haidari, Greece

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: The patients with SCI very commonly suffer from pressure ulcers. The aim of this study was to determine how much pressure ulcers have a negative effect in the quality of life of these patients.

Methods: One hundred sixty four SCI individuals with a history of SCI of different causes were studied in this survey. They were residents of urban, suburban and rural areas of the Greek territory. Questionnaires were completed for each one in interview form and when needed, clinical examination was performed for data collection. The questionnaire included demographic and clinical characteristics. World Health Organization Quality of Life Instrument (WHOQOL-BREF) was used for quality of life assessment. Statistical analysis of the findings was performed with t-test.

Results: The presence of pressure ulcers was found having statistically significant correlation with WHOQOL BREF-general health (p=0,032), with individuals without pressure ulcers having advantage. However pressure ulcers do not seem to have impact in the rest dimensions of quality of life (environment, social relations, physical health and psychology).

Conclusion: Spinal cord individuals with pressure ulcers exhibit lower levels of quality of life in the dimension of general health.
Healthcare professionals’ views on patient responsibility in the prevention of pressure ulcers

Ms Claudia Zanini1,2, Ms Nadia Lustenberger2, MBA, MPH Mirjam Brach2, MD, PhD Stefan Essig2,3, MD Hans-Georg Koch1, MD, PhD Anke Scheel-Sailer5, Prof. PhD Armin Gemperli1,2, Prof. MD Gerold Stucki1,2, Prof. PhD Sara Rubinelli1,2

1 Department of Health Sciences and Health Policy, University of Lucerne and Swiss Paraplegic Research, Lucerne/Nottwil, Switzerland, 2 Swiss Paraplegic Research, Nottwil, Switzerland, 3 Institute of Primary Care and Community Care, Lucerne, Switzerland, 4 Swiss Paraplegics Association, Nottwil, Switzerland, 5 Swiss Paraplegic Centre, Nottwil, Switzerland

Introduction:
A major target of education during first rehabilitation is to instruct individuals with spinal cord injury (SCI) on how to minimize the risk of preventable secondary conditions. By focusing on the context of pressure ulcers (PU), this presentation illustrates the perspective of healthcare professionals (HPs) on the tension between preventive measures and SCI individuals’ self-determination.

Methods:
25 semi-structured interviews with a focus on PU prevention and care were conducted with HPs working in specialized clinics, care facilities or homecare services, and then transcribed and analyzed using inductive thematic analysis.

Results:
HPs are aware of their limited influence on individuals’ preventive behaviors. As the analysis showed, prevention is carried out on a daily basis through a multitude of decisions and actions, and individuals sometimes prioritize other goals than health maintenance. On the one hand, HPs acknowledged individuals’ right to self-determination, on the other, they emphasized personal responsibility as its corresponding duty. Shifting the responsibility to individuals with SCI seemed to be a strategy to deal with frustration and a sense of helplessness in front of personal choices that do not adhere to health strategies.

Conclusion:
The results of this study are consistent with a trend in healthcare which fosters personal responsibility for health. But are all individuals with SCI prepared to take on this responsibility? The prevention of secondary conditions requires sufficient knowledge on preventive measures, ability to make decisions and to evaluate their impact. This points to the need of developing tools to support individuals in making informed decisions.
Incidence, Timing and Risk Factors Associated with Healing a Sitting-Acquired Pressure Ulcer: Preliminary Results from a 5-Year Cohort Study (AusCAN)

**Associate Professor Jillian Swaine**\(^1\), Mrs. Marianne Mullane\(^2\), Mr. Luke Brennan\(^2\), Associate Professor James Middleton\(^3\), Professor Michael Stacey\(^4\)

\(^1\)University Of Notre Dame Australia, Fremantle, Australia, \(^2\)University of Western Australia, Perth, Australia, \(^3\)University of Sydney, Sydney, Australia, \(^4\)McMaster University, Hamilton, Canada

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

INTRODUCTION: Sitting-acquired pressure ulcers (SAPUs) are a subset of pressure ulcers based on anatomical locations (pelvis, posterior femur). We present preliminary results of the incidence, timing and risk factors associated with healing a (SAPU) in community dwelling persons with SCI. METHODS: The study has 2 parts: Cohort Study Part A: one Australian site enrolled 21 participants and followed them for 3 years or until a SAPU developed and then enrolled in Pressure Ulcer Follow-up Study Part B. Open SAPUs were confirmed using NPUAP guidelines and measured using the PUSH Tool. Participants with SAPUs were followed weekly with telephone surveillance until confirmed closed/resolved SAPU visit. Health economics from societal perspective were used to collect treatments and costs. RESULTS: Part A: 21 participants had a mean age of 47 ±16 years (4 began walking, 7 developed SAPU and 10 remain active), 5 tetraplegics/6 paraplegics. Incidence of a SAPU was 33%. Of the 7 participants, all had open SAPUs sized 0.2 – 7.4 cm\(^2\) (mean 3.9±3.7 cm\(^2\)). Anatomical locations were coccyx/sacrum, ischial tuberosity, buttocks adjacent to natal cleft. Days to SAPU was 84-797 (441±230 days). Part B: Days to healing was 66-352 (mean 228±122 days) and wound dressings ceased at 4-171 days (mean 102±87). Three received a wheelchair cushion review and 1 received an OT home visit and none received a seating assessment. CONCLUSIONS: Participants received wound treatment and limited support but were left to manage their SAPUs after treatment stopped halfway through the healing trajectory with prolonged healing times for all sizes of SAPUs.
Optimising the management of spasticity in people with spinal cord damage: a clinical pathway for assessment and treatment.

**Dr Gerald Bilsky**¹, Dr. Jesús Benito-Penalva², Dr. Djamel Bensmail³, Dr. Indira Lanig⁴, Dr. Peter New⁵, Dr. Michael Yochelson⁶

¹Shepherd Center, Atlanta, United States, ²Institut Guttmann, Barcelona, Spain, ³University of Versailles Saint Quentin, Garches, France, ⁴Northern Colorado Rehabilitation Hospital, Johnstown, USA, ⁵Southern Medical School, Monash University, Victoria, Australia, ⁶MedStar National Rehabilitation Network, Washington, USA

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: Recognition, evaluation, and management of problematic spasticity in persons with spinal cord damage (SCD) is often suboptimal. This is due in part to the relative absence of clinical guidelines and concise algorithms to support decision-making within the broader clinical community. Many people with SCD are cared for in non-specialist settings, and may not have access to best practice in spasticity management.

Methods: An international panel of clinical experts, the Ability Network, was initiated to develop management algorithms to guide and standardize the assessment, treatment and evaluation of outcomes of persons with SCD and disabling spasticity. A clinical pathway is being developed using a consensus-based process supported by literature reviews.

Results: Work to date on the creation of a clinical pathway and recommendations for appropriate clinical assessment measures will be presented. The pathway is intended for use by all healthcare professionals involved in the care of people with SCD. It will include guidance on when to refer patients for assessment of their suitability for specialist spasticity treatment. Barriers to implementation of best practice in spasticity management will be discussed.

Conclusion: There is an urgent need for decision-making tools to guide the management of problematic spasticity. We present progress towards a clinical pathway and a menu of appropriate assessment measures, and issue a call to action to the clinical community to identify and overcome organizational and healthcare system-based barriers to optimal spasticity care.
Point Prevalence of pressure ulcer among admitted patients in a tertiary spinal cord injury care hospital

Mrs Ipsita Shee
Indian Spinal Injuries Centre, New Delhi, India

Introduction
Pressure ulcer (PU) is a most serious health issue for patients with spinal cord injury. As per NPUAP of US, incidence of bedsore varies from 0.4% to 38% in hospitals.
The study objectives are-
- to estimate the point prevalence of PU in a tertiary care hospital.
- to assess the functional dependence in activity of daily life (ADL) amongst the admitted patients with PU in a tertiary care hospital.

Methods
A cross sectional survey was conducted using a structured questionnaire on 29th March, 2016. One hundred and forty five patients were studied from spine, orthopedic, and other units. Katz Index of Independence in ADL was used to evaluate the functional dependence of patients in their ADL. Braden scale was used to assess the risk factors for developing PU.

Result
Sixteen percent (23) patients were found to have PU in different areas with different stages. Most patients (87%) were brought with PU from outside. Katz Index of Independence in ADLs score was 0.91 with range of 0 - 6. Mean Braden Scale score was 13.17, range from 8 - 17. Sacrum (87%) was the commonest site of PU development. Most patients (78%) require assistance to change position.2 hourly position change was done for all patients (100%). Alternating air mattress was used for all patients with PU (100%). Dressing was done commonly with Betadine (95%), others are Hydrogen peroxide, Autolysing Cream, Oxum Spay, NS.

Conclusion
Sixteen percent prevalence of PU indicates the need for improving quality care in the hospital.
Pressure Ulcer stratification and management at Yorkshire Regional Spinal Injuries Centre (YRSIC)

Dr Siddeshwar Patil¹,², Mr Wajid Raza¹, Mr Firas Jamil¹

¹Yorkshire Regional Spinal Injuries Centre, Wakefield, United Kingdom, ²University of Leeds, Leeds, United Kingdom

INTRODUCTION:
Pressure ulcers (PU) represent a very significant cost burden, health implications in the UK and globally. PU resulted in 43,000 deaths as per global burden of disease study-2010. Spinal Cord Injured (SCI) are at risk of PU. National Model Systems SCI database reported Incidence of 7.9% and 8.9% in the first & second year respectively after SCI.

Our aim was to study prevalence & characteristics of PU. Objective was to identify strategies to prevent developing PU.

MATERIALS & METHODS:
Retrospective cohort study of patients admitted to YRSIC (July 2012 and July 2013). Data collected from Medical notes and clinical photography. Deceased and patients with no information excluded.

RESULTS:
Twenty patients identified; 5 acute and 15 chronic SCI with mean duration 4 weeks and 32 years respectively; five excluded (4-deceased/1-lack of information).

Prevalence of 10 %( N=200). 90% males, 53 %(n=8) traumatic SCI, 60%(n=9) were thoracic and 67%(n=10) were AIS A.

Of the 10(67%) developing in the community, 3 had multiple pressure sores. Sacral was the most common site (40%, n=6) followed by Ischial (33%, n=5). Nearly 47% (n=7) were Category III.

Sacral PU in all acute; Ischial in majority of community acquired.

Most were poly-microbial; enterococcus and staphylococcus most common organisms.

Eight patients managed with debridement and dressings, 7 required flaps only or flap and negative pressure therapy.

CONCLUSION:
Despite best efforts prevalence still high at 10%. Patient education needs further strengthening. Early transfer of acute SCI patients, acute care and Regional Spinal Injuries centre networking can be beneficial.
Result of outpatient rehabilitation program for self care, pressure ulcer prevention, quality of life of spinal cord lesion patients.

Mrs Siriwan Surapitoon Ngaosinchai

Srinagarind Hospital, Khonkaen University, Thailand, Khonkaen, Thailand

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

The patients with spinal cord lesions who defective ambulation, self care impairment and incontinence were at risk to complications such as pressure ulcer, quality of life decreases. Moreover, limitation right to medical care, patient was not well prepared and the bed in patient is not enough. Rehabilitation program which consists of educating and demonstration of home-care rehabilitation were constructed by rehabilitation medicine multidisciplinary team. This operation research aimed to study the result of outpatient rehabilitation program for self care, pressure ulcer prevention and quality of life of spinal cord lesion patients.

15 new cases were prospectively enrolled in this program. The pressure ulcers and self-care score were documented pre and post program. The quality of life patients was assessed using the Quality of Life of the World Health Organization in Thai version. Data were tested descriptive statistics percent and Wilcoxon Signed Rank test by using SPSS software.

The results showed that 33.33 percent of patients with pressure ulcers, after rehabilitation program pressure ulcers healing were 100.00 percent and pressure ulcers were not increase. Improved self-care of patients were 70.53 percent and improved quality of life of patients were 73.40 percent, respectively (P<0.001). However, admission and full continuous program of patients by rehabilitation medicine multidisciplinary team is needs.
Risk factors for Pressure Ulcer in Spinal Cord Injury Rehabilitation

**Dr Jonathan Rios**, Dr Daniel Pinha Cardoso, Dr Gonçalo Pires, Dr.ª Anabela Ferreira, Dr.ª Maria Martin, Dr.ª Filipa Faria

1 Centro Hospitalar Do Algarve, Faro, Portugal, 2 Centro de Medicina de Reabilitação de Alcoitão, Lisboa, Portugal

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction:
Pressure ulcers (PU) are the second most common comorbid condition in patients with spinal cord injury (SCI) with 85% of them developed at least once during their lifetime. Few studies have been made for understanding the risk associated with pressure ulcers, although knowledge remains very incomplete. The aim of the study was the assessment of the incidence and risk factors for pressure ulcers development during rehabilitation.

Material and Methods:
Retrospective, observational and descriptive study conducted at rehabilitation hospital specialized SCI center. Study included all patients (N = 187) with SCI admitted as inpatient rehabilitation during year 2014. Statistical Analysis was made with Statistical Package for Social Sciences, version 20.

Results:
Total of 21.96% of patients developed a PU during the rehabilitation inpatient and a total of 61 PU were observed. In these group, there were an higher mean of inpatient days – 91.27 (±37.40) days, p<0,001, a lower mean of admission FIM – 66.27 (±21.19), p<0,001 – and Braden Scale – 14.85 (±21.19), p<0,001. 58.50% of patients were tetraplegic (p=0,011) and 46.30% were AIS A (p=0,003). A PU at admission was 19.50% (p=0.05) and an history of PU was 53.70% (p<0,001).

Conclusion:
PU is a frequent complication of SCI with long term hospital stay and higher costs as consequence. The risk of PU development in rehabilitation center can be associated with lower admission FIM, high and complete SCI lesion and patient with history or admission PU. It’s important a development PU risk algorithm at admission for SCI patients.
Should aspirate from ITB pump sent for culture and sensitivity? An evaluation of clinical practice with in UK and Ireland

Dr Ajay BOPPANA 1, Dr Graham 1 harvey, Mr joy roy chowdhury 1, Mr Aheed Osman 1, Mr Naveen Kumar 1

1RJAH NHS FOUNDATION TRUST, Oswestry, United Kingdom

INTRODUCTION
ITB is an established method of treatment for moderate and severe spasticity in wide range of conditions, Infection remains a rare but important risk (2-5%) especially during refill of the pump.

Objective/quality issues
To look in to clinical relevance and cost effectiveness of the practice of sending the pump aspirate fluid (baclofen) routinely for culture and sensitivity after each refill.

Methodology
We carried out a telephonic survey of all spinal cord injuries rehabilitation centres with in UK and Ireland where ITB pump refill is carried out. we reviewed all microbiology results of aspirates (baclofen fluid) and patients records since April 2007. And finally we also carried out literature search, reviewed the National ITB document and manufacturers guidelines on this subject.

Results
12 spinal injuries were contacted
The practice of sending pump aspirates for culture sensitivity is practiced in 4 centres of the 12 spinal injuries centres.

Review of microbiology results from our own centre (n=575) revealed only one positive result. The patient had grown Pseudomonas from the aspirate sample which was secondary to scar infection of the abdominal pocket.
There is no evidence in medical literature to suggest that infections were detected early by such practice.

There is no guideline, recommendation or consensus.

Conclusion
Based on lack of evidence and lack of guidelines, there is no need to routinely send ITB pump aspirate fluid for culture and sensitivity after each refill.

Such a practice has no clinical relevance and neither it is cost effective.
We have changed practice at our centre
Early decompression following cervical spinal cord injury: Examining the process of care from accident to surgery in Australia and NZ

Dr Camila Battistuzzo¹, Dr Alex Armstrong², Dr Jillian Clark³, Ms Peta Skeers¹, Prof Brian Freeman³, Prof Sarah Dunlop², Dr Peter Batchelor¹

¹The University Of Melbourne, Department of Medicine (Royal Melbourne Hospital), Melbourne, Australia, ²The University of Western Australia, School of Animal Biology, Perth, Australia, ³Royal Adelaide Hospital, Spinal Injuries Unit, Adelaide, Australia

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction: Early decompression may improve neurological outcome after spinal cord injury (SCI), but is often difficult to achieve because of logistical issues. The aims of this study were to determine (1) the time to decompression in cases of isolated cervical SCI in Australia and New Zealand and (2) where substantial delays occur between accident scene to surgery.

Methods: Data were extracted from medical records of 192 patients aged 15-70 years with C3-T1 traumatic SCI (AIS A-C) between 2010-2013. Data are presented as median (IQR).

Results: The median time from accident to decompression was 21h, with the fastest times associated with closed reduction (6h). A significant decrease in the time to decompression occurred from 2010 (31h) to 2013 (19h, p = 0.008). Patients undergoing direct surgical hospital admission had a significantly lower time to decompression compared to patients undergoing pre-surgical hospital (12h vs. 26h, p < 0.0001). Medical stabilisation and radiological investigation appeared not to influence the timing of surgery. The time taken to organise theatre following surgical hospital admission was a further factor delaying decompression (12.5h). There was a relationship between the timing of decompression and the proportion of patients demonstrating substantial recovery (2-3 AIS grades).

Conclusion: The time of cervical spine decompression markedly improved over the study period. Neurological recovery appeared to be promoted by rapid decompression. Direct surgical hospital admission, rapid organisation of theatre and where possible use of closed reduction, are likely to be effective strategies to reduce the time to decompression.
Long-term intrathecal baclofen therapy for severe spasticity of spinal origin

MD Osamu Kawano¹, MD Takayoshi Ueta¹, MD Takeshi Maeda¹, MD Keiichiro Shiba¹
²Spinal Injuries Center, Iizuka Fukuoka, Japan

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

[Objective] To analyze the long-term effectiveness and incidence of complications of intrathecal baclofen (ITB) therapy from implantation to follow-up at a single institute, and to report the management of tolerance in patients with ITB therapy.

[Methods] The subjects were 35 cases that were followed up for 2 years or longer following implantation. The average follow-up period was 7 years (2 years to 14 years). Changes in the Ashworth score (before surgery and final follow-up) as well as changes in the dosage of baclofen were investigated to evaluate the effectiveness of ITB therapy. Moreover, complications and its management were also investigated.

[Results] The average Ashworth score decreased from 3.26 before surgery to 1.38 at the final follow-up (p < 0.01). Three cases (multiple sclerosis, myasthenia gravis, incomplete spinal cord injury) were difficult to continue ITB therapy because of the progression of paralysis. Two patients developed tolerance, defined as a dose increase of > 100 microg per year. Pulsatile bolus infusion was effective in controlling spasticity of these cases. Catheter problems were observed in 3 patients: breakage in 2, migration in 1. Pump trouble was observed in 1 patient: malfunction in 1. Surgical-site infection was observed in 1 case.

[Conclusions] Severe spasticity, which have been difficult to control, were well-controlled over a long-term by ITB therapy. The incidence of complications was very low compared to other reports and severe adverse events did not occur due to prompt and adequate operation. Pulsatile bolus infusion was effective in the patients with tolerance.
Neuromodulation using custom self sizing cuff electrodes wrapped around S3 root. Report of a technique and seven years experience.

Dr Maria Paola Bertapelle1, Dr Mario Vottero1

1Neurourology Department, Spinal Cord Injuries Center, Torino, Italy

Introduction: In 2006 we approached Medtronic InterStim (HQ, Switzerland) group with the request to develop a root cuff lead for sacral root stimulation in patients who failed standard InterStim® (Sacral Neuromodulation, SNM) approach. In March 2008 the Model 09048, tri-polar nerve cuff lead for sacral root stimulation was available. In 7 years we performed implant of cuff lead SNM in 30 patients. In 2015 Medtronic decided to stop the custom production and the procedure is no more available for new patients. We report the results of seven years implants. Methods: we started performing cuff lead implants in failures of standard Interstim procedures as well as in neurogenic overactive bladder due to complete spinal cord lesion. From Apr 2008 to Sept 2014 we performed sacral root cuff lead implant in 30 patients 5 of whom with neurogenic overactive bladder in complete paraplegia. Results: In 8 out of the 20 retention cases complete voiding occurred; 5 patients passed from four to one to two catheterization a day. All of the 5 patients in the incontinence group received permanent implant. In the group of paraplegic patients with NOAB, functional bladder capacity shifted from 110±20 ml to 180±25 ml, with scarce increase in QOL and removal of the devices. None of the complete paraplegic patients experienced lead displacement. Conclusions: cuff lead implant was successful in 18 out of 30 previously unsuccessful SNM. Lack of satisfactory results in paraplegic patients might be due to the already established plasticity phenomenon that could be avoided by early root implant.
Comparison Of Postoperative Outcomes Of Different Surgical Techniques In Patients With Chiari Malformation Type I

MD Hüseyin Güler¹, Prof,MD Zihni Şans³¹, Prof,MD Murat Hancı¹

¹İstanbul University Cerrahpaşa Medical Faculty, Department of Neurosurgery, Istanbul, Turkey

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Posterior fossa decompression (PFD) is an effective surgical procedure on patients with Chiari type I malformation (CIM).

Method:57 CIM cases have been prospectively examined (45 female, 12 male; 29 with and 28 without syringomyelia). We performed bony decompression alone on 11 patients (Group I), bony decompression with arachnoid-preserving duraplasty on 25 patients (Group II) and bony decompression with arachnoid dissections and duraplasty on 21 patients (Group III).

Results:The average follow-up time was 776 (±272) days. The average cerebellar tonsillar herniation from basion-opisthion line was 8.9 (±4) mm. Improvements in all life-quality outcome measurements were significant in all groups, however without statistical differences between groups. Group I, II and III have a median of 3, 4 and 5 days of postoperative hospitalization duration, respectively. Postoperative complication rates were 0%, 4% and 28%. The need for reoperation were 1/11, 0 and 0. The ratio of patients whose cerebrospinal fluid flow increased was 37%, 70% and 47%. Reductions in syringomyelia were observed 20%, 88% and 93% respectively among groups. Electrophysiological tests didn’t change.

Conclusion: Bony decompression alone seemed superior to other techniques in means of hospitalization duration and complications, but considering reoperation need, it loses its superiority to arachnoid-preserving duraplasty. Due to high CSF-related complications and the possible aggravation of arachnoid scarring, arachnoid dissections should be restricted to certain patients. Considering all outcome criteria, arachnoid-preserving duraplasty should be the choice of surgical technique.
Favorable outcome following neurosurgery in patients presenting with neurological deterioration due to spinal cord tethering and/or cyst formation

**MD Ulrika Holmström**¹, MD, PhD Parmenion P. Tsitsopoulos¹², MD, PhD Konstantin Salci¹, Dr, Ass Prof Anders Holtz¹, MD, Professor Niklas Marklund¹

¹Department of Neuroscience; Neurosurgery, Uppsala University, Uppsala, Sweden, ²Hippokratio General Hospital, Aristotle University, Thessaloniki, Greece

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

**Introduction**

Progressive neurological deterioration observed later in patients with spinal cord injury (SCI) may be due to spinal cord tethering and/or cyst formation. Surgical treatment involves untethering of the cord, occasionally cyst drainage and insertion of a syringosubarachnoidal shunt aiming at preventing further deterioration. Surgical outcome was prospectively evaluated in a mixed cohort of SCI patients.

**Methods**

Seventeen patients with neurological deterioration (motor, sensory, spasticity and/or pain symptoms) and radiological findings consistent with spinal cord tethering and/or cyst formation were included. Preoperative EQ-5D, mJOA questionnaire and neurological assessment were applied while postoperatively, clinical follow-up by the neurosurgeon and phone interviews for EQ5D and mJOA at three months were used as outcome measures.

**Results**

Nine patients had previous trauma, four spontaneous hemorrhage, three congenital malformation and one was operated for a spinal cord tumor. Eight had cervical SCI, four of which were AIS A. Of the thoracic (n=7) and lumbar (n=2) SCIs, all were AIS C and D. At follow-up, neurological deterioration had been halted in 94.1% patients, with 88.2% reporting improved quality of life. The median mJOA scores remained unchanged in four of five domains and increased for life satisfaction. One postoperative infection required revision surgery. The variables NRS-arm, NRS-toe and EQ-5D VAS were all significantly improved after surgery (p<0.05).

**Conclusion**

Neurosurgery was safe and halted further deterioration in our mixed cohort of SCI patients. Three months following surgery, quality of life also improved in most cases. The current results are encouraging, although longer follow-up time points may be required.
Operating room autonomic measures as predictors of neurological changes after spinal cord injury

PhD Jenny Haefeli\textsuperscript{1,2}, D Torres\textsuperscript{1}, PhD MS. Beattie\textsuperscript{1,2}, PhD JC. Bresnahan\textsuperscript{1,2}, CG. Suen\textsuperscript{1,2}, MD, PhD JF Talbott\textsuperscript{1,2}, MD, PhD GT. Manley\textsuperscript{1,2}, MD WD. Whetstone\textsuperscript{1,2}, MD SS. Dhall\textsuperscript{1,2}, MD PhD JZ Pan\textsuperscript{1,2}, PhD AR. Ferguson\textsuperscript{1,2,3}  

\textsuperscript{1}Brain and Spinal Injury Center, Department of Neurological Surgery, University of California, San Francisco (BASIC-UCSF), SAN FRANCISCO, United States, \textsuperscript{2}Zuckerberg San Francisco General Hospital and Trauma Center (ZSFG), San Francisco, United States, \textsuperscript{3}San Francisco Veterans Affairs Medical Center, San Francisco, United States

Introduction: Spinal cord injury (SCI) impacts many physiological systems, resulting in broad deficits in motor, sensory and autonomic function. We used a multivariate workflow to test if aspects of operating room (OR) data following SCI predict the trajectory of neurological recovery, extending previous work done by the BASIC-UCSF team. Methods: OR records from N=95 SCI patients were collected retrospectively from ZSFG. OR data included: mean arterial pressure (MAP), heart rate (HR), anesthesia log, and neurophysiological monitoring. The OR paper charts were digitalized, curated, aligned to NIH/NINDS Common Data Elements (CDEs), and incorporated into an existing registry that includes demographics and outcome variables. We used heat-maps to visualize the MAP during surgery (Q5 minutes) and applied topological data analysis to the Q5 minutes intraoperative data to identify patient subpopulations in a data-driven way. Results: Subjects had an average age of 49+/20years and a surgery length of 393+/170minutes. The heat-map of intraoperative MAP, showed many episodes of hypotension, categorized as falling below the standard MAP goal of 85mmHg. Episodes of hypertension were also present in many cases, highlighting the difficulty in meeting MAP goals even in the highly controlled OR environment. Preliminary topological data analysis revealed that patients with low MAP (<85mmHg) split into two subgroups based on HR. Patients with higher HR showed greater neurological recovery based on AIS in comparison to the patients that had lower HR during hypotensive episodes. Conclusions: The data-driven results suggest possible relationships between perioperative autonomic physiology and neurological recovery trajectories after SCI.
Patients’ perceived outcomes in tetraplegia reconstructive hand surgery – a 12 years perspective

OT/ PhD Johanna Wangdell¹, RPT, PhD Lina Bunketorp², MD, PhD Jan Fridén³

¹Centre of Advanced Reconstruction of Extremities, C.A.R.E., Göteborg, Sweden

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

Introduction
Reconstructive hand surgery in tetraplegia has been performed since 1970s. The aim is to improve grip ability and increase activity performance and independence. This presentation reports a 12-year clinical evaluation of patients’ perspective of activity change after grip reconstructive surgery in tetraplegia.

Methods
Prior to surgery all patient were interviewed according to Canadian Occupational Performance Measure (COPM) in order to define their individual prioritised activity limitations they wished to improve by the grip reconstruction. The activities were rated with current level of performance and satisfaction, respectively, on a scale 1-10. At 12 months post-operatively, the ratings for each activity were repeated. All patients with 12 months follow-ups between 2003-2014 were included (N=90). In-depth interviews were performed between 2011-2012 (N=11) with focus on patients’ experiences of gains one year postoperatively.

Results
The mean improvements in activity performance were 3.5 scale steps and 3.8 for satisfaction (N=426). Improvements were reported in all type of goals, from self-care to leisure. The qualitative study concludes that patients experience practical improvements as well as several psychological gains, such as regained identities and increased manageability.

Conclusion
Our results clearly indicate that patients’ expectations of improvements in daily life after grip reconstruction are to a great extent fulfilled. Improved grip ability has the potential to have impact not only on practical aspects but also on several psychological aspects of daily life. The results are used to give presumptive patients more detailed and reliable information about expected outcome after surgery.
Introduction: ISCoS decided to collect data on SCI which could help in developing preventive programs in regions where there is no or scanty data, with a pilot in emerging ASCoN countries.

Objectives: The objectives of the project are to evaluate database variables, processes involved and web platform for appropriateness for a subsequent larger database.

Method: Nine centres varying from acute hospitals to specialized spinal injury centres collected the data. Data elements included the International SCI Core Data Set and the Minimal Safety Data Set. The quality check for IDAPP web platform was performed by initial five entries from different participating centres.

Results: In the first six months of study 426 patients have been enrolled from 6 centres, of which 341 are male. Falls (n=214) was the most common cause of SCI in comparison to transport related injury (n=171). 57% of all SCI have complete injuries. Fall from more than 1 meter (69%) is the most common cause of injury due to falls. Majority of the patients sustained spinal cord injury at home, i.e. 58% (n=115). The appropriateness of study and quality and ease of use of web platform has been confirmed by the current investigators through a questionnaire. Availability of man power and financial reasons is listed as major hindrance by some investigators.

Conclusions: The appropriateness of data variables, processes and web platform of IDAPP for a subsequent larger global database has been confirmed. Demographics of SCI for the region differ in some aspects from that of developed countries.
SCIOT, Spinal Cord Injury Occupational therapists, annual network meeting

OT, PhD Johanna Wangdell¹, OT, Ms Elma Burger²

¹Centre of Advanced Reconstruction of Extremities, C.A.R.E., Göteborg, Sweden, ²Gauging Health department, Johannesburg, South Africa

Poster Viewing with refreshments. 3, Exhibition/Poster/Catering Area, September 16, 2016, 9:50 AM - 10:50 AM

The aim of the Workshop is to strengthen the Occupational therapists network within ISCoS. Occupational therapists in general has major difficulties to get funding to attend ISCoS meetings. It is therefore important to build web based networks within ISCoS to share knowledge, discuss problems and develop the occupational therapist areas in SCI rehabilitation.

The workshop will include:
- Networking
- Discussion on how to use our existing Facebook group and web page (OTSCI.org).
- Investigate the interest to make a MOOC for OT:s and identify possible persons to work further on the project.
- Organisation within SCIOT.
Review of the knowledge of autonomic dysreflexia amongst patients and healthcare providers

Dr Francois Theron¹, Dr A. H Van Niekerk¹, Prof J.G Myburgh¹

¹Consultant Orthopedic Surgeon, Department of Orthopedic Surgery, Pretoria, South Africa

Topical Papers 9, Festsaal (Plenary), September 16, 2016, 10:55 AM - 12:25 PM

Purpose of the study:
Awareness of the triggers of AD is the key to prevention. The aim of the study was to assess the current knowledge of AD among participants.

Methods:
Descriptive, cross-sectional study. A web-based questionnaire was distributed to members of QuadPara Association of South Africa (QASA), casualty and rehabilitation centre doctors, registrars, specialists of various disciplines and nurses.

Results:
From a sample size of 95 SCI individuals, 78% have spinal cord injuries at or above T6. 40% of patients had no prior knowledge of AD. Nasal congestion (42%), change heart rate (40%) and extremes of temperature were the most common symptoms frequently experienced in the high SCI group. Blocked catheter (52%), UTI (46%) and bowel impaction (39%) were the most common associated triggers. The diagnosis of AD was made in 46% of cases.

A total of 106 medical personnel completed the survey, of which 22% had no prior knowledge of AD. High blood pressure (27%), flushing skin (22%) and pounding headache (22%) were the symptoms most often seen associated with an AD episode. Causes associated most frequently with AD are blocked catheter (23%), UTI (22%) and bowel impaction (16%). 75% of medical professionals follow no protocol in the management of AD.

Conclusion:
The incidence of AD amongst our participants is higher than expected. The current level of awareness of AD among the SCI population is inadequate, despite current awareness campaigns. Most doctors have no clear guidelines in the management of AD, despite frequently encountering the condition.
Outcomes of Ventilated Patients admitted for Specialised Rehabilitation Following Spinal Cord Injury (SCI) during a 3 year period

Miss Jan Lee¹, Dr Alice L Baldwin¹, Mrs Jacqueline Ross¹, Dr Andrew Beechey¹

¹Princess Royal Spinal Injuries Unit, Sheffield, Uk, Sheffield, United Kingdom

Introduction:
Princess Royal Spinal Injuries Unit (PRSIU) in Sheffield, UK is the second largest spinal cord injury centre in the UK with six in-patient ventilated beds. This study has been undertaken to evaluate the outcome of ventilated patients admitted to PRSIU as this has not previously been done.

Method:
All ventilated patients admitted to PRSIU from 2012 to 2015 were included (N=42). Retrospective data analysis of medical records obtained following data:
- Patient demographics
- Details of SCI
- Co-morbidities and resuscitation status
- Admission details
- Ventilation status on discharge
- Readmission details
- Mortality rate

Results:
Most patients were male (n=26). Trauma was the commonest cause of SCI (n=34) - 23 were due to falls. Median age at presentation was 58.5 years and the average number of co-morbidities was 3.39. Most patients had C1-C4 injuries (n =31) - 30 had a complete injury. 20 patients required ventilation on discharge. The mortality rate was 34.8% (n=15) mainly due to respiratory compromise. 25% of those who died had do not attempt resuscitation orders in place. Median time from SCI to death was 1.94 years (interquartile range 0.95 -4 years). Readmission rates for all patients was 45.2% (n=19) –mostly due to chest infections and urosepsis.

Conclusion:
These outcomes will be useful for discussing prognosis of patients admitted to major trauma units following SCI and could influence decisions regarding tracheostomies, long term ventilation and resuscitation status. Further studies to obtain substantial quality of life data will be useful to facilitate these discussions.
Challenges After Discharge For People With Spinal Cord Injury In Bangladesh: A Cohort Study

Professor Sohrab Hossain¹,2, Mr Akhlas Rahman¹, Mr M Quadir¹, Dr Jocelyn Bowden³, Professor Robert Herbert⁴, Professor Lisa Harvey³

¹Centre For The Rehabilitation Of The Paralysed, Savar, Bangladesh, ²Bangladesh Health Professions Institute, Savar, Bangladesh, ³John Walsh Centre for Rehabilitation Research, University of Sydney, Sydney, Australia, ⁴Neuroscience Research Australia, Sydney, Australia

Introduction: Little is known about survival rates or complications following spinal cord injury (SCI) in low and middle income countries. Currently there are no studies which include large and representative samples. Accurate data on survival and complications are essential for understanding the issues and developing appropriate local services. This study aimed to investigate the survival and health status of patients discharged from the Centre for the Rehabilitation of the Paralysed (CRP) in Bangladesh three years post discharge.

Methods: In 2014 medical records identified all patients discharged to CRP in 2011 with a new SCI. Patients, or their families, were contacted by telephone or visited in person to determine mortality, incidence of complications, quality of life, social interactions and participation.

Results: 371 new SCI patients were admitted to CRP in 2011. 360 people (or family) were subsequently contacted. Of these, 75 patients were deceased, with the majority dying from complications from pressure ulcers (56%). In those who were alive, data were collected for the SCI Secondary Conditions Scale, the participation items of the WHODAS-V2 and the SF12, and the incidence of pressure ulcers. At time of interview, 26% of wheelchair users had a current pressure ulcer. Problems related to pain, bladder, bowel and sexual dysfunction were the most commonly reported issues.

Conclusion: Mortality rates following SCI in Bangladesh are high but the results of this study probably underestimate the problem as the sample was from a specialised spinal cord injury hospital which may not be representative of all hospitals in Bangladesh.
No pain, no gain? Repurposing anti-convulsants to improve neurological outcomes after acute spinal cord injury

Dr John Kramer  
ICORD/University of British Columbia, Vancouver, Canada

Introduction: In an effort to improve neurological function after spinal cord injury (SCI), candidate treatments have sought to limit the spread of secondary injury and regenerate damaged axons. Unfortunately, translation to the clinic has failed, and there are currently no pharmacological interventions available. Pain medications are biologically active in the central nervous system (CNS) and routinely administered in the early stages of SCI. Surprisingly, very little is known regarding the effects of these potent neuromodulators on neurological recovery.

Objective: To examine the effects of pain medications on neurological (sensory and motor) recovery after SCI.

Methods: Secondary analysis of approximately 220 individuals with SCI assessed with a pain questionnaire in the European Multi-centre Study about SCI (EM-SCI). Mixed effects regression analyses were used to model longitudinal sensory and motor scores.

Results: Only anticonvulsants modified the course of neurological recovery after SCI. Individuals receiving anticonvulsants at 1-month had significantly higher motor scores at 12-months. The beneficial effect of anticonvulsants depended on the timing of administration, but was independent of changes in pain intensity and injury severity. Of those administered anticonvulsants, the majority of subjects were administered pregabalin/gabapentin (33/40). No other pain medication had a significant beneficial/detrimental effect.

Conclusions: Gabapentin/pregabalin could potentially be repurposed to enhance the neurological recovery after SCI.
Weight management guideline in spinal cord injured individuals.

Dr Samford Wong1,2,3, Mrs Lorna O’Connor4, Mr Anthony Twist5, Ms Gemma Moseley6, Mr Ronan Langan4, Dr Allison Graham1, Dr Eimear Smith4, Dr Chris Wilson5, Mrs Carolyn Taylor6, Lady Marie Dawson-Malcom7, Ms Debbie Green7, Dr Shashi Hirani2

1National Spinal Injury Centre, Stoke Mandeville Hospital, Aylesbury, United Kingdom, 2School of Health Sciences, City University London, London, United Kingdom, 3Institute of Liver and Digestive Health, University College London, London, United Kingdom, 4National Rehabilitation Hospital, Dublin, Ireland, 5London Spinal Injuries Centre, Royal National Orthopaedic Hospital, London, United Kingdom, 6Midland Centre for Spinal Injuries, Robert Jones and Agnes Hunt Orthopaedic Hospital, Oswestry, United Kingdom, 7Princess Royal Spinal Injuries Centre, Northern General Hospital, Sheffield, United Kingdom, 8Spinal Injury Association, Milton Keynes, United Kingdom

Workshop 13: Weight management guideline in spinal cord injured individuals. Samford Wong, Geheime Ratstube (Parallel 1), September 16, 2016, 10:55 AM - 12:25 PM

As life expectancy has improved since the introduction of multidisciplinary and comprehensive spinal cord injury (SCI) management by Sir Ludwig Guttmann, obesity becomes an unavoidable issue in SCI patients, due to enforced inactivity secondary to paralysis and subsequent change in body composition which requires nutritional interventions, modifications of individual behaviour and environmental change. Obesity has now become a cause of concern as it affects activities of daily living and is also associated with poor clinical outcomes and increased healthcare costs. Although generic guidelines exist for weight management, a recent survey completed by a range of SCI centre professionals suggest there is a need to develop a SCI specific weight management guideline. A SCI expert panel (including clinical dietitians, physiotherapists, psychologists, physicians, specialist nurses and service users) was formed in 2014 to take on the task to develop a weight management guideline for SCI individuals.

This symposium, consists of 6 x 15 mins presentations from a group of SCI specialists using the GRADE methodology (Grade of Recommendation, Assessment, Development and Evaluation) to evaluate human SCI literatures on weight management between 2000 to 2013 from Medline, Embase, CINAHL, PsycINFO and the Cochrane Library. The workshop will present the guideline development journey and discuss (1) classification and indices of obesity; (2) components of weight management strategies from specialist clinics to fad diets; (3) energy requirements; (4) exercise and behavioural strategies for weight management and (5) medical and surgical intervention for obese SCI individuals.

Through the completion of this course, it is expected to provide a greater awareness of obesity prevention and management in SCI care and a better understanding of nutritional status, providing optimal and cost effective interventions as a result. Audience feedback will be recorded and will be used to improve the guideline content before official launch in quarter 4 2016

References:

Suggests programme
1. 2 x Dietitians presentation
2. 1x Medical presentation
3. 1x Physiotherapist presentation
4. 1 x Psychologist presentation
5. 1 x Nurse presentation;
Urodynamic: correct interpretation, better management

Dr. Apichana Kovindha¹, Dr. Jean-Jacques Wyndaele²

¹Department of Rehabilitation Medicine, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand, ²Department of Urology, University Hospital Antwerpen, Antwerp, Belgium

Workshop 14: Urodynamic: correct interpretation, better management. Apichana Kovindha, Rittersaal (Parallel 2), September 16, 2016, 10:55 AM - 12:25 PM

Background: Neurogenic lower urinary tract dysfunction (NLUTD) leading to difficulty in urination and incontinence, is common problem among patients with spinal cord injury (SCI). Urodynamic study is recommended for proper management and better outcome. Currently, urodynamic is widely used by urologists and rehabilitation specialists who treat and rehabilitate individuals with SCI and NLUTs. However, there are some pitfalls in urodynamic interpretation that make us misinterpret and provide wrong management.

Objective: To make doctors and nurses have better understanding and interpretation of urodynamic studies.

Participants: For doctors and nurses interested in improving management of NLUTD.

Method:
Short introduction of NLUTs (15 min) by Prof. J-J Wyndaele
Urodynamic – how to start (15 min) by Prof. J-J Wyndaele
Different case studies with NLUTD are presented and participants are asked to discuss and interpret urodynamic tracings, and suggestions/comments on proper management are provided. (60 min) by Assoc. Prof. A. Kovindha

Outcome: Participants could correctly interpret urodynamic tracings and properly manage different NLUTDs based on clinical data and urodynamic studies.
Using Pediatric Spinal Cord Injury (PEDI-SCI) Activity Limitation and Participation Short Forms in Clinical Settings

Dr. MJ Mulcahey¹, Dr Mary Slavin²

¹Thomas Jefferson University, Department of Occupational Therapy, Philadelphia, United States, ²Health and Disability Research Institute, Boston University School of Public Health, Boston, United States


The Pediatric Spinal Cord Injury (PEDI-SCI) Measure was developed specifically to assess activity and participation outcomes in youth with spinal cord injury (SCI). The PEDI-SCI provides an alternative to generic pediatric outcome measures, which include items inappropriate for children with SCI and may not detect clinically meaningful change. The PEDI-SCI Activity Measure is comprised of calibrated item banks that assess activity limitation in the following domains: General Mobility, Daily Routines, Wheeled Mobility and Ambulation. The PEDI-SCI Participation Measure assesses two domains: participation self (relevant to what I want to do) and participation friends (relevant to what my friends do). There are parent and child versions for all PEDI-SCI domains. The PEDI-SCI can be administered using computerized adaptive tests (CATs). However, short forms (SFs) were developed to allow for PEDI-SCI administration without a computer. To develop the SFs, PEDI-SCI items were carefully selected from the calibrated item banks to ensure that the SFs include items that cover important aspects of the domain examined. Furthermore, items with a range of difficulty were selected for the SFs to minimize floor and ceiling effects. Each PEDI-SCI SF is scored using a specific table to convert the raw score (achieved by summing numeric values of item responses) to a transformed score (mean = 50, standard deviation = 10).

This workshop will provide training for attendees use PEDI-SCI SFs in clinical settings. Attendees will understand what the PEDI-SCI offers and will be able to reliably administer and score the SFs.

Learning Objectives:
On completion of this workshop, attendees will be able to
1.) Describe the PEDI-SCI, including the domain structure and item banks.
2.) Explain how PEDI-SCI SF items were selected.
3.) Discuss how to reliably administer and score the PEDI-SCI
4.) Given a patient case, demonstrate the ability to select the appropriate PEDI-SCI SFs, score items, determine raw and transformed scores and interpret findings.

Presentations:
Dr. Mulcahey: PEDI-SCI Domain Structure and Item Banks (10 min)
Dr. Slavin: PEDI-SCI SF Development (10 min)
Drs. Mulcahey & Slavin: Selecting and Scoring SFs (10 min)
Audience Engagement: Case Examples (select and score SFs) (15 min)
Around the World with Telesci

Telemedicine and telehealth use has grown exponentially. Smart phones, tablets, virtual reality and the internet provide new ways to educate and care for persons with health concerns. Even in urban settings, persons with SCI face excessive transportation burdens and would benefit tremendously from teleSCI services—telehealth and telemedicine services provided specifically for persons with SCI. However, provision of teleSCI services often lags behind our generalist colleagues who treat patients for common acute issues. Moreover, telestroke care is commonly offered in rural emergency rooms. Workshop goals include discussion of the status of teleSCI services, review of basic concepts of telehealth and telemedicine, discussion of various formats used for teleSCI and discussion of future benefits of the development of teleSCI from clinical and research standpoints. Specific topics include the spectrum of care, privacy and encryption, licensure and insurance, direct to clinic versus consumer services, standardization of services and potential for development of clinical and research services. These issues are increasingly important to providers as patients desire convenient care and treatment options expand.

Marca Alexander: TeleSCI: The Nuts and Bolts. 6 minutes
Ingebjorg Irgens: TeleSCI in Norway, The Sunnas Model: 12 minutes
Ruth Marshall: TeleSCI in Australia: 12 minutes
Marca Alexander, Bethlyn Houlihan: TeleSCI in the Americas-Networks, Pilots and a Virtual Coach: 12 minutes
Mohit Arora: Testing Basic TeleSCI in Caring for Persons in Low Income Communities in India: 10 minutes
Nan Liu: TeleSCI in China-An Emerging Technology: 10 minutes
Fin Biering Sorensen: Using Standardization and Datasets to Improve Care at a Distance-Benefits for TeleSCI: 10 minutes
Group Discussion: Audience participants will be asked to share their experiences with teleSCI and discussion will be held about the future research and clinical directions for the use of teleSCI. 18 minutes

Learning Objectives: Attendees will understand the concepts of teleSCI, telehealth and telemedicine, gain knowledge of the basic parts of a telemedicine encounter, they will gain knowledge of various types of telehealth services, teleSCI projects ongoing around the world and common issues associated with provision
of teleSCI services. Outcomes include potential collaborations for research and clinical care development in teleSCI.
Physiotherapy is a relatively young profession. Consequently, it is yet to build a strong evidence base for the many different physiotherapy interventions commonly administered to people with spinal cord injuries (SCI). Randomised controlled trials provide the most robust estimates of treatment effectiveness because they minimise bias arising from the expectations of clinicians, patients and researchers. We recently conducted a systematic review and identified 53 randomised controlled trials investigating the effectiveness of different physiotherapy interventions for people with SCI. This is a relatively small number of clinical trials given the scope of physiotherapy practice in SCI. This is problematic because clinicians and patients need good quality evidence to guide decisions about the most effective interventions. To address this problem, my colleagues and I have devoted the last 15 years to conducting simple randomised controlled trials aimed at systematically examining the effectiveness of different physiotherapy interventions. To date we have completed 20 randomised controlled trials looking at a range of interventions such as those used to manage contractures, improve motor control, reduce respiratory complications, aid gait, enhance hand function and increase strength. Most of these trials are simple in design but with a focus on methodology to reduce bias. This includes the use of blinded assessors, concealed allocation, intention-to-treat analyses and pre-defined primary outcomes. These trials have been possible because research is embedded within clinical practice thereby minimising costs. The trials are largely done within the three Sydney SCI units by the physiotherapy clinicians. The interventions to experimental participants are administered as part of routine clinical care. A professional development program runs in parallel providing opportunities for SCI physiotherapy clinicians to attain post-graduate qualifications through their participation in the trials. The findings of the trials have sometimes challenged long-held beliefs about the effectiveness of widely administered interventions. For example six of our clinical trials have contributed to a recent Cochrane Systematic Review which provided clear evidence for the first time that stretches administered through the hands of physiotherapists are not an effective form of contracture management in people with SCI. Some of our trials have pointed to the importance of functional training while others have reconfirmed long-held assumptions about the effectiveness of interventions which have been administered to date without a good evidence base. While the primary purpose of our research program has been to progress the physiotherapy care of people with SCI, a by-product of our research program has been the development of a SCI physiotherapy work-force which is highly educated in evidence based practice. This not only helps ensure that patients receive high quality evidence-based physiotherapy but it also fosters a workplace that is intellectually stimulating for therapists. This in turn increases job satisfaction, retains staff and builds clinical expertise. This model of conducting simple trials as part of clinical practice will help ensure the physiotherapy management of people with SCI is evidence-based.
Towards a common standard for quality of life measurement in spinal cord injury research and clinical practice

**Professor Marcel Post**\(^1\), Professor Denise Tate\(^3\), Dr. Susie Charlifue\(^4\), Dr. Peter New\(^5\), Dr. Divya Parashar\(^7\)

\(^1\)Center of Excellence in Rehabilitation Medicine, Utrecht, Netherlands, \(^2\)University of Groningen, Groningen, Netherlands, \(^3\)University of Michigan Spinal Cord Injury Model System, Ann Arbor, United States, \(^4\)Craig Hospital, Englewood, United States, \(^5\)Spinal Rehabilitation Service, Caulfield Hospital, Alfred Health, Caulfield, Australia, \(^6\)Ewport-Monash Rehabilitation Medicine Unit, Southern Medical School, Monash University, Melbourne, Australia, \(^7\)Department of Psychology, Indian Spinal Injuries Centre, Delhi, India

Workshop 17: Towards a common standard for quality of life measurement in spinal cord injury research and clinical practice. Marcel Post, Festsaal (Plenary), September 16, 2016, 2:15 PM - 3:45 PM

**Background**

Quality of life (QoL) is a difficult to define concept and a wide range of QoL measures exist, limiting comparability of research outcomes across different studies. Having a standard way to consistently assess QoL across different settings, cultures and environments will allow comparison of research results and clinical data worldwide. This can be especially helpful in adopting common QoL measures for clinical trials. In response to the lack of standard QoL measures for people with SCI, the International SCI QoL Basic Data Set (QoL BDS) was developed as part of the International SCI Data Sets Project. The purpose of the QoL BDS is to standardize the collection and reporting of a minimal amount of information necessary to merge and compare results of studies on QoL in individuals with SCI. The QoL BDS might also be useful as a screening tool to identify individuals with SCI with adjustment problems in clinical settings.

**Learning objectives**

To inform the audience about current work on the validity, reliability and usefulness of the QoL BDS in various countries and settings and to discuss future use of the QoL BDS in research and clinical practice.

**Contents**

Data on a total of 959 subjects from five countries, Australia, India, Netherlands, United States and Brazil, is used for this goal. Brief presentations will highlight the promise of the QoL BDS as a measure of QoL in research and clinical practice. An interactive discussion involving the audience will explore possible applications of the QoL BDS and future opportunities in this area.

**Workshop program (Chair: Denise Tate)**

Susan Charlifue: Conceptual background and development of the QoL BDS

Denise Tate: Inter-rater reliability of the QoL BDS

Peter New: Validity of the QoL BDS including comparison between people with SCD and controls

Divya Parashar: Experience with the QoL BDS in an inpatient rehabilitation setting

Marcel Post: QoL according to demographic and SCI variables, and country of origin

Discussion involving panel and audience on future use of the QoL BDS
Degenerative Cervical Myelopathy (Nontraumatic SCI): Early Detection and Management of a Disabling Disease

**Dr Sukhvinder Kalsi-Ryan¹, Dr. Michael Fehlings¹, Dr Patrick Freund², Dr. Catherine Jutzeler², Dr. Mark Kotter³**

¹University Health Network, Toronto, Canada, ²University Hospital, Balgrist, Zurich, Switzerland, ³University of Cambridge, Cambridge, UK


The onset of Degenerative Cervical Myelopathy is often insidious in nature, which can lead to delayed diagnosis or misdiagnosis, lack of timely treatment and permanent disability. The incidence of spinal cord dysfunction due to degenerative spine problems is now recognized to exceed the incidence of traumatic SCI and will only increase as the population ages in the developed world. The impact of DCM has already been recognized among the spinal care community. However, our current understanding of DCM is still limited. Thus, this workshop aims to present new knowledge related to the pathobiology and clinical presentation of DCM. We further explain new methods, which can be used for early detection of the disease, provide insight into newer methods to establish severity of the disease and present measures that are predictive of progression. Furthermore, emerging evidence and techniques for the treatment of DCM will be presented.

**Learning Objectives:**
At the end of the session participants will be able to:
• Understand DCM with respect to pathobiology, epidemiology, and clinical presentation
• Become aware of new diagnostic tools for early detection, rating severity of disease and predicting progression of disease
• Become aware of new evidence and potential strategies for treatment of DCM beyond surgical intervention

**Presenters (5 minute introduction, 5 – 12 minute talks, with 30 minute panel):**
Introduction – S Kalsi-Ryan
1. Pathobiology and Histology of Degenerative Cervical Myelopathy and clinical presentation M Fehlings
2. Next Generation Imaging and it’s role in the diagnosis of DCM P Freund
3. Beyond clinical testing: Improved diagnosis and prognosis of DCM using contact heat evoked potentials. C Jutzeler
4. Clinical correlates which define disease, inform management and predict progression  S Kalsi-Ryan
5. Emerging Evidence and Future Treatment Options for DCM M Kotter

30 min - Panel Discussion - Impact of the disease on SCI programs, how is it best managed, what is the role of the clinician in management of this disease
Cannabis in Spinal Cord Injury Care

Professor Claes Hultling1, Dr. Colleen O’Connell2, Dr. Fredrik von Kieseritzky3

1Spinalis/karolinska Institutet, Stockholm, Sweden, 2Dalhousie University Faculty of Medicine, Fredericton, Canada, 3Royal Institute of Technology, Stockholm, Sweden

Workshop 19: Cannabis in Spinal Cord Injury Care. Claes Hultling, Rittersaal (Parallel 2), September 16, 2016, 2:15 PM - 3:45 PM

Herbal cannabis, in various forms of administration, has emerged as a popular choice for self-management of pain and spasticity among persons with spinal cord injury (SCI). Cannabinoids show promise as therapeutic agents, particularly as analgesics, but for decades their development through research, trials and clinical use has been complicated by the placement of herbal cannabis in the Schedule I category by the UN and its drug conventions. Although research on endogenous cannabinoid systems and potential cannabinoid pharmaceuticals is increasing, there has been intense societal pressure to make herbal cannabis available for medicinal use; currently 23 American States, Canada and several South American and European countries permit use in some clinical contexts.

Considerable progress has been made in understanding the role of cannabinoids in the modulation of pain, and a number of clinical studies have suggested that cannabinoid therapy may reduce spasticity. Several cannabis-based medicines are registered in various countries. Nabiximol, an oromucosal spray of THC and CBD is prescribed for multiple sclerosis related spasticity, but only in Canada may it formally be prescribed for pain. Dronabinol is an oral synthetic THC used for chemotherapy-induced nausea, and nabilone is a synthetic cannabinoid with pain indications in Mexico, but used for pain management by off label prescription in several other countries. One Dutch producer provides the European market with GMP certified herbal cannabis preparations, which are available for prescription via various forms of exemptions, license procedures or compassionate use programs in European union countries, including Germany, Finland, Denmark and Norway.

This session will:
• Review the history of cannabis as a therapeutic agent, and describe the pharmacologic and pharmacokinetic properties of the endogenous cannabinoid systems and the phyto (plant) cannabinoids, in particular THC and CBD, with focus on the potential of cannabinoids as therapeutic agents in treating complications of spinal cord injury.
• Critique current evidence based on clinical trials of cannabinoids and inhaled herbal cannabis, with focus on pain and spasticity.
• Compare and contrast legal access programs in select countries.
• Profile a case history with personal experience, with time for participant discussion.
Due to long-term consequences and associated healthcare-related costs, prevention, management and search for cure of spinal cord injury (SCI) are of international importance. For years possibility of cure was limited by the belief that central nervous system (CNS) neurons could not regenerate. In 1928, it was demonstrated that CNS neurons could re-grow in a supportive extracellular environment. Recent advances in SCI research have enabled design of novel experimental therapeutics to promote axonal function. Many of the therapies have yielded encouraging evidence at pre-clinical level. However, their translation into clinical setting has been hindered by lack of substantial evidence from a well-designed clinical trial.

Inability to identify and normalize probable confounding factors might be one of the major drawbacks of many of clinical trials conducted till date. Recognizing importance of this issue, Spine Trauma Study Group is undertaking a survey to document role of confounding factors in a SCI trial and would like to discuss its findings in a workshop during ISCoS-2016.

Methodology: A survey is being conducted amongst ISCoS members. 43 variables relevant to SCI have been listed and survey responders are being asked to classify these as modifiable or not. Their importance in a SCI trial is also being rated. Additionally, measures to normalize these factors are being documented. An in-depth panel discussion on role of these variables for trial on SCI and measures to normalize them would be undertaken in the workshop. Concurrently, results of the survey will also be presented and discussed. This would provide valuable information for designing future SCI trials for yielding good level of evidence for safety and efficacy of intervention tested.

Agenda

1415-1425 Natural history of SCI. William Donovan
1425-1540 Panel Discussion & Presentation of Findings of Survey: Role of variables relevant to SCI for designing a SCI trial and measures to normalize confounding factors. Moderator: HS Chhabra, Kanchan Sarda, Saurabh Verma
1540-1545 Wrap-up and carry-home message. HS Chhabra
Different Application Forms of Electrical Stimulation in Persons with SCI

Miss Vanesa Bochkezanian¹, Dr Ashraf S. Gorgey²
¹Edith Cowan University, Joondalup, Australia, ²Hunter Holmes McGuire Medical Center. Spinal Cord Injury & Disorders Service, Richmond, United States of America

Workshop 21: Different Application Forms of Electrical Stimulation in Persons with SCI. Vanesa Bochkezanian, Prinz Eugen Saal (Parallel 4), September 16, 2016, 2:15 PM - 3:45 PM

After a spinal cord injury (SCI) the voluntary activation of the muscles below the level of the lesion is reduced and this can reduce muscle force production, impair physical function and compromise physical health status. Neuromuscular electrical stimulation (NMES) and functional electrical stimulation (FES) have been widely used in clinical populations and specifically in people with SCI. NMES has been shown to restore muscle size, improve cardio-vascular metabolic health, decrease spasticity and improve physical health after SCI. Current NMES applications use short pulse widths (100-200 μs) and low-to-moderate pulse frequencies (30-50 Hz), and such NMES protocols are commonly used based on limited research evidence. However, little is known about the NMES parameters and how these can be manipulated to optimize performance in clinical practice. Moreover, clinicians are still uncertain about the correct NMES dosage to obtain the physical health benefits described in the current literature. Thus, this workshop will shed light into the correct use of FES and NMES for each individual case to maximise the benefits of this rehabilitation tool. The workshop will summarize the existing evidence on how the basic stimulation parameters influences muscle activation, evoked torque and fatigue during NMES. We will summarize recent findings on how these stimulation parameters need to be modulated differently in persons with SCI.

Learning objectives:
This workshop will focus on different stimulation parameters of NMES and how to use them based on the available evidence. The audience will gain knowledge about the benefits and drawbacks associated with the different stimulation parameters of NMES. The audience will be able to distinguish between planning an aerobic FES and planning strength-training NMES sessions. This information will be useful when planning sessions in the clinical practice based on specific goals determined for each individual with SCI according to their specific physical characteristics and limitations.

Presentations: Examples of NMES applications will be presented and audience will have an opportunity to plan a NMES and/or FES session on another person who will serve as a model. Guidance and supervision will be provided and discussions on each example will be prompted.
<table>
<thead>
<tr>
<th>Name</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aito, Sergio</td>
<td>368</td>
</tr>
<tr>
<td>Benito, Jesus</td>
<td>172</td>
</tr>
<tr>
<td>Biering-Sørensen, Fin</td>
<td>172</td>
</tr>
<tr>
<td>Brust, Anne Katrin</td>
<td>172</td>
</tr>
<tr>
<td>Cardozo, Christopher</td>
<td>282</td>
</tr>
<tr>
<td>Fitzharris, Michael</td>
<td>368</td>
</tr>
<tr>
<td>Glott, Thomas</td>
<td>172</td>
</tr>
<tr>
<td>Holmström, Ulrika</td>
<td>172</td>
</tr>
<tr>
<td>Kawano, Osamu</td>
<td>270</td>
</tr>
<tr>
<td>Mai, Li-Jung</td>
<td>157</td>
</tr>
<tr>
<td>Mori, Eiji</td>
<td>270</td>
</tr>
<tr>
<td>Shiba, Keiichiro</td>
<td>270</td>
</tr>
<tr>
<td>Tsitsopoulos, Parmenion P.</td>
<td>397</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aach, Mirko</td>
<td>400</td>
</tr>
<tr>
<td>Abdelrehim, Zeinab</td>
<td>410</td>
</tr>
<tr>
<td>Abel, Rainer</td>
<td>103</td>
</tr>
<tr>
<td>Aberg Hakansson, Maria</td>
<td>58, 29</td>
</tr>
<tr>
<td>Abreu, Elizângela</td>
<td>475</td>
</tr>
<tr>
<td>Actis, Maria Vittoria</td>
<td>383, 384</td>
</tr>
<tr>
<td>Adcock, Carol</td>
<td>99</td>
</tr>
<tr>
<td>Adcock, James</td>
<td>121</td>
</tr>
<tr>
<td>Adriaansen, Jacinthe</td>
<td>8, 312</td>
</tr>
<tr>
<td>Agostinello, Jacqui</td>
<td>108, 93</td>
</tr>
<tr>
<td>Aguirre-Güemez, Ana Valeria</td>
<td>106</td>
</tr>
<tr>
<td>Ahren, Gunilla</td>
<td>194</td>
</tr>
<tr>
<td>Aidinoff, Elena</td>
<td>42</td>
</tr>
<tr>
<td>Aikat, Ruby</td>
<td>451</td>
</tr>
<tr>
<td>Akinlose, Titilope</td>
<td>291</td>
</tr>
<tr>
<td>Akyüz, Müfit</td>
<td>457</td>
</tr>
<tr>
<td>Al Kandari, Maitha</td>
<td>124</td>
</tr>
<tr>
<td>Ala’i-Hansen, Sherita</td>
<td>31</td>
</tr>
<tr>
<td>Al Kandari, Salem</td>
<td>124</td>
</tr>
<tr>
<td>Allan, Helen</td>
<td>125</td>
</tr>
<tr>
<td>Allin, Sony</td>
<td>488, 450, 322</td>
</tr>
<tr>
<td>Anderson, Kim D</td>
<td>434, 454</td>
</tr>
<tr>
<td>Anderson-Erisman, Kimberly</td>
<td>121</td>
</tr>
<tr>
<td>Andrade, Gil</td>
<td>468</td>
</tr>
<tr>
<td>Angel, Sanne</td>
<td>196, 113</td>
</tr>
<tr>
<td>Antcliff, Patty</td>
<td>292</td>
</tr>
<tr>
<td>Antepohl, Wolfram</td>
<td>172</td>
</tr>
<tr>
<td>Antiga, Silvia</td>
<td>301, 477</td>
</tr>
<tr>
<td>Antonacci, M Darryl</td>
<td>401</td>
</tr>
<tr>
<td>Anwar, Fahim</td>
<td>301</td>
</tr>
<tr>
<td>Anzai, Karen</td>
<td>450, 322</td>
</tr>
<tr>
<td>Arakawa, Hideki</td>
<td>111, 317</td>
</tr>
<tr>
<td>Araz, Özkan</td>
<td>304</td>
</tr>
<tr>
<td>Armin, Curt</td>
<td>405, 406</td>
</tr>
<tr>
<td>Armstrong, Alex</td>
<td>93, 92</td>
</tr>
<tr>
<td>Armstrong, Joanna</td>
<td>150</td>
</tr>
<tr>
<td>Arnell, Margareta</td>
<td>382</td>
</tr>
<tr>
<td>Arnet, Ursina</td>
<td>200, 341</td>
</tr>
<tr>
<td>Arnold, Cathy</td>
<td>165</td>
</tr>
<tr>
<td>Arnoux, Pierre-Jean</td>
<td>448</td>
</tr>
<tr>
<td>Arora, Mohit</td>
<td>47, 208</td>
</tr>
<tr>
<td>Arora, Mohit</td>
<td>206, 203, 205, 392</td>
</tr>
<tr>
<td>Arora, Tarun</td>
<td>235, 437</td>
</tr>
<tr>
<td>Arumugam, Narkeesh</td>
<td>203</td>
</tr>
<tr>
<td>Asaba, Eric</td>
<td>227</td>
</tr>
<tr>
<td>Asafu Adajay, Klint</td>
<td>301</td>
</tr>
<tr>
<td>Asano, Koudai</td>
<td>323</td>
</tr>
<tr>
<td>Name</td>
<td>Page</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Allison, Garry</td>
<td>279</td>
</tr>
<tr>
<td>Allison, Garry T</td>
<td>143</td>
</tr>
<tr>
<td>Aloe, Luigi</td>
<td>100</td>
</tr>
<tr>
<td>Alves, Rani</td>
<td>475</td>
</tr>
<tr>
<td>Aman, Samantha</td>
<td>414</td>
</tr>
<tr>
<td>Amann, Julia</td>
<td>164</td>
</tr>
<tr>
<td>Amorim, Isabel</td>
<td>129</td>
</tr>
<tr>
<td>Amstrong, Johanna</td>
<td>496</td>
</tr>
<tr>
<td>Backx, Annemiek</td>
<td>98</td>
</tr>
<tr>
<td>Bader, Avgerinos</td>
<td>268, 278</td>
</tr>
<tr>
<td>Badran, Abdul</td>
<td>470</td>
</tr>
<tr>
<td>Baek, Ahreum</td>
<td>334</td>
</tr>
<tr>
<td>Baiocco, Luisa</td>
<td>219</td>
</tr>
<tr>
<td>Balasubramanian, Krishanthini</td>
<td>372</td>
</tr>
<tr>
<td>Baldwin, Alice L</td>
<td>378</td>
</tr>
<tr>
<td>Balikçı, Sibel</td>
<td>304</td>
</tr>
<tr>
<td>Ballert, Carolina</td>
<td>138</td>
</tr>
<tr>
<td>Bandi, Surendra</td>
<td>435, 438, 436, 477</td>
</tr>
<tr>
<td>Bandini, Barbara</td>
<td>300, 295</td>
</tr>
<tr>
<td>Bang, Moon Suk</td>
<td>41</td>
</tr>
<tr>
<td>Baniya, Mandira</td>
<td>246, 332</td>
</tr>
<tr>
<td>Bansal, ML</td>
<td>163</td>
</tr>
<tr>
<td>Bao, Bingbo</td>
<td>214</td>
</tr>
<tr>
<td>Barbagallo, Giuseppe</td>
<td>255</td>
</tr>
<tr>
<td>Barbeiro, Carolina</td>
<td>128, 129, 424</td>
</tr>
<tr>
<td>Bardak, Ayşe Nur</td>
<td>366</td>
</tr>
<tr>
<td>Bardak, Ayşenur</td>
<td>433, 445</td>
</tr>
<tr>
<td>Bardak, Ayşenur</td>
<td>304</td>
</tr>
<tr>
<td>Bargellesi, Stefano</td>
<td>442</td>
</tr>
<tr>
<td>Barnes, Thomas</td>
<td>395</td>
</tr>
<tr>
<td>Baroncini, Ilaria</td>
<td>226, 199</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Barrera, Aida 376
Barrera-Ortíz, Aida 106
Barry, Sorcha 431, 432
Bassett-Spies, Kent 434
Batalha, Isabel 424
Batchelor, Peter 108, 93
Batchelor, Peter 92
Battini, Elena 118, 197
Battistuzzo, Camila 93, 92
Battistuzzo, Camila 108
Bauman, Craig 65, 66
Bauman, William 282
Baumberger, Michael 198
Baunsgaard, Carsten B 411
Baunsgaard, Carsten Bach 172
Bazelaïs, Suy 142
Bazzana, Anna 442
Bazzocchi, Gabriele 226, 82, 83, 109
Beaton, Dorcas 447
Beattie, Michael 294
Beattie, MS. 461
Béchir, Markus 200
Bedi, Parneet K 203
Beechey, Andrew 378
Beeke, Suzanne 126, 127
Behrens, Adrienne 313
Bekker, Michel 341
Belanger, Lise 489, 482
Belci, Maurizio 427
Bellotti, Stefano 30
Benavides, Francisco 412
Benito, Jesus 57, 105
Benito-Penalva, Jesús 210
Bensmail, Djamal 210
Bergmark, Lisa 227
Bergner, Ulla 342, 77, 289
Berlowitz, David 156, 158, 367, 160, 245, 248

Boldrini, Paolo 442
Bolliger, Marc 406, 138, 394, 446
Bonaccorsi, Astrid 2
Bonatti, Enrica 226, 199
Bonavita, Jacopo 340, 2, 295, 199
Bongers, Helma 166, 98, 167
BOPPANA, Ajay 311
Bosch, Karin 71
Botticello, Amanda 426
Bouwsema, Hanneke 98
Bouwsema, Hanneke 296
Bovend'Eerdt, Thamar 205
Bowden, Joce 47, 88, 46, 89
Brach, Mirjam 164, 466, 460, 204, 263, 265
Brach, Mirjam 374
Bradbury, Elisabeth 26
Bragge, Peter 485
Bravo-Esteban, Elisabeth 56
Bresnahan, Jacqueline 294
Bresnahan, JC. 461
Bressan, Stefano 442
Brinkel, Teresa 97
Brinkhof, Martin 200
Brinkhof, Martin 483, 97, 146
Brown, Doug 333
Brown, Doug J 159, 160
Brown, Douglas J 434
Brown, Elizabeth 158
Brown, Douglas J 368
Brust, Anne Katrin 130, 75
Budithi, Srinivasa 389
Chakravarty
Buehlmann, Sibille 142
Bugdaycı, Derya 366
Bugdaycı, Derya 433, 304
Bugdaycı, Derya 361
<table>
<thead>
<tr>
<th>Name</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlowitz, David</td>
<td>241</td>
</tr>
<tr>
<td>Berlowitz, David J</td>
<td>434</td>
</tr>
<tr>
<td>Berlowitz, David J.</td>
<td>159</td>
</tr>
<tr>
<td>Bernard, Stephen</td>
<td>93</td>
</tr>
<tr>
<td>Bernet, Madeleine</td>
<td>110</td>
</tr>
<tr>
<td>Bersch, Ines</td>
<td>130</td>
</tr>
<tr>
<td>Bersch, Ines</td>
<td>198</td>
</tr>
<tr>
<td>Bertapelle, Maria Paola</td>
<td>402</td>
</tr>
<tr>
<td>Bertschy, Sue</td>
<td>170</td>
</tr>
<tr>
<td>Betz, Randal</td>
<td>401</td>
</tr>
<tr>
<td>Bhargava, Pranshu</td>
<td>258</td>
</tr>
<tr>
<td>Bhide, Rohit</td>
<td>421, 416</td>
</tr>
<tr>
<td>Bunketorp, Lina</td>
<td>180</td>
</tr>
<tr>
<td>Burger, Elma</td>
<td>148, 123, 183</td>
</tr>
<tr>
<td>Burke, Dearbhla</td>
<td>431, 432, 261</td>
</tr>
<tr>
<td>Burki, J</td>
<td>327</td>
</tr>
<tr>
<td>Burns, Anthony</td>
<td>407, 310, 417</td>
</tr>
<tr>
<td>Burns, Brian</td>
<td>337</td>
</tr>
<tr>
<td>Busche, Roger</td>
<td>103</td>
</tr>
<tr>
<td>Bussmann, Johannes</td>
<td>315</td>
</tr>
<tr>
<td>Butera, Chiara</td>
<td>300</td>
</tr>
<tr>
<td>Bye, Elizabeth</td>
<td>47</td>
</tr>
<tr>
<td>Byrne, Jacqui</td>
<td>422</td>
</tr>
<tr>
<td>Cadorin, Cristina</td>
<td>442</td>
</tr>
<tr>
<td>Caetano, Pedro</td>
<td>456</td>
</tr>
<tr>
<td>Calabrese, Andrea</td>
<td>442</td>
</tr>
<tr>
<td>Caldas, Jorge</td>
<td>303</td>
</tr>
<tr>
<td>Callot, Virginie</td>
<td>448</td>
</tr>
<tr>
<td>Cameron, Ian</td>
<td>206</td>
</tr>
<tr>
<td>Cameron, Ian D</td>
<td>203</td>
</tr>
<tr>
<td>Campbell, Karen</td>
<td>359</td>
</tr>
<tr>
<td>Campos, Inês</td>
<td>456, 468</td>
</tr>
<tr>
<td>Campus, Giuliana</td>
<td>2</td>
</tr>
<tr>
<td>Cantisani, Teresa Anna</td>
<td>219</td>
</tr>
<tr>
<td>Capkan, Nigar</td>
<td>250</td>
</tr>
<tr>
<td>Carlozzi, Noelle A.</td>
<td>480</td>
</tr>
<tr>
<td>Carr, Jenni</td>
<td>373</td>
</tr>
<tr>
<td>Carrig, Siobhan</td>
<td>173</td>
</tr>
<tr>
<td>Carroll, Paul</td>
<td>261</td>
</tr>
<tr>
<td>Carton, Edmund</td>
<td>422</td>
</tr>
<tr>
<td>Carvalho, Maria Pais</td>
<td>393</td>
</tr>
<tr>
<td>Casasnovas, Cristina</td>
<td>280</td>
</tr>
<tr>
<td>Cassinis, Adriana</td>
<td>295</td>
</tr>
<tr>
<td>Catz, Amiram</td>
<td>42</td>
</tr>
<tr>
<td>Catz, Amiram</td>
<td>379, 490</td>
</tr>
<tr>
<td>Cazzaniga, Maurizio</td>
<td>2</td>
</tr>
<tr>
<td>Celani, Maria Grazia</td>
<td>219</td>
</tr>
<tr>
<td>Cerrel Bazo, Humberto</td>
<td>442</td>
</tr>
<tr>
<td>Cho, Kang Hee</td>
<td>500, 499</td>
</tr>
<tr>
<td>Cho, Sung-Rae</td>
<td>334</td>
</tr>
<tr>
<td>Choi, Dennis</td>
<td>454</td>
</tr>
<tr>
<td>Choi, Woo Hyuk</td>
<td>80</td>
</tr>
<tr>
<td>Choi, Young-Ah</td>
<td>43, 41</td>
</tr>
<tr>
<td>Chotiyarnwong, Johannas</td>
<td>161</td>
</tr>
<tr>
<td>Chowdhury, Joy</td>
<td>260, 389, 272, 276</td>
</tr>
<tr>
<td>Christensen, Peter</td>
<td>134</td>
</tr>
<tr>
<td>Christensen, Peter</td>
<td>87</td>
</tr>
<tr>
<td>Chun, Seong Min</td>
<td>43</td>
</tr>
<tr>
<td>Chung, Young-Woo</td>
<td>18</td>
</tr>
<tr>
<td>Churilov, Leonid</td>
<td>238, 252</td>
</tr>
<tr>
<td>Cicitri, Alessandra</td>
<td>30</td>
</tr>
<tr>
<td>Cistulli, Peter A.</td>
<td>158, 159, 160</td>
</tr>
<tr>
<td>Citak, Mustafa</td>
<td>400, 403</td>
</tr>
<tr>
<td>Clark, Elisabeth</td>
<td>305</td>
</tr>
<tr>
<td>Clark, Jillian</td>
<td>108, 252</td>
</tr>
<tr>
<td>Clark, Jillian</td>
<td>92</td>
</tr>
<tr>
<td>Clark, Jillian</td>
<td>93</td>
</tr>
<tr>
<td>Clarke, Michelle</td>
<td>150</td>
</tr>
<tr>
<td>Clarke-Richardson, Penny</td>
<td>454</td>
</tr>
<tr>
<td>Clezy, Kate</td>
<td>152</td>
</tr>
<tr>
<td>Cohen, Matt</td>
<td>480</td>
</tr>
<tr>
<td>Collins, Katrina</td>
<td>247</td>
</tr>
<tr>
<td>Condeça, Beatriz</td>
<td>129</td>
</tr>
<tr>
<td>Condeça, Beatriz</td>
<td>440</td>
</tr>
</tbody>
</table>
Dawson-Malcom, Marie 52
De Oliveira, Beatriz 279
De Valk, Quido 296
Deegan, Rachel 125
Del Popolo, Giulio 2, 224, 300, 295, 228, 171
Delparte, Jude 407, 310, 417
Derry, Fadel 427
Derry, Fadel 413
Desai, Manish 425, 358, 371
Deshpande, Pradeep
DeVivo, Michael 297, 286, 54
DeWeerth, Steve 285
Dhaliwal, Shelly 337
Dhall, Sanjay 294
Dhall, SS. 461
Di Lollo, Silvia 362
Divanoglou, Anestis 50
Divanoglou, Anestis 256
Domingo, Trisha 407
Donohoe, Sheelagh 244
Donovan, William H. 368, 367, 490
Draulans, Nathalie 260, 449
Ducharme, Stanley 246
Dugger, Cathi 72
Dunlop, Sarah 238, 93, 252, 279
Dunlop, Sarah 92
Dunlop, Sarah A 143
Dunt, David 251
Duras, Alexandra 263
Duverger, Nathalie 142
Dvorak, Marcel 482
d
de Bellis, Alberto 100
de Groot, Sonja 95
de Iure, Federico 255
E
Easthope, Christopher Schmidt 446
Echeverria, Eduardo 489
Edward, Charles 76
Ehrmann-Bostan, Cristina 271
Eken, Maaike 335
El Masri, Wagih 272
El Masri, Wagih 379
Elbas, Nurgul 250
Elgherian, Ali 117, 116
Elishar, Ronen 103
Elmers, Anna 292
Elmgren Frykberg, Gunilla 382
Elmo, Marylo 330, 328
Elsas, Johanna 139
Emmanouil, Dimitra 350
Emmanuel, Anton 127, 177
Emmanuel, Anton 126
EMSCI Study Group, 178, 287
Endo, Naoto 73
Engelhardt, Britta 192
Enishi, Tetsuya 240
Erhan, Belgin 403, 250
Erhan, Belgin 243, 293
Essig, Stefan 70, 460, 204
Essig, Stefan 374
Esterlitz, Joy 31
Etingen, Bella 114
F
Faaborg, Pia Møller 134
Faaborg, Pia Møller 87
Floyd Jr, Michael 391
Foatki, Sofia 268
Faber, Willemijn 335  
Faber, Willemijn 172  
Falcone, Roberta 199  
Faleiros, Fabiana 326  
Fard, Aram 477  
Faria, Filipa 429, 469  
Farquharson, Shawna 159, 160  
Faulkner, James 420  
Fehlings, Michael 117, 447, 116, 119, 221, 428  
Fekete, Christine 97  
Felleiter, Peter 139, 390  
Ferguson, Adam 294  
Ferguson, AR. 461  
Ferguson, Michelle 66  
Fernandez Viña, Roberto 398  
Ferrari, Raffaelo 442  
Ferreira, Ana 468  
Ferreira, Anabela 393, 222, 469  
Ferroni, Costanza 442  
Fessler, Richard 318  
Fielding, Melissa 439, 414  
Filli, Linard 446  
Finnerup, Nanna 10  
Finnerup, Nanna 134  
Finnerup, Nanna Brix 87  
Fitzpatrick, Patricia 107  
Flett, Heather 407, 310, 325, 78, 266  
Flett, Heather 417  
Flett, Heather, M 302  
Fleuren, Judith 102  
Flood, Stephen 237  
Flower, Oliver 337  
Forbes, Joshua 302  
Forchheimer, Martin  
Ford, Anastasia E. 262  
Fortunato, Jorge 440  
Fotaki, Sofia 278  
Fournely, Marion 448  
FOURTASSI, Maryam 234  
Franchini, Alessandra 118  
Frankel, Hans 286, 54  
Franz, Martina 289  
Franz, Steffen 178, 287  
Fraser, Matthew 212, 211, 209  
Freeman, Brian 93, 92  
Freeman, Brian 108  
Freitag, Marina 443  
Freitas, Sérgio 475  
Freund, Patrick 308, 428  
Frøgårdova, Barbora 267  
Fridén, Jan 180  
Friedman, Hagit 42  
Frigerio, Simona 383  
Frotzler, Angela 75, 280  
Frotzler, Angela 172  
Frykberg, Gunilla 218  
Fu, Kai 214  
Fujita, Nobuyuki 314  
Fujiwara, Yuichi 20  
Fujiyoshi, Kanehiro 147  
Fullen, Brona 431, 432  
Furuya, Takeo 176  
Fyffe, Denise 464  

f
for the SwiSCI study group,

G
Gaetani, Paolo 201  
Gómez-Soriano, Julio 56
<table>
<thead>
<tr>
<th>Name</th>
<th>Pages</th>
<th>Name</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galan-Arriero, Iriana</td>
<td>56</td>
<td>González-Mayorga, Ankor</td>
<td>249</td>
</tr>
<tr>
<td>Galea, Mary</td>
<td>238, 143, 251, 237, 252, 279</td>
<td>Gorgey, Ashraf</td>
<td>282, 281, 410</td>
</tr>
<tr>
<td>Gall, Angela</td>
<td>327, 125</td>
<td>Galli, Giulia</td>
<td></td>
</tr>
<tr>
<td>Galligan, Irene</td>
<td>261</td>
<td>Galligan, Irene</td>
<td>261</td>
</tr>
<tr>
<td>Gambhir, Anjali</td>
<td>47</td>
<td>Gambhir, Anjali</td>
<td>47</td>
</tr>
<tr>
<td>Gandevia, Simon</td>
<td>47</td>
<td>García-Forcada, Angel</td>
<td></td>
</tr>
<tr>
<td>Garrino, Lorenza</td>
<td>383, 384</td>
<td>Gross-Hemmi, Mirja</td>
<td></td>
</tr>
<tr>
<td>Gassaway, Julie</td>
<td>49</td>
<td>Gross-Hemmi, Mirja H.</td>
<td></td>
</tr>
<tr>
<td>Gassert, Roger</td>
<td>11</td>
<td>Gervin, Jan V</td>
<td>411</td>
</tr>
<tr>
<td>Gater, David</td>
<td>282</td>
<td>Geyh, Szilvia</td>
<td>145, 137</td>
</tr>
<tr>
<td>Gawronski, Jan</td>
<td>76</td>
<td>Ghaffari, Azadeh</td>
<td>291</td>
</tr>
<tr>
<td>Gemperli, Armin</td>
<td>264, 145, 70, 466, 460, 204, 133, 263, 265, 198, 262, 374</td>
<td>Gharoooni, Ali</td>
<td>131</td>
</tr>
<tr>
<td>Gerini, Adriana</td>
<td>118, 197</td>
<td>Giangregorio, Lora</td>
<td>215</td>
</tr>
<tr>
<td>Gerven, Jan V</td>
<td>411</td>
<td>Gioti, Konstantina</td>
<td>357, 350, 347, 345, 349, 343</td>
</tr>
<tr>
<td>Geyh, Szilvia</td>
<td>145, 137</td>
<td>Giovannini, Tiziana</td>
<td>199</td>
</tr>
<tr>
<td>Gisевич, Astrid</td>
<td>403</td>
<td>Gisevius, Astrid</td>
<td></td>
</tr>
<tr>
<td>Glass, Itzhak</td>
<td>42</td>
<td>Glass, Itzhak</td>
<td></td>
</tr>
<tr>
<td>Glinsky, Joanne</td>
<td>206, 47, 205, 90, 46</td>
<td>Glinsky, Joanne V</td>
<td>203</td>
</tr>
<tr>
<td>Glinsky, Joanne V</td>
<td>203</td>
<td>Gobets, David</td>
<td>172</td>
</tr>
<tr>
<td>Gobets, David</td>
<td>172</td>
<td>Golla, Jonathan</td>
<td>78</td>
</tr>
<tr>
<td>Gollan, Emily</td>
<td>47</td>
<td>Gollan, Emily</td>
<td></td>
</tr>
<tr>
<td>Gómaro-Toldrà, Natàlia</td>
<td>28</td>
<td>Gomara-Toldrà, Natàlia</td>
<td></td>
</tr>
<tr>
<td>Haak, Michael</td>
<td>321, 319, 387</td>
<td>Hendricks, Henk</td>
<td>144</td>
</tr>
<tr>
<td>Haak, Michael</td>
<td>379, 490</td>
<td>Henn, Rita</td>
<td>259</td>
</tr>
<tr>
<td>Habermann, Jana</td>
<td>139</td>
<td>Herbert, Robert</td>
<td>88, 89</td>
</tr>
<tr>
<td>Haefeli, Jenny</td>
<td>461</td>
<td>Hernández-León</td>
<td>106</td>
</tr>
<tr>
<td>Haefeli, Jenny</td>
<td>294</td>
<td>Saúl Renán</td>
<td></td>
</tr>
<tr>
<td>Hagen, Ellen</td>
<td>320, 217, 232</td>
<td>Hikata, Tomohiro</td>
<td>314</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hillier, Loretta M.</td>
<td>66</td>
</tr>
<tr>
<td>Name</td>
<td>Page Numbers</td>
<td>Name</td>
<td>Page Numbers</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------------</td>
<td>-----------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Merete</td>
<td></td>
<td>Hinrichs, Timo</td>
<td>200</td>
</tr>
<tr>
<td>Hahn, Jodie</td>
<td>237</td>
<td>Hirani, Shashi</td>
<td>52</td>
</tr>
<tr>
<td>Hahn-Goldberg, Shoshana</td>
<td>302</td>
<td>Hirose, Yuichiro</td>
<td>314</td>
</tr>
<tr>
<td>Haider, Javvad</td>
<td>373, 372</td>
<td>Hiyama, Akihiko</td>
<td>202</td>
</tr>
<tr>
<td>Haider, Javvaid</td>
<td>229</td>
<td>Hlavackova, Tereza</td>
<td>267</td>
</tr>
<tr>
<td>Haisma, Janneke</td>
<td>315</td>
<td>Hlinkova, Zuzana</td>
<td>186</td>
</tr>
<tr>
<td>HAJJIOUI, Abderrazak</td>
<td>234</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hakova, Renata</td>
<td>336</td>
<td>Hlinkova, Zuzana</td>
<td>269</td>
</tr>
<tr>
<td>Halvorsen, Annette</td>
<td>181</td>
<td>Ho, Chester</td>
<td>453, 462, 463</td>
</tr>
<tr>
<td>Hamid, Rizwan</td>
<td>327</td>
<td>Hobbs, Helen</td>
<td>420</td>
</tr>
<tr>
<td>Hanci, Murat</td>
<td>293, 329</td>
<td>Hoffmann, Dorte Dahl</td>
<td>74</td>
</tr>
<tr>
<td>Hansen, Rikke Middelhede</td>
<td>232</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harigai, Toru</td>
<td>73</td>
<td>Holdnack, James A</td>
<td>480</td>
</tr>
<tr>
<td>Hariharan, Ram</td>
<td>399, 421, 416, 131</td>
<td>Holmström, Ulrika</td>
<td>397</td>
</tr>
<tr>
<td>Hariharan, Ramaswamy</td>
<td>441</td>
<td>Holtslag, Herman</td>
<td>71</td>
</tr>
<tr>
<td>Harrington, Emma</td>
<td>292</td>
<td>Holtz, Anders</td>
<td>397</td>
</tr>
<tr>
<td>Harris, Gerald</td>
<td>291</td>
<td>Hongo, Michio</td>
<td>242</td>
</tr>
<tr>
<td>Harrison, Rachel</td>
<td>415, 150</td>
<td>Hopman, Maria</td>
<td>189</td>
</tr>
<tr>
<td>Hart, Kirsten</td>
<td>415, 174</td>
<td>Hopman, Maria T.E.</td>
<td>185</td>
</tr>
<tr>
<td>Harvey, Lisa</td>
<td>238, 206, 47, 90, 88, 46, 89, 12</td>
<td>Horsewell, Jane</td>
<td>352, 194, 348</td>
</tr>
<tr>
<td>Harvey, Lisa A</td>
<td>205</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harvey, Lisa A</td>
<td>203</td>
<td>Hosman, Allard J.</td>
<td>255</td>
</tr>
<tr>
<td>Hasnan, Nazirah</td>
<td>246</td>
<td>Hossain, Sohrab</td>
<td>203, 88, 89</td>
</tr>
<tr>
<td>Hasnan, Nazirah</td>
<td>68, 367</td>
<td>Houdijk, Han</td>
<td>335</td>
</tr>
<tr>
<td>Hatakeyama, Kazutoshi</td>
<td>353, 375</td>
<td>Houlihan, Bethlyn</td>
<td>208</td>
</tr>
<tr>
<td>HATAKEYAMA, KAZUTOSHI</td>
<td>154</td>
<td>Hsieh, Jane</td>
<td>439, 414</td>
</tr>
<tr>
<td>Hatt, Alice</td>
<td>158, 159, 160</td>
<td>Hsueh, Arthur</td>
<td>251</td>
</tr>
<tr>
<td>Haviv, Lior</td>
<td>42</td>
<td>Huang, Jianan</td>
<td>466</td>
</tr>
<tr>
<td>Hayashi, Tetsuo</td>
<td>20, 290, 487, 270, 169</td>
<td>Huber, Eveline</td>
<td>308</td>
</tr>
<tr>
<td>Hayes, Alison</td>
<td>205</td>
<td>Hultling, Claes</td>
<td>299, 177, 239</td>
</tr>
<tr>
<td>Hayes, Alison J</td>
<td>203</td>
<td>Hunting, Judith</td>
<td>121</td>
</tr>
<tr>
<td>Hayes, Keith C</td>
<td>434</td>
<td>Hupp, Markus</td>
<td>316</td>
</tr>
<tr>
<td>Heaton, Robert K</td>
<td>480</td>
<td>Hurtado-Chong, Anahi</td>
<td>255</td>
</tr>
<tr>
<td>Hegi, Andreas</td>
<td>145</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heinemann, Allen</td>
<td>464, 114</td>
<td>Husain, Ruby</td>
<td>68</td>
</tr>
<tr>
<td>Heinemann, Allen</td>
<td>426</td>
<td>Hutchinson, Peter</td>
<td>117, 116, 119</td>
</tr>
<tr>
<td>Heinemann, Allen W.</td>
<td>480</td>
<td>Hynes, Catherine</td>
<td>380</td>
</tr>
<tr>
<td>Hell, M</td>
<td>327</td>
<td>Hysperska, Veronika</td>
<td>336</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hyun, Sooin</td>
<td>184, 182</td>
</tr>
</tbody>
</table>
Jeon, Hyun Kyu 500
Jeon, Min soo 500
Jutzeler, Catherine 428
Jutzeler, Catherine R

K

Kaas, Amanda 167
Kadum Husein Al-Taleb, Manaf 209
Kagiouli, Dimitra 268, 278
Kakita, Mari 111, 317
Kalke, Yorck 16
Kalke, Yorck-Bernhard 172
Kallinen, Mauri 309
Kalsi-Ryan, 470
Sukhvinder
Kalsi-Ryan, 447, 428
Sukhvinder
Kamijo, Yoshiichiro 111
Kamijo, Yoshi-ichiro 317
Kammuang-lue, Pratchayapon 161
Kanchiku, Tsukasa 21
Kaneko, Shinjiro 147
Kaplan, Cindy 330, 328
Kapralos, Ioannis 345, 343
Karagiannakis, Elias 268, 278
Karatas, Gulsah 457
Karemani, Aldi 226, 82
Kasch, Helge 217
Kasicki, Stefan 412
Kasukawa, Yuji 242
Kataria, Chitra 386, 47, 444, 388, 451
Katoh, Hiroyuki 6, 202
Katoh, Shinsuke 240
Katoh, Shinsuke 379
Katran, Banu 250
Katte, Lyndall 485
Kawano, Osamu 15, 290, 487, 169, 155
Kazmi, Shuja 229
Kazmi, Shuja 229
Keeney, Tamra 464
Kejla, Zvonko 255
Keles, Betul 366
Keleş, Betül Yavuz 433

Kimura, Shinji 73
Kinoshita, Tokio 111
Kirby, John 373
Kirby, John 372
Kisala, Pamela 464
Kisala, Pamela A 480
Kizilkılıç, Osman 293
Klein, Carolin 110
Ko, Hyun-yoon 80
Ko, Hyun-Yoon 104
Ko, Myoung-Hwan 84
Kobayakawa, Kazu 290
Koch, Hans Georg 460, 204, 133
Koch, Hans-Georg 374
Koch, Sabrina 130
Koda, Masao 176
Kohyama, Jun 81, 38
Kolias, Angelos 117, 116, 119
Kolli, S 260
Kolli, Sreedhar 373, 229
Kolli, Sreedhar 230
Komaki, Yuji 62
Komaratat, Napasakorn 161
Konstantinidis, Konstantinidis 345
Kontaxakis, Charalambos 268, 278
Koskinen, Eerika 309
Kostovski, Emil 190
Kotter, Mark 117, 116, 473, 119, 470, 428
Kovindha, 246, 161, 162
<table>
<thead>
<tr>
<th>Name</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kelly, Erin</td>
<td>33</td>
</tr>
<tr>
<td>Kelly, Erin</td>
<td>291</td>
</tr>
<tr>
<td>Kelly, Louise</td>
<td>485</td>
</tr>
<tr>
<td>Kemerder, Rahşan</td>
<td>293</td>
</tr>
<tr>
<td>Kesikburun, Serdar</td>
<td>135</td>
</tr>
<tr>
<td>Kesiktas, Nur</td>
<td>363, 361</td>
</tr>
<tr>
<td>Kesiktas, Nur</td>
<td>366</td>
</tr>
<tr>
<td>Kesiktas</td>
<td></td>
</tr>
<tr>
<td>Kesiktaş, Fatma Nur</td>
<td>433, 304, 445</td>
</tr>
<tr>
<td>Khalil, Refka</td>
<td>281</td>
</tr>
<tr>
<td>Khanna, Meeka</td>
<td>1</td>
</tr>
<tr>
<td>Kibar, Halime</td>
<td>361</td>
</tr>
<tr>
<td>Kiekens, Carlotte</td>
<td>260, 449, 148</td>
</tr>
<tr>
<td>Kikuchi, Naohisa</td>
<td>323</td>
</tr>
<tr>
<td>Killeen, Tim</td>
<td>446</td>
</tr>
<tr>
<td>Kim, Ashley</td>
<td>72</td>
</tr>
<tr>
<td>Kim, Gwangsook</td>
<td>184</td>
</tr>
<tr>
<td>Kim, Jae-sik</td>
<td>25, 24</td>
</tr>
<tr>
<td>Kim, Jayoung</td>
<td>493</td>
</tr>
<tr>
<td>Kim, Jihyang</td>
<td>104</td>
</tr>
<tr>
<td>Kim, Keewon</td>
<td>41</td>
</tr>
<tr>
<td>Kim, Soo-Yeon</td>
<td>80, 104</td>
</tr>
<tr>
<td>Kim, Sung Kyu</td>
<td>18</td>
</tr>
<tr>
<td>Kim, Yerin</td>
<td>184</td>
</tr>
<tr>
<td>Kim, Yoon-Tae</td>
<td>25, 24</td>
</tr>
<tr>
<td>Kim, Hye-Ri</td>
<td>43</td>
</tr>
<tr>
<td>Kimura, Ryota</td>
<td>179, 242, 375</td>
</tr>
<tr>
<td>Apichana</td>
<td>367</td>
</tr>
<tr>
<td>Kovindha, Apichana</td>
<td>396</td>
</tr>
<tr>
<td>Kramer, John</td>
<td>443</td>
</tr>
<tr>
<td>Kras-Dupuis, Anna</td>
<td>419, 325</td>
</tr>
<tr>
<td>Krassioukov, Andrei</td>
<td>124</td>
</tr>
<tr>
<td>Krassioukov, Andrei</td>
<td>379, 490</td>
</tr>
<tr>
<td>Krebs, Joerg</td>
<td>185, 189</td>
</tr>
<tr>
<td>Krebs, Jörg</td>
<td>192</td>
</tr>
<tr>
<td>Krebs, Jörg</td>
<td>138</td>
</tr>
<tr>
<td>Kressig, Reto W.</td>
<td>280</td>
</tr>
<tr>
<td>Kříž, Jiří</td>
<td>336, 186</td>
</tr>
<tr>
<td>Kříž, Jiří</td>
<td>269</td>
</tr>
<tr>
<td>Krogh, Klaus</td>
<td>87, 134</td>
</tr>
<tr>
<td>Krylov, Vladimir</td>
<td>216</td>
</tr>
<tr>
<td>Kshetrimayum, Getita</td>
<td>497</td>
</tr>
<tr>
<td>Kubota, Kensuke</td>
<td>290, 487, 270, 169</td>
</tr>
<tr>
<td>Kudo, Daisuke</td>
<td>242</td>
</tr>
<tr>
<td>Kuiper, Jan</td>
<td>277, 272</td>
</tr>
<tr>
<td>Kulshrestha, Richa</td>
<td>277, 272, 276</td>
</tr>
<tr>
<td>Kumar, Deepak</td>
<td>386</td>
</tr>
<tr>
<td>Kumar, Naveen</td>
<td>260, 277, 272, 311</td>
</tr>
<tr>
<td>Kumar, Neelesh</td>
<td>386</td>
</tr>
<tr>
<td>Kumru, Hatice</td>
<td>57</td>
</tr>
<tr>
<td>Kunz, Simon</td>
<td>137</td>
</tr>
<tr>
<td>Kurpad, Shekar</td>
<td>318</td>
</tr>
<tr>
<td>Kwon, Brian</td>
<td>454</td>
</tr>
<tr>
<td>k Kimura, Ryota</td>
<td>353</td>
</tr>
<tr>
<td>L La, Gaoyan</td>
<td>188</td>
</tr>
<tr>
<td>Laberge-Malo, Marie</td>
<td>305</td>
</tr>
<tr>
<td>Lachappelle, Patrice</td>
<td>308</td>
</tr>
<tr>
<td>Lains, Jorge</td>
<td>456, 468</td>
</tr>
<tr>
<td>Lam, Cynthia</td>
<td>47</td>
</tr>
<tr>
<td>Lampart, Patricia</td>
<td>198</td>
</tr>
<tr>
<td>Landi, Lorenza</td>
<td>226</td>
</tr>
<tr>
<td>Landi, Lorenza</td>
<td>82, 83</td>
</tr>
<tr>
<td>Lin, Yang-Pin</td>
<td>86</td>
</tr>
<tr>
<td>Li, Xiaowen</td>
<td>187</td>
</tr>
<tr>
<td>Li, Yu-Chan</td>
<td>157</td>
</tr>
<tr>
<td>Lidal, Ingeborg</td>
<td>190</td>
</tr>
<tr>
<td>Lima, Fernanda</td>
<td>475</td>
</tr>
<tr>
<td>Lima, Mário</td>
<td>475</td>
</tr>
<tr>
<td>LIN, YANG-PIN</td>
<td>86</td>
</tr>
<tr>
<td>Name</td>
<td>Pages</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Maria Landmann, Gunther</td>
<td>200</td>
</tr>
<tr>
<td>Landolt, Hardy</td>
<td>265</td>
</tr>
<tr>
<td>Langan, Ronan</td>
<td>261, 52</td>
</tr>
<tr>
<td>Lanig, Indira</td>
<td>210</td>
</tr>
<tr>
<td>Lannem, Anne M</td>
<td>256</td>
</tr>
<tr>
<td>Lanovaz, Joel</td>
<td>235, 437</td>
</tr>
<tr>
<td>Lashkari, Behnia</td>
<td>313</td>
</tr>
<tr>
<td>LaVela, Sherri</td>
<td>426, 114</td>
</tr>
<tr>
<td>Lavis, Timothy</td>
<td>281</td>
</tr>
<tr>
<td>Lavrencic, Lucija</td>
<td>203, 205</td>
</tr>
<tr>
<td>Lebkowski, Jane</td>
<td>318</td>
</tr>
<tr>
<td>Lee, Bon San Bonne</td>
<td>158</td>
</tr>
<tr>
<td>Lee, Bon San Bonne</td>
<td>152, 151</td>
</tr>
<tr>
<td>Lee, Bonsan Bonne</td>
<td>368</td>
</tr>
<tr>
<td>Lee, Frank</td>
<td>327</td>
</tr>
<tr>
<td>Lee, Jan</td>
<td>380, 378</td>
</tr>
<tr>
<td>Lee, Jin-young</td>
<td>25, 24</td>
</tr>
<tr>
<td>Lee, Joseph</td>
<td>65, 66</td>
</tr>
<tr>
<td>Lee, Kyu Ho</td>
<td>500, 499</td>
</tr>
<tr>
<td>Lee, Linda</td>
<td>66</td>
</tr>
<tr>
<td>Lee, Ray</td>
<td>291</td>
</tr>
<tr>
<td>Lee, Tae Min</td>
<td>18</td>
</tr>
<tr>
<td>Leigh, Ja-Ho</td>
<td>43</td>
</tr>
<tr>
<td>Leiulfsrud, Hakon</td>
<td>352</td>
</tr>
<tr>
<td>Lenggenhager, Bigna</td>
<td>3</td>
</tr>
<tr>
<td>Lennon, Kelley</td>
<td>298</td>
</tr>
<tr>
<td>Lennon, Olive</td>
<td>431, 261</td>
</tr>
<tr>
<td>Lennon, Olive</td>
<td>432</td>
</tr>
<tr>
<td>León, Natcha</td>
<td>172</td>
</tr>
<tr>
<td>Leslie, Donald</td>
<td>318</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Pages</th>
<th>Name</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>MacDonald, David</td>
<td>324</td>
<td>McRae, Samantha</td>
<td>419</td>
</tr>
<tr>
<td>MacIsaac, Glenys</td>
<td>489</td>
<td>Meaklim, Hailey</td>
<td>158, 159, 160</td>
</tr>
<tr>
<td>Maclean, Rhona</td>
<td>421</td>
<td>Mearin, Fermín</td>
<td>105</td>
</tr>
<tr>
<td>Maeda, Takashi</td>
<td>270</td>
<td>Meindl, Renate Ch.</td>
<td>400</td>
</tr>
<tr>
<td>Maeda, Takeshi</td>
<td>15, 20, 487, 169, 101, 155</td>
<td>Menon, Nitin</td>
<td>1</td>
</tr>
<tr>
<td>Maeda, Takeshi</td>
<td>290</td>
<td>Menosso, Rachele</td>
<td>220</td>
</tr>
<tr>
<td>Mahachai, Rungarun</td>
<td>161</td>
<td>Merlo, Christoph</td>
<td>70</td>
</tr>
<tr>
<td>Maher, Jennifer L.</td>
<td>411</td>
<td>Messina, Aurora</td>
<td>237</td>
</tr>
<tr>
<td>MAI, LI-JUNG</td>
<td>86</td>
<td>Messina, Querino</td>
<td>442</td>
</tr>
</tbody>
</table>
Maier, Doris 149
Maitan, Patrizia 383, 384
Maki, Satoshi 176
Malik, Neha 47
Malisan, Cristina 220
Mancini, Francesca 30
Mancino, Maristella 219
Manley, Geoffrey 294
Manley, GT. 461
Marco, Biondi 228
Margalho, Paulo 468
Marial, Obaydullah 151, 152
Marino, Ralph 464
Marklund, Niklas 397, 172
Marquez, Maru 377
Marrocco, Stephanie 439, 419, 414
Marshall, Ruth 208
Marshall, Ruth 252, 244
Martin, Maria 469
Martin, Ryan 319
Martin Ginis, Kathleen 79
Martin Ginis, Kathleen A. 95
Martinelli, Louis 420
Martinez-Arizala, Alberto 121
Martyn, Ryan 321, 387
Maschke, Renee 219
Mashhoof Fard, Aram 435, 438, 436
Maske, Renee 219
Mason, Lydia 320
Masuda, Muneaki 15, 487, 270, 169
Masuda, Muneaki 290
Masutani, Norimitsu 353, 242, 375
Mat Rosly, Hadi 68
Metli, Neslihan 457
Meyer, Thorsten 170
Michálková, Veronika 269
Middleton, James 337, 485
Middleton, James 324
Middleton, James 354
Middleton, James W 379, 367
Mikkelsen, Ellen 112
Millard, Melinda 333
Milligan, James 65, 66
Mills, Sandra 302
Milloshevska, Vesna 190
Mimura, Masaru 62
Mirrado, Ana 429
Mischke, Claudia 110
Miskevics, Scott 114
Mitsiokapa, Evanthia 357, 350, 347, 345, 343
Miyakoshi, Naohisa 179, 242, 375
MIYAKOSHI, NAOHISA 154
Mizuno, Juncihi 40
Mizutani, Takashi 353, 242, 375
Molinary, Marco 4, 30, 3
Molony, Catriona 261
Montanari, Federica 295
Monypenny, Frances 485
Moolya, Srinivasa N 385
Moon, Myung Hoon 80
Morgan, Sarah 132
Mori, Eiji 15, 290, 487, 169
Morishita, Yuichiro 290, 487, 169
Morishita, Yuichiro 270
MORTIER, Pierre Eugene 288
Moseley, Gemma 52
Mothabeng, Joyce 501
Moviglia, Gustavo 398, 136
<table>
<thead>
<tr>
<th>Name</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mat Rosly, Maziah</td>
<td>68</td>
</tr>
<tr>
<td>Mathew, K</td>
<td>421</td>
</tr>
<tr>
<td>Mathew, Kidangalil</td>
<td>441, 416</td>
</tr>
<tr>
<td>Matsubayashi, Kohei</td>
<td>62</td>
</tr>
<tr>
<td>Matsumoto, Morio</td>
<td>81, 38, 314, 62</td>
</tr>
<tr>
<td>Matsunaga, Toshiki</td>
<td>353, 179, 242, 375</td>
</tr>
<tr>
<td>MATSUNAGA, TOSHIKI</td>
<td>154</td>
</tr>
<tr>
<td>Matsushita, Akinobu</td>
<td>290, 487, 270, 169</td>
</tr>
<tr>
<td>Mavrogenis, Andreas</td>
<td>357, 350, 347, 345, 349, 343</td>
</tr>
<tr>
<td>Maye, Fiona</td>
<td>431, 432</td>
</tr>
<tr>
<td>Mazzoleni, Stefano</td>
<td>118, 197</td>
</tr>
<tr>
<td>Mazzoli, Norma</td>
<td>199</td>
</tr>
<tr>
<td>Mc Donagh, Cara</td>
<td>298</td>
</tr>
<tr>
<td>McGroarty, Marie</td>
<td>422</td>
</tr>
<tr>
<td>McHugh, Maire</td>
<td>117, 116</td>
</tr>
<tr>
<td>McKenna, Steven</td>
<td>294</td>
</tr>
<tr>
<td>McKenzie, Nicole</td>
<td>462, 463</td>
</tr>
<tr>
<td>McKerracher, Lisa</td>
<td>454</td>
</tr>
<tr>
<td>McManus, Alexandra</td>
<td>279</td>
</tr>
<tr>
<td>McMillan, Colleen</td>
<td>66</td>
</tr>
<tr>
<td>McPhail, Lowell</td>
<td>313</td>
</tr>
<tr>
<td>McRae, Jackie</td>
<td>126, 127</td>
</tr>
<tr>
<td>Matsumoto, Morio</td>
<td>81, 38, 314, 62</td>
</tr>
<tr>
<td>Matsunaga, Toshiki</td>
<td>353, 179, 242, 375</td>
</tr>
<tr>
<td>MATSUNAGA, TOSHIKI</td>
<td>154</td>
</tr>
<tr>
<td>Matsushita, Akinobu</td>
<td>290, 487, 270, 169</td>
</tr>
<tr>
<td>Mavrogenis, Andreas</td>
<td>357, 350, 347, 345, 349, 343</td>
</tr>
<tr>
<td>Maye, Fiona</td>
<td>431, 432</td>
</tr>
<tr>
<td>Mazzoleni, Stefano</td>
<td>118, 197</td>
</tr>
<tr>
<td>Mazzoli, Norma</td>
<td>199</td>
</tr>
<tr>
<td>Mc Donagh, Cara</td>
<td>298</td>
</tr>
<tr>
<td>McGroarty, Marie</td>
<td>422</td>
</tr>
<tr>
<td>McHugh, Maire</td>
<td>117, 116</td>
</tr>
<tr>
<td>McKenna, Steven</td>
<td>294</td>
</tr>
<tr>
<td>McKenzie, Nicole</td>
<td>462, 463</td>
</tr>
<tr>
<td>McKerracher, Lisa</td>
<td>454</td>
</tr>
<tr>
<td>McManus, Alexandra</td>
<td>279</td>
</tr>
<tr>
<td>McMillan, Colleen</td>
<td>66</td>
</tr>
<tr>
<td>McPhail, Lowell</td>
<td>313</td>
</tr>
<tr>
<td>McRae, Jackie</td>
<td>126, 127</td>
</tr>
<tr>
<td>Naidoo, Anitha</td>
<td>427, 94</td>
</tr>
<tr>
<td>Nakamura, Masaya</td>
<td>51, 147, 81, 38, 314, 62</td>
</tr>
<tr>
<td>Nakamura, Takeshi</td>
<td>111, 317</td>
</tr>
<tr>
<td>Nalim, Claudio</td>
<td>199</td>
</tr>
<tr>
<td>Nash, Mark S.</td>
<td>411</td>
</tr>
<tr>
<td>Navarro-Otano, Judith</td>
<td>320</td>
</tr>
<tr>
<td>Nachtegaal, Janneke</td>
<td>335</td>
</tr>
<tr>
<td>Nachtegaal, Janneke</td>
<td>172</td>
</tr>
<tr>
<td>Nagoshi, Narihito</td>
<td>81, 38, 62</td>
</tr>
<tr>
<td>Naicker,</td>
<td>458</td>
</tr>
<tr>
<td>Amaramalar Selvi</td>
<td>427, 94</td>
</tr>
<tr>
<td>Naidoo, Anitha</td>
<td>427, 94</td>
</tr>
<tr>
<td>Nakamura, Masaya</td>
<td>51, 147, 81, 38, 314, 62</td>
</tr>
<tr>
<td>Nakamura, Takeshi</td>
<td>111, 317</td>
</tr>
<tr>
<td>Nalim, Claudio</td>
<td>199</td>
</tr>
<tr>
<td>Nash, Mark S.</td>
<td>411</td>
</tr>
<tr>
<td>Navarro-Otano, Judith</td>
<td>320</td>
</tr>
<tr>
<td>March, K</td>
<td>421</td>
</tr>
<tr>
<td>Moviglia, Maria Teresita</td>
<td>398</td>
</tr>
<tr>
<td>Moviglia, Brandolino, Maria Teresita</td>
<td>136</td>
</tr>
<tr>
<td>Mozzone, Silvia</td>
<td>383, 384</td>
</tr>
<tr>
<td>Mueller, Gabi</td>
<td>185, 189</td>
</tr>
<tr>
<td>Mueller, Gabi</td>
<td>75</td>
</tr>
<tr>
<td>Mukai, Yuki</td>
<td>317</td>
</tr>
<tr>
<td>Mulcahey, Mary Jane</td>
<td>401</td>
</tr>
<tr>
<td>Mulcahey, MJ</td>
<td>379, 31, 486</td>
</tr>
<tr>
<td>Muldoon, Stephen</td>
<td>247, 246, 367, 148</td>
</tr>
<tr>
<td>Muldoon, Stephen</td>
<td>88</td>
</tr>
<tr>
<td>Mullane, Marianne</td>
<td>355, 359, 354</td>
</tr>
<tr>
<td>Muller, Rachel</td>
<td>200, 145</td>
</tr>
<tr>
<td>Munce, Sarah</td>
<td>488, 450, 221, 322</td>
</tr>
<tr>
<td>Murillo, Narda</td>
<td>172</td>
</tr>
<tr>
<td>Murray, Herndon</td>
<td>142, 292</td>
</tr>
<tr>
<td>Murray, H Herndon</td>
<td>368</td>
</tr>
<tr>
<td>Musco, Stefania</td>
<td>226, 82, 2, 224, 109</td>
</tr>
<tr>
<td>Musco, Stefania</td>
<td>83</td>
</tr>
<tr>
<td>Musselman, Kristin</td>
<td>235, 437, 165, 78, 266</td>
</tr>
<tr>
<td>Musumeci, Gaia</td>
<td>340</td>
</tr>
<tr>
<td>Myburgh, J.G</td>
<td>274, 273</td>
</tr>
</tbody>
</table>
Nayar, Meenakshi 425, 371
Nella, Athina-Maria 268, 278
Neovius, Kristian 58, 29
Netten, Gerbrig 296
New, Peter 213, 453, 37, 223
New, Peter 210
Newton, Robert U. 61
Ngaosinchai, Siriwan Surapitoon 7
Ni, Pengsheng 464
Nicolotti, Domenico 362
Nielsen, Steffen Dam 87, 134

O
Oates, Alison 235, 437
O’Connell, Colleen 325
O’Connell, Colleen 239
O’Connor, Lorna 173, 52
Odenkirchen, Joanne 31
O’Donoghue, Fergal J. 158, 159, 160
O’Driscoll, Jean 260
Ogawa, Takahiro 317
Ogonowska, Joanna 430
Oh, Seon-jeong 25, 24
Ohlmeier, Malte 400, 403
Ohnmar Htwe, Rashidah Ismail 458
Ohno, Teruaki 101
Okada, Seiji 290
Okano, Hideyuki 51, 81, 38, 62
Okubo, Toshiki 38

Ö
Öneş, Kadriye 433, 304, 465

P
Pagliacci, Maria Cristina 219
Paglierani, Paola 340
Paiken, Lauren 259
Pais Carvalho, Maria 303, 222
Nolan, Maeve 431, 432
Nomoto, Norie 73
Noonan, Vanessa 489, 453, 462, 450, 5, 322, 463
Noonan, Vanessa 367, 482
Novillo, German 172
Nunn, Andrew 333
Nutlin, Bart 449
Nützi, Marina 48
Nyberg, Heli 45

Oleson, Christina 140
Oliveira, Bea IRD 143
Olivi, Silvia 340
Omar, I 327
Onal, Bashak 33
Onders, Raymond 330, 328
Ones, Kadriye 366
Oo, Tun 360
Oosman, Sarah 165
Opheim, Arve 172
Opris, Ioan 412
Osman, Aheed 272, 311
Osterthun, Rutger 312
Ota, Mitsutoshi 176
Ottaviani, Silvia 4
Ozaki, Masahiroyo 81

Pettersen, Ann Louise 181
Pfister, Mirjam 185, 189
Phadke, Vandana 356
Phadke, Kedar 379
Öneş, Kadriye 445
<table>
<thead>
<tr>
<th>Name</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paker, Nurdan</td>
<td>433, 363, 366, 304</td>
</tr>
<tr>
<td>Phillips, Julie</td>
<td>299</td>
</tr>
<tr>
<td>Pan, Jonathan</td>
<td>294</td>
</tr>
<tr>
<td>Piazza, Stefano</td>
<td>56</td>
</tr>
<tr>
<td>Panini, Claudia</td>
<td>461</td>
</tr>
<tr>
<td>Piccone, Samanta</td>
<td>398</td>
</tr>
<tr>
<td>Panneke, Jurgen</td>
<td>192, 170</td>
</tr>
<tr>
<td>Pico, Anton</td>
<td>327</td>
</tr>
<tr>
<td>Papagelopoulos, Panayiotis</td>
<td>22</td>
</tr>
<tr>
<td>Picone, Samanta</td>
<td>136</td>
</tr>
<tr>
<td>Papagelopoulos, Panagiotis</td>
<td>357, 350, 347, 345, 349, 343</td>
</tr>
<tr>
<td>Pires, Gonçalo</td>
<td>440, 469</td>
</tr>
<tr>
<td>Papetti, Rossella</td>
<td>219</td>
</tr>
<tr>
<td>Pires, Jennifer</td>
<td>468</td>
</tr>
<tr>
<td>Parashar, Divya</td>
<td>213, 223</td>
</tr>
<tr>
<td>Pisano, Patrizia</td>
<td>201</td>
</tr>
<tr>
<td>Park, Han-Kyul</td>
<td>182</td>
</tr>
<tr>
<td>Pistorini, Caterina</td>
<td>201</td>
</tr>
<tr>
<td>Park, Seong-Hee</td>
<td>84</td>
</tr>
<tr>
<td>Pivetta, Alessandra</td>
<td>442</td>
</tr>
<tr>
<td>Parner, Erik</td>
<td>112</td>
</tr>
<tr>
<td>Plotkin, Anton</td>
<td>42</td>
</tr>
<tr>
<td>Papetti, Rossella</td>
<td>219</td>
</tr>
<tr>
<td>Popescu, Eugen</td>
<td>255</td>
</tr>
<tr>
<td>Patil, Siddeshwar</td>
<td>474, 467, 481, 471</td>
</tr>
<tr>
<td>Pajjai, Milos</td>
<td>447</td>
</tr>
<tr>
<td>Pavese, Chiara</td>
<td>316</td>
</tr>
<tr>
<td>Portolés, Maria</td>
<td>249</td>
</tr>
<tr>
<td>Pavlichek, David</td>
<td>192</td>
</tr>
<tr>
<td>Post, Marcel</td>
<td>71, 312, 223</td>
</tr>
<tr>
<td>Paz, Fatima</td>
<td>260</td>
</tr>
<tr>
<td>Post, Marcel WM</td>
<td>379, 367</td>
</tr>
<tr>
<td>Pazzaglia, Mariella</td>
<td>3</td>
</tr>
<tr>
<td>Postiglione, Marco</td>
<td>224, 300, 228, 171</td>
</tr>
<tr>
<td>Peckham, P Hunter</td>
<td>454</td>
</tr>
<tr>
<td>Popovic, Milos</td>
<td>447</td>
</tr>
<tr>
<td>Peixoto, Irina</td>
<td>303</td>
</tr>
<tr>
<td>Portolés, Maria</td>
<td>249</td>
</tr>
<tr>
<td>Pelosi, Giovana</td>
<td>326</td>
</tr>
<tr>
<td>Post, Marcel</td>
<td>315</td>
</tr>
<tr>
<td>Penninx, Frans</td>
<td>141</td>
</tr>
<tr>
<td>Post, Marcel WM</td>
<td>352</td>
</tr>
<tr>
<td>PEPSICI Collaboration,</td>
<td>33</td>
</tr>
<tr>
<td>Postma, Karin</td>
<td>296, 213, 141, 233, 71, 312, 223</td>
</tr>
<tr>
<td>Pereira, Carlos</td>
<td>440, 222</td>
</tr>
<tr>
<td>Postiglione, Marco</td>
<td>224, 300, 228, 171</td>
</tr>
<tr>
<td>Pereira, Carlos Ernesto</td>
<td>393</td>
</tr>
<tr>
<td>Postma, Karin</td>
<td>315</td>
</tr>
<tr>
<td>Perez, Salomé</td>
<td>121</td>
</tr>
<tr>
<td>Postma, Marcel WM</td>
<td>379, 367</td>
</tr>
<tr>
<td>Perez, Ramiro</td>
<td>376</td>
</tr>
<tr>
<td>Prasad, Anjani</td>
<td>94</td>
</tr>
<tr>
<td>Perez-San Pablo, Isaac</td>
<td>106</td>
</tr>
<tr>
<td>Prasad, Lata</td>
<td>124</td>
</tr>
<tr>
<td>Perez-Sanpablo, Alberto Isaac</td>
<td>168</td>
</tr>
<tr>
<td>PREVINAIRE, Jean Gabriel</td>
<td>288</td>
</tr>
<tr>
<td>Perez-Zavala, Ramiro</td>
<td>168</td>
</tr>
<tr>
<td>Price, Chloe</td>
<td>391</td>
</tr>
<tr>
<td>Perez-Zavala, Ramiro</td>
<td>106</td>
</tr>
<tr>
<td>Prodinger, Birgit</td>
<td>271</td>
</tr>
<tr>
<td>Perret, Claudio</td>
<td>185, 189</td>
</tr>
<tr>
<td>Prodinger, Birgit</td>
<td>198</td>
</tr>
<tr>
<td>Peter, Claudio</td>
<td>137</td>
</tr>
<tr>
<td>Pujol, Clara</td>
<td>165</td>
</tr>
<tr>
<td>Petit, Yvan</td>
<td>448</td>
</tr>
<tr>
<td>Purcell, Mariel</td>
<td>212, 211, 209</td>
</tr>
<tr>
<td>Puzić, Nataša</td>
<td>115</td>
</tr>
</tbody>
</table>

Q
<table>
<thead>
<tr>
<th>Name</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadir, M</td>
<td>89</td>
</tr>
<tr>
<td>Quel De Oliveira, Camila</td>
<td>324</td>
</tr>
<tr>
<td>Quiñones-Uriostegui, Ivett</td>
<td>168</td>
</tr>
<tr>
<td>Quinzaños-Fresnedo, Jimena</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Raab, Anja M</td>
<td>189</td>
</tr>
<tr>
<td>Raab, Anja M.</td>
<td>185</td>
</tr>
<tr>
<td>Raffaele, Elizabeth</td>
<td>313</td>
</tr>
<tr>
<td>Rahman, Akhlas</td>
<td>88, 89</td>
</tr>
<tr>
<td>RAKOTONIRAINY, Jean Jacques</td>
<td>399</td>
</tr>
<tr>
<td>Renaud</td>
<td></td>
</tr>
<tr>
<td>Ramachandran, Unnikrishnnan</td>
<td>124</td>
</tr>
<tr>
<td>Ramanathan, Shruthikaa</td>
<td>371</td>
</tr>
<tr>
<td>Rampello, Rosetta</td>
<td>442</td>
</tr>
<tr>
<td>Rana, Chanda</td>
<td>332</td>
</tr>
<tr>
<td>Rapidi, Christina</td>
<td>349</td>
</tr>
<tr>
<td>Rapidi, Christina-anastasia</td>
<td></td>
</tr>
<tr>
<td>Rapidi, Christina-Anastasia</td>
<td>268</td>
</tr>
<tr>
<td>Ratha Krishnan, Rathi</td>
<td>19</td>
</tr>
<tr>
<td>Rawat, Nisha</td>
<td>364</td>
</tr>
<tr>
<td>Raza, Wajid</td>
<td>474, 467, 481, 471</td>
</tr>
<tr>
<td>Recio, Marta</td>
<td>260</td>
</tr>
<tr>
<td>Refshauge, Kathryn</td>
<td>324</td>
</tr>
<tr>
<td>Reinhardt, Jan D</td>
<td>352</td>
</tr>
<tr>
<td>Reis, Virginia</td>
<td>303</td>
</tr>
<tr>
<td>Reynard, John</td>
<td>150</td>
</tr>
<tr>
<td>Ribeill, Cornelia</td>
<td>172</td>
</tr>
<tr>
<td>Ricci, Federica</td>
<td>30</td>
</tr>
<tr>
<td>Richardson, Michael</td>
<td>291</td>
</tr>
<tr>
<td>Richner, Lea</td>
<td>289</td>
</tr>
<tr>
<td>Riedstra, Andries</td>
<td>141</td>
</tr>
<tr>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Sacco, Carlo</td>
<td>340</td>
</tr>
<tr>
<td>Sachdev, Gaurav</td>
<td>356</td>
</tr>
<tr>
<td>Sachdeva, Gaurav</td>
<td>369</td>
</tr>
<tr>
<td>Sachdeva, Gaurav</td>
<td>367</td>
</tr>
<tr>
<td>Sadiqi, Said</td>
<td>379</td>
</tr>
<tr>
<td>Saif, Mofid</td>
<td>260, 427, 174</td>
</tr>
<tr>
<td>Rosenblum, David</td>
<td>464</td>
</tr>
<tr>
<td>Ross, Jacqueline</td>
<td>378</td>
</tr>
<tr>
<td>Rziai, Joanna</td>
<td>430</td>
</tr>
<tr>
<td>Rubinelli, Sara</td>
<td>164, 460, 204, 374</td>
</tr>
<tr>
<td>Ruf, Cordula</td>
<td>265</td>
</tr>
<tr>
<td>Rup, Rüdiger</td>
<td>149, 178</td>
</tr>
<tr>
<td>Rustici, Alessandro</td>
<td>118, 197</td>
</tr>
<tr>
<td>Rutter, Michael</td>
<td>321, 319</td>
</tr>
<tr>
<td>Ryabov, Sergey</td>
<td>216</td>
</tr>
<tr>
<td>Ryan, Suzanne</td>
<td>152</td>
</tr>
<tr>
<td>Ryerson Espino, Susan</td>
<td></td>
</tr>
<tr>
<td>Simas, Pedro</td>
<td>389</td>
</tr>
<tr>
<td>Simpson, Anthony</td>
<td>302</td>
</tr>
<tr>
<td>Singh, Hardeep</td>
<td>266</td>
</tr>
<tr>
<td>Singh, Neha</td>
<td>409</td>
</tr>
<tr>
<td>Singh, Rahul</td>
<td>258</td>
</tr>
<tr>
<td>Name</td>
<td>Pages</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Saijets, Nelli</td>
<td>309</td>
</tr>
<tr>
<td>Saito, Junya</td>
<td>176</td>
</tr>
<tr>
<td>Saito, Kimio</td>
<td>353, 375</td>
</tr>
<tr>
<td>Saito, Klmio</td>
<td>242</td>
</tr>
<tr>
<td>SAIITO, KIMIO</td>
<td>154</td>
</tr>
<tr>
<td>Sakai, Daisuke</td>
<td>202</td>
</tr>
<tr>
<td>Sakai, Hiroaki</td>
<td>15, 20, 290, 487, 270, 169, 101</td>
</tr>
<tr>
<td>Sakalis, Vasileios</td>
<td>391</td>
</tr>
<tr>
<td>Salci, Konstantin</td>
<td>397</td>
</tr>
<tr>
<td>Samdani, Amer</td>
<td>401</td>
</tr>
<tr>
<td>Samuelsson, Kersti</td>
<td>172</td>
</tr>
<tr>
<td>Sanada, Nao</td>
<td>73</td>
</tr>
<tr>
<td>Sanchez, Francisco</td>
<td>412</td>
</tr>
<tr>
<td>Sandner, Elisabeth</td>
<td>130</td>
</tr>
<tr>
<td>Santullo, Piera</td>
<td>413, 477, 427</td>
</tr>
<tr>
<td>Santullo, Pierra</td>
<td>260</td>
</tr>
<tr>
<td>Sarda, Kanchan</td>
<td>490</td>
</tr>
<tr>
<td>Sasaki, Yusuke</td>
<td>317</td>
</tr>
<tr>
<td>Sato, Masato</td>
<td>202</td>
</tr>
<tr>
<td>Sato, Nori</td>
<td>240</td>
</tr>
<tr>
<td>Savic, Gordana</td>
<td>286, 54, 477</td>
</tr>
<tr>
<td>Schaefer, Dirk</td>
<td>280</td>
</tr>
<tr>
<td>Schedin Leuiflsrud, Annelie</td>
<td>352</td>
</tr>
<tr>
<td>Scheel, Anke</td>
<td>33</td>
</tr>
<tr>
<td>Scheel-Sailer, Anke</td>
<td>264, 460, 204, 280, 133, 198</td>
</tr>
<tr>
<td>Scheel-Sailer, Anke</td>
<td>374</td>
</tr>
<tr>
<td>Schembri, Rachel</td>
<td>248</td>
</tr>
<tr>
<td>Schembri, Rachel</td>
<td>241</td>
</tr>
<tr>
<td>Schmid, Brigitte</td>
<td>23</td>
</tr>
<tr>
<td>Schmidt, Chris</td>
<td>394</td>
</tr>
<tr>
<td>Schmitt, Klaus</td>
<td>198</td>
</tr>
<tr>
<td>Schubert, Martin</td>
<td>316</td>
</tr>
<tr>
<td>Schuetz, Michael</td>
<td>482</td>
</tr>
<tr>
<td>Schudl, Christian</td>
<td>178, 287</td>
</tr>
<tr>
<td>Schwager, Christa</td>
<td>75</td>
</tr>
<tr>
<td>Schwegler, Urban</td>
<td>48</td>
</tr>
<tr>
<td>Schweidler, Joachim</td>
<td>178</td>
</tr>
<tr>
<td>SCI KMN,</td>
<td>325</td>
</tr>
<tr>
<td>Scivoletto, Giorgio</td>
<td>149, 4, 377, 2, 3</td>
</tr>
<tr>
<td>Scovil, Carol</td>
<td>407, 310, 325, 417</td>
</tr>
<tr>
<td>Name</td>
<td>Pages</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Seelen, Henk</td>
<td>166, 167</td>
</tr>
<tr>
<td>Segerer, Wolfgang</td>
<td>145</td>
</tr>
<tr>
<td>Seiger, Åke</td>
<td>299</td>
</tr>
<tr>
<td>Sen, Ekin Ilke</td>
<td>433</td>
</tr>
<tr>
<td>Sen, Ekin Ilke</td>
<td>465</td>
</tr>
<tr>
<td>Seo, Hyoung Yeon</td>
<td>18</td>
</tr>
<tr>
<td>Seo, Jeong-Hwan</td>
<td>85</td>
</tr>
<tr>
<td>SEO, Jeong-Hwan</td>
<td>84</td>
</tr>
<tr>
<td>Serrano, Maria</td>
<td>249</td>
</tr>
<tr>
<td>Seymour, Alison</td>
<td>389</td>
</tr>
<tr>
<td>Shah, Garima</td>
<td>235, 78</td>
</tr>
<tr>
<td>Shah, Julian</td>
<td>327</td>
</tr>
<tr>
<td>Shah, Meeral</td>
<td>266</td>
</tr>
<tr>
<td>Sharawat, Rajesh</td>
<td>356</td>
</tr>
<tr>
<td>Sharawat, Rajesh</td>
<td>163</td>
</tr>
<tr>
<td>Sharkey, David</td>
<td>252</td>
</tr>
<tr>
<td>Sharma, Shruti</td>
<td>392</td>
</tr>
<tr>
<td>Sharwood, Lisa</td>
<td>337</td>
</tr>
<tr>
<td>Shee, Ipsita</td>
<td>338</td>
</tr>
<tr>
<td>Sheikh, Muniza</td>
<td>31</td>
</tr>
<tr>
<td>Shepherd, John</td>
<td>488, 450, 322</td>
</tr>
<tr>
<td>Sherawat, Rajesh</td>
<td>206</td>
</tr>
<tr>
<td>Shiba, Keichiro</td>
<td>101</td>
</tr>
<tr>
<td>Shiba, Keiihiro</td>
<td>15, 20, 290, 487, 169, 155</td>
</tr>
<tr>
<td>Shimada, Yoichi</td>
<td>353, 179, 242, 375</td>
</tr>
<tr>
<td>SHIMADA, YOICHI</td>
<td>154</td>
</tr>
<tr>
<td>Shin, Hyung-Ik</td>
<td>43</td>
</tr>
<tr>
<td>Shin, Ji Cheol</td>
<td>184, 334</td>
</tr>
<tr>
<td>Shin, Ji-Cheol</td>
<td>182</td>
</tr>
<tr>
<td>Short, Debbie</td>
<td>276</td>
</tr>
<tr>
<td>Shushan, Sagit</td>
<td>42</td>
</tr>
<tr>
<td>Sigvardsson, Sofi</td>
<td>58, 29</td>
</tr>
<tr>
<td>Stapelfeldt, Christina Malmose</td>
<td>112</td>
</tr>
<tr>
<td>Steensgaard, Randi</td>
<td>74</td>
</tr>
<tr>
<td>Steeves, John D</td>
<td>434, 454</td>
</tr>
<tr>
<td>Steeves, John</td>
<td>490</td>
</tr>
<tr>
<td>Stefas, Eleftherios</td>
<td>347, 349</td>
</tr>
<tr>
<td>Steinberg, Gary</td>
<td>318</td>
</tr>
<tr>
<td>Stell, Anthony</td>
<td>245</td>
</tr>
<tr>
<td>Stephenson, Fiona</td>
<td>142, 247, 13, 246</td>
</tr>
<tr>
<td>Stephens, John</td>
<td>496</td>
</tr>
<tr>
<td>Stolwijk, Janneke</td>
<td>141</td>
</tr>
<tr>
<td>Stout, Conor</td>
<td>261</td>
</tr>
<tr>
<td>Stoyanov, Jivko</td>
<td>192</td>
</tr>
<tr>
<td>Strachan, Dorothy</td>
<td>454</td>
</tr>
<tr>
<td>Straus, Sharon</td>
<td>221</td>
</tr>
<tr>
<td>Strauss, Sharon</td>
<td>67</td>
</tr>
<tr>
<td>Stucki, Gerold</td>
<td>271, 460, 204, 23, 374</td>
</tr>
<tr>
<td>Subong, Paul</td>
<td>174</td>
</tr>
<tr>
<td>Suen, Catherine</td>
<td>294</td>
</tr>
<tr>
<td>Suen, CG.</td>
<td>461</td>
</tr>
<tr>
<td>Suero, Eduardo</td>
<td>403</td>
</tr>
<tr>
<td>Sutherland, Kate</td>
<td>158, 159, 160</td>
</tr>
<tr>
<td>Sutter, Reto</td>
<td>308</td>
</tr>
<tr>
<td>Suzuki, Hidenori</td>
<td>21</td>
</tr>
<tr>
<td>Svensson, Peter</td>
<td>382</td>
</tr>
<tr>
<td>Sviklina, Inese</td>
<td>459</td>
</tr>
<tr>
<td>Swaine, Jillian</td>
<td>359, 354</td>
</tr>
<tr>
<td>Swaine, Jillian</td>
<td>355</td>
</tr>
<tr>
<td>Şans, Zihni</td>
<td>329</td>
</tr>
<tr>
<td>Şen, Ekin Ilke</td>
<td>304, 445</td>
</tr>
<tr>
<td>Šavrin, Rajmond</td>
<td>115</td>
</tr>
<tr>
<td>Taguchi, Toshihiko</td>
<td>21</td>
</tr>
<tr>
<td>Thiyagarajan, Chinnaya Asari</td>
<td>94</td>
</tr>
<tr>
<td>Name</td>
<td>Page Numbers</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Tajima, Fumihiro</td>
<td>111, 317</td>
</tr>
<tr>
<td>Takahashi, Yasuhiro</td>
<td>353, 242, 375</td>
</tr>
<tr>
<td>Takahashi, Yusuke</td>
<td>353, 375</td>
</tr>
<tr>
<td>TAKAHASHI, YASUHIRO</td>
<td>154</td>
</tr>
<tr>
<td>Takao, Tsuneaki</td>
<td>15, 290, 487, 270, 169</td>
</tr>
<tr>
<td>Takata, Norio</td>
<td>62</td>
</tr>
<tr>
<td>Takemitsu, Masakazu</td>
<td>147</td>
</tr>
<tr>
<td>Talbott, Jason</td>
<td>294</td>
</tr>
<tr>
<td>Talbott, JF</td>
<td>461</td>
</tr>
<tr>
<td>Taly, Arun</td>
<td>1</td>
</tr>
<tr>
<td>Tamburella, Federica</td>
<td>4</td>
</tr>
<tr>
<td>Tan, Charlotte</td>
<td>76</td>
</tr>
<tr>
<td>Tansey, Keith</td>
<td>285</td>
</tr>
<tr>
<td>Tashiro,SYoichi</td>
<td>51</td>
</tr>
<tr>
<td>Tasiemski, Tomasz</td>
<td>50</td>
</tr>
<tr>
<td>Tasiemski, Tomasz</td>
<td>256</td>
</tr>
<tr>
<td>Tate, Denise</td>
<td>175, 213, 464, 223</td>
</tr>
<tr>
<td>Taylor, Carolyn</td>
<td>52</td>
</tr>
<tr>
<td>Taylor, Julian</td>
<td>33, 56</td>
</tr>
<tr>
<td>Tedeschi, Sara</td>
<td>226</td>
</tr>
<tr>
<td>Tekdös, Demet</td>
<td>361</td>
</tr>
<tr>
<td>Terwilliger, Virginia</td>
<td>306</td>
</tr>
<tr>
<td>Tesini, Stefanie</td>
<td>75</td>
</tr>
<tr>
<td>Tessari, Anna</td>
<td>442</td>
</tr>
<tr>
<td>Tetreault, Lindsay</td>
<td>117, 116, 119</td>
</tr>
<tr>
<td>Tetzlaff, Wolfram</td>
<td>313</td>
</tr>
<tr>
<td>Thapa, Bishow</td>
<td>332</td>
</tr>
<tr>
<td>Thapa Dungana, Esha</td>
<td>247</td>
</tr>
<tr>
<td>Theron, Francois</td>
<td>274, 273</td>
</tr>
<tr>
<td>Theys, Tom</td>
<td>449</td>
</tr>
<tr>
<td>Ueda, Takayoshi</td>
<td>101</td>
</tr>
<tr>
<td>Ueta, Takayoshi</td>
<td>290, 487, 169, 155</td>
</tr>
<tr>
<td>Ueta, Takayoshi</td>
<td>270</td>
</tr>
<tr>
<td>Väärälä, Eija</td>
<td>309</td>
</tr>
<tr>
<td>Vainionpää, Aki</td>
<td>309</td>
</tr>
<tr>
<td>Name</td>
<td>Page(s)</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Vainionpää, Aki</td>
<td>181</td>
</tr>
<tr>
<td>Vaksha, Vedant</td>
<td>451</td>
</tr>
<tr>
<td>Valentino, Tiziana</td>
<td>171</td>
</tr>
<tr>
<td>Valles, Margarita</td>
<td>105</td>
</tr>
<tr>
<td>Valotto, Daniela</td>
<td>442</td>
</tr>
<tr>
<td>Van de Graaf, Maureen</td>
<td>296</td>
</tr>
<tr>
<td>Van Den Borne, Katrien</td>
<td>8</td>
</tr>
<tr>
<td>Van Leeuwen, Christel</td>
<td>233</td>
</tr>
<tr>
<td>Van Niekerk, A. H</td>
<td>274, 273</td>
</tr>
<tr>
<td>Van Zyl, Natasha</td>
<td>237</td>
</tr>
<tr>
<td>Vanmulken, Diana</td>
<td>166, 167</td>
</tr>
<tr>
<td>Vasconcelos, Ana</td>
<td>424</td>
</tr>
<tr>
<td>Veeger, DirkJan</td>
<td>341</td>
</tr>
<tr>
<td>Vellone, Ercole</td>
<td>383</td>
</tr>
<tr>
<td>Velstra, Inge-Marie</td>
<td>138</td>
</tr>
<tr>
<td>Venkataraman, Kavita</td>
<td>19</td>
</tr>
<tr>
<td>Vergara, Pierluigi</td>
<td>301</td>
</tr>
<tr>
<td>Verma, Saurabh</td>
<td>490</td>
</tr>
<tr>
<td>van de Graaf, Maureen</td>
<td>296</td>
</tr>
<tr>
<td>Van Den Borne, Katrien</td>
<td>8</td>
</tr>
<tr>
<td>Van Leeuwen, Christel</td>
<td>233</td>
</tr>
<tr>
<td>Van Niekerk, A. H</td>
<td>274, 273</td>
</tr>
<tr>
<td>Van Zyl, Natasha</td>
<td>237</td>
</tr>
<tr>
<td>Vanmulken, Diana</td>
<td>166, 167</td>
</tr>
<tr>
<td>Vasconcelos, Ana</td>
<td>424</td>
</tr>
<tr>
<td>Veeger, DirkJan</td>
<td>341</td>
</tr>
<tr>
<td>Vellone, Ercole</td>
<td>383</td>
</tr>
<tr>
<td>Velstra, Inge-Marie</td>
<td>138</td>
</tr>
<tr>
<td>Venkataraman, Kavita</td>
<td>19</td>
</tr>
<tr>
<td>Vergara, Pierluigi</td>
<td>301</td>
</tr>
<tr>
<td>Verma, Saurabh</td>
<td>490</td>
</tr>
<tr>
<td>van Asbeck, Floris</td>
<td>312</td>
</tr>
<tr>
<td>van De Meent, Henk</td>
<td>255</td>
</tr>
<tr>
<td>van den Berg-Emons, Rita</td>
<td>8</td>
</tr>
<tr>
<td>van der Scheer, Jan W.</td>
<td>95</td>
</tr>
<tr>
<td>van der Woude, Lucas</td>
<td>341</td>
</tr>
<tr>
<td>van Koppenhagen, Casper</td>
<td>71, 312</td>
</tr>
<tr>
<td>van Leeuwen, Christel</td>
<td>141</td>
</tr>
<tr>
<td>Wade, Rodney</td>
<td>281</td>
</tr>
<tr>
<td>Wagnac, Eric</td>
<td>448</td>
</tr>
<tr>
<td>Name</td>
<td>Pages</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Wagner, Benjamin</td>
<td>319, 387</td>
</tr>
<tr>
<td>Wagner, Benjamin</td>
<td>321</td>
</tr>
<tr>
<td>Wahman, Kerstin</td>
<td>299</td>
</tr>
<tr>
<td>Wakabayashi, Hidetaka</td>
<td>323</td>
</tr>
<tr>
<td>Walden, Kristen</td>
<td>489</td>
</tr>
<tr>
<td>Walia, Saagar</td>
<td>325</td>
</tr>
<tr>
<td>Wallace, Eva</td>
<td>298</td>
</tr>
<tr>
<td>Wallace, Dagmar</td>
<td></td>
</tr>
<tr>
<td>Wan, Eric</td>
<td>488</td>
</tr>
<tr>
<td>Wang, Justin</td>
<td>447</td>
</tr>
<tr>
<td>Wang, Mengyuan</td>
<td>188</td>
</tr>
<tr>
<td>Wang, Wenchun</td>
<td>313</td>
</tr>
<tr>
<td>Wangdell, Johanna</td>
<td>180, 183</td>
</tr>
<tr>
<td>Watanabe, Kota</td>
<td>314</td>
</tr>
<tr>
<td>Watanabe, Masahiko</td>
<td>6, 202</td>
</tr>
<tr>
<td>Watanabe, Motoyuki</td>
<td>353, 375</td>
</tr>
<tr>
<td>Weber, Kay</td>
<td>66</td>
</tr>
<tr>
<td>Weber, Matthew</td>
<td>292</td>
</tr>
<tr>
<td>Webster, Fiona</td>
<td>221</td>
</tr>
<tr>
<td>Weerts, Eric</td>
<td>496, 472</td>
</tr>
<tr>
<td>Weerts, Eric</td>
<td>368</td>
</tr>
<tr>
<td>Weidner, Norbert</td>
<td>149, 178, 287, 289</td>
</tr>
</tbody>
</table>

**X**

<table>
<thead>
<tr>
<th>Name</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xing, Huaiyi</td>
<td>178, 188, 187</td>
</tr>
</tbody>
</table>

**Y**

<table>
<thead>
<tr>
<th>Name</th>
<th>Pages</th>
<th>Name</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yadav , Shiv Lal</td>
<td>368</td>
<td>Yochelson, Michael</td>
<td>210</td>
</tr>
<tr>
<td>Yalçın, Elif</td>
<td>457</td>
<td>Yoo, Jeelyun</td>
<td>334</td>
</tr>
<tr>
<td>Yalçınkaya, Ebru</td>
<td>243</td>
<td>Youn, Kyo Jun</td>
<td>500, 499</td>
</tr>
<tr>
<td>Yilmaz</td>
<td></td>
<td>Youn, Mi Ok</td>
<td>500, 499</td>
</tr>
<tr>
<td>Yamane, Junichi</td>
<td>147</td>
<td>Yugue, Itaru</td>
<td>15, 487, 169</td>
</tr>
<tr>
<td>Yamazaki, Masashi</td>
<td>176</td>
<td>Yugue, Itaru</td>
<td>270</td>
</tr>
<tr>
<td>Yates, Allison</td>
<td>251</td>
<td>Yugué, Itaru</td>
<td>290</td>
</tr>
<tr>
<td>Yato, Yoshiyuki</td>
<td>147</td>
<td>Yuliawiratman, Brenda Saria</td>
<td>458</td>
</tr>
<tr>
<td>Yelamarthy, P K</td>
<td>385</td>
<td>Yun, Jiyoung</td>
<td>184</td>
</tr>
<tr>
<td>Kartik</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yıldırım, Mustafa Aziz</td>
<td>465, 445</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Yılmaz, Bilge 135
Yılmaz Yalcinkaya, Ebru 250

Z
Zakrakek, Elissa 331
Zampa, Agostino 220
Zanardo, Claudio 442
Zanini, Claudia 204
Zanini, Claudia 374
Zanollo, Lucia 2
Zardini, Elisa 220
Zebracki, Kathy 306
Zee, Joanne 310

Yun, Ji-Young 182
Zheng, Xianyou 214
Zheng, Zhi 245
Zhou, Mouwang 178, 188, 187
Zhu, Xiaozhong 214
Zobina, Ineta 260, 230, 229
Zoerner, Björn 446
Zucchini, Maura 228
Zvyagintseva, Marina 216