Abstracts and Workshops 7th National Spinal Cord Injury Conference November 9 – 11, 2017 Fallsview Casino Resort Niagara Falls, Ontario, Canada

First Place Award Submission - CA147
Category: Clinical Application

Management of obesity after spinal cord injury: a systematic review

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Background/Objectives: To identify and compare effective means of managing obesity in individuals with chronic spinal cord injury (SCI).
Methods/Overview: This review included English and non-English articles, published prior to January 2017 found in PubMed/Medline, Embase, Cinahl, Psychinfo and Cochrane databases. Studies evaluating any obesity management strategy alone or in combination including diet therapy, physical exercises, passive exercises such as neuro-muscular electric stimulation (NMES), pharmacotherapy, and surgery, among individuals with chronic SCI were included. Outcomes of interest were declines in waist circumference, body weight, body mass index and Total Fat Mass (TFM) and increases in total lean body mass (TLBM). From 3553 retrieved titles and abstracts, 34 articles underwent full-text review and 23 articles selected for data abstraction. Weight loss due to inflammation, cancer or B12 deficiency was excluded. The quality of the selected studies was evaluated by Downs and Black tool and found to be generally poor to medium with 4 exceptions.
Results: Bariatric surgery produced the greatest permanent weight reduction and BMI correction followed by combinations of physical exercise and diet therapy. Generally NMES and pharmacotherapy did not reduce weight but improved body composition (increases in TLBM and reductions in TFM).
Conclusions: Due to link between adiposity and all-cause mortality; obesity is a legitimate therapeutic target. A trial of diet and exercise therapy is recommended prior to definitive bariatric surgery.

Keywords: Physical Medicine and Rehabilitation, Informatics, Clinical, Rehabilitation Outcome

Source of Funding: None

First Place Award Submission - KG152
Category: Knowledge Generation

Effect of specialized inpatient rehabilitation on returning home for people with traumatic spinal cord injury

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Background/Objectives: Specialized inpatient rehabilitation assists patients with traumatic spinal cord injury (tSCI) in maximizing function and independence improving their chances of return to living at home which is important for quality of life following tSCI. The aim of this study was to describe those patients receiving specialized rehabilitation after tSCI in Canada, and to determine if such rehabilitation improved the likelihood of returning home.
Methods/Overview: The Rick Hansen SCI Registry (RHSCIR) was used to identify patients with tSCI discharged from one of 18 participating acute specialized spine facilities between 2011-2013 to either one of 13 participating specialized rehabilitation facilities, or another discharge destination. To determine if specialized rehabilitation affected likelihood of returning home, multiple logistic regressions and propensity score matching were performed. Chi-square test was used to compare rate of return home between matched groups.
Results: Of the 1449 patients included, 74% received specialized rehabilitation. After adjusting for covariates (age, gender, and injury severity), receiving specialized rehabilitation remained a significant and strong predictor of return to home (adjusted odds ratio=2.6; 95% CI 1.3-5.3). The rate of return to home was significantly higher in the matched rehabilitation group than the no rehabilitation group (94% vs 86%, p=0.04).
Conclusions: These findings demonstrate that receiving specialized rehabilitation increased the chances of patients with tSCI returning home beyond the influence of age, gender, and injury severity. The effect of age on receiving rehabilitation and on returning home requires further investigation. Maintaining access to specialized rehabilitation could potentially prevent discharges to non-home destinations including nursing homes.

Keywords: Rehabilitation Outcome, Healthcare Delivery, Statistical Data Analysis

Source of Funding: This study was supported by financial contributions from the Rick Hansen Institute and the Government of Canada through Health Canada and Western Economic Diversification Canada.

First Place Award Submission - PC153
Category: Policy Change

A cost-utility analysis comparing elderly and younger individuals with traumatic cervical spinal cord injury regarding their initial care and rehabilitation

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Background/Objectives: The aging of the population has modified the epidemiology of traumatic spinal cord injury (SCI) with an increased frequency of fall-related injuries among the elderly. Given the paucity of economic studies involving elderly individuals with SCI, a cost-utility analysis (CUA) was undertaken to assess the economic impact of older age (65 years of age or older) in the context of acute surgical management and rehabilitation of traumatic cervical SCI.
Methods/Overview: The CUA was performed under the perspective of a public health care insurer. A time horizon of 6 months from SCI onset was used. Costs were estimated in 2014 US dollars. Utilities were generated from the Surgical Timing in Acute Spinal Cord Injury Study (STASCIS).

Results: There were no significant differences between the age-related groups with regard to sex distribution, severity and level of SCI, length of stay in the acute care and rehabilitation facilities, and frequency of postoperative complications. The baseline analysis indicated that acute care and rehabilitative management of acute cervical SCI in the elderly is more costly, but similarly effective, than in younger adults. When considering acute care and rehabilitation management of younger adults with SCI as the baseline, the incremental cost-effectiveness ratio (ICER) analysis revealed an additional cost of US$ 5,655,557 per QALY gained when managing elderly patients with traumatic cervical SCI. The probabilistic analysis confirmed that spinal surgery in the elderly is more costly but similarly effective to younger adults after SCI, even though there is no definitive dominance.
Conclusions: This economic analysis indicates that acute care and neurorehabilitation management of acute traumatic cervical SCI in the elderly is more costly but similarly effective when compared with younger adults with similar injuries.

Keywords: Cost Effectiveness, Healthcare Costs, Burden of Illness

Source of Funding: Rapid Response Award from Rick Hansen Foundation; Seed Grant from the Cervical Spine Research Society.

First Place Award Submission - SS154
Category: Student Submission

Monitoring functional hand use with wearable cameras: towards a novel outcome measure for upper extremity function at home

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Background/Objectives: In order to develop effective upper limb interventions for individuals with cervical spinal cord injury (SCI), tools are needed to accurately measure hand function throughout the rehabilitation process. However, there is currently no satisfactory method to collect quantitative information about hand function in the community. The purpose of this study was to develop a system based on wearable cameras (egocentric video) that can quantify the amount of functional hand use, by detecting interactions of the hand with objects in the environment.
Methods/Overview: The first step of the video-processing algorithm is to segment out the hand from the cluttered and variable background. The second step is to extract image features associated with interactions, based on motion and shape descriptors. These features are inputted into a Random Forest classifier to classify video frames as representing interactions or not. The output is filtered with a moving average.
Results: The algorithm has been tested using egocentric videos obtained in a home-simulation laboratory, in which participants performed activities of daily living in several environments. F-scores for the interaction detection were 0.85 and 0.81 for able-bodied and spinal cord injured participants, respectively, during leave-one-activity-out cross-validation. Additionally, the algorithm was validated on a publicly available dataset of able-bodied individuals (F-score of 0.85).
Conclusions: This wearable system will allow researchers and clinicians for the first time to gauge the user's level of independence at home in activities involving upper limb function. This is a valuable tool for analyzing hand function in a variety of naturalistic contexts.

Keywords: Computer Vision Systems, Rehabilitation Outcome, Engineering, Biomedical

Source of Funding: This work was supported in part by the Natural Sciences and Engineering Research Council of Canada (RGPIN-2014-05498) and the Rick Hansen Institute (G2015-30).

Second Place Award Submission - CA149
Category: Clinical Application

Re-Shaping and Re-Invigorating SCI rehabilitation practice through a practice-based research approach

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Background/Objectives: Adherence to evidence-based practice in pursuit of best possible outcomes is a primary objective of clinical programs. Similarly, researchers are focused on producing high-quality research evidence that ultimately will be mobilized to enhance practice and improve outcomes for patients (e.g., persons with SCI). However, both of these fundamental objectives are compromised when the methods of evidence generation are limited to the traditional research pipeline culminating in randomized controlled trials. This workshop will provide a real-life example of an SCI rehabilitation program endeavouring enhancement of clinical, research and program outcomes through development and implementation of a practice-based research approach that complements traditional research methods. Examples will be presented that describes clinical implementation and research activities associated with the integration of robotic and conventional locomotor therapies to improve walking outcomes.
Methods/Overview: Illustrative examples will be presented by a researcher, a front-line clinician and a program manager that outline key adopted methods, processes and resulting outcomes associated with the practice-based approaches initiated over the past 1.5 years. These will include formation of research to practice (R2P) teams, intentional reflective practice methods, clinical protocol development, integrated systems for data management and clinical decision support and development of key indicators within an evaluative framework - all directed toward improving practice, outcomes and evidence generation associated with conventional and advanced therapies for locomotor training. The audience will be encouraged to reflect and share their own experiences that relate to the examples.
Results: Although long-term outcomes are not yet available, early findings have been extremely positive for all stakeholders: i.e., persons with SCI with enhanced outcomes despite having previously plateaued, clinicians expressing greater satisfaction and meaning with their jobs, researchers with increased data access to address more clinically relevant research questions and leaders with additional information to assess programmatic success.
Conclusions: These findings support continued evolution of these processes with a focus on evaluating impact across multiple domains (e.g., traditional research metrics of knowledge generation, capacity building, patient outcomes, economic, societal).

Keywords: Healthcare Delivery, Rehabilitation Outcome, Clinical Decision Support Systems

Source of Funding: St. Joseph Health Care Foundation / Ontario Neurotrauma Foundation Grant #: 076-1314 / RHI-DECIS-1016

Second Place Award Submission - KG151
Category: Knowledge Generation

Secondary health conditions: impact on function, health-related quality of life, and life satisfaction following traumatic spinal cord injury

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Background/Objectives: Individuals with traumatic spinal cord injury (SCI) are at risk of multiple secondary health conditions (SHCs) during community-living due to pre-existing comorbidities (e.g. high blood pressure) and development of injury-related complications (e.g. spasticity). Quantification of the impact of SHC's on patient outcomes is needed. Objective: To analyze relationships among injury, demographic and environmental factors on function, Health-Related Quality of Life (HRQoL) and life satisfaction following SCI.
Methods/Overview: Participants from the Rick Hansen Spinal Cord Injury Registry, treated at 31 Canadian acute/rehabilitation SCI centres with community follow-up between 9-18 months were included. Relationships among SCI severity ASIA Impairment Scale A-D and level (cervical/thoracolumbar), age at injury, post-discharge education, number of SHCs, function [Functional Independence Measure (FIM)], HRQoL [Short Form-36 physical/mental component scores (PCS, MCS)], and life satisfaction [Life Satisfaction-11 (LiSat-11)] were analyzed. Path analysis was conducted using Mplus (v7.1); model fit was assessed using published indices.
Results: 340 participants were included and 79.1% were male, mean age was 41.6 (±17.3), and 34.7% were AIS A. Participants had 3.1 (±2.0) SHC's. SHCs negatively affected FIM motor, SF-36 PCS and MCS and LiSat-11. Higher age, more severe injuries, cervical injuries were negatively associated with FIM motor. Increased age, less education, more severe injuries were negatively associated with a lower SF-36 PCS. Higher SF-36 MCS was associated with lower FIM motor. An increased LiSat-11 was associated with being married and higher function.
Conclusions: Individuals living in the community experience multiple SHCs and negative impact important patient outcomes including function, HRQoL and life satisfaction.

Keywords: Burden of Illness, Statistical Data Analysis, Healthcare Delivery

Source of Funding: Health Canada, Western Economic Diversification, Governments of Alberta, British Columbia, and Manitoba

Second Place Award Submission - SS156
Category: Student Submission

Barriers and facilitators to an anti-inflammatory diet in individuals with spinal cord injury

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Background/Objectives: The present study was conducted one year following a 3-month randomized control trial that investigated the effects of an anti-inflammatory diet on health outcomes after spinal cord injury (SCI). In that study 12 participants adhered to a strict diet, while 8 participants served as controls. Following the 3-

month intervention various inflammatory markers decreased in the experimental group and such changes correlated with significant improvements in neuropathic pain and depression. Objectives. The purpose of this study was to determine the barriers and facilitators for adherence to the diet.
Methods/Overview: Five participants from the larger diet study were recruited to participate in a focus group and a one-on-one interview. The focus group and interviews were guided by questions concerning participants' experiences with the diet, including perceived barriers and facilitators. Transcripts were coded inductively using thematic analysis.
Results: Facilitators for diet adherence included i) familial support and/or autonomy in meal choice and preparation, ii) peer support from fellow dieters, iii) reductions in health concerns including neuropathic pain and edema, and iv) implementing "cheat days" into the diet schedule. Barriers for diet adherence included i) food temptations during social events and holidays, ii) lack of motivation once the obligations of the study ended, iii) the expense of ingredients and supplements, iv) meal preparation time, and v) lack of knowledge regarding meal planning and preparation.
Conclusions: Many barriers and facilitators exist for adherence to a strict diet among people with SCI, and future research will focus on optimizing such factors to increase long-term adherence.

Keywords: Rehabilitation Outcome, Physical Medicine and Rehabilitation, Clinical Marker

Source of Funding: Ontario Neurotrauma Foundation Grant Number: 2011-ONF-RHI-MT-894

Third Place Award Submission - CA148
Category: Clinical Application

Barriers and facilitators to skin care in people with a spinal cord injury

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Background/Objectives: 80% of people with a spinal cord injury (SCI) develop a pressure ulcer (PU) requiring medical care. Given this lifelong risk, it is crucial for SCI patients to perform preventive skin care. Evidence suggests that adherence to skin care recommendations is low. The purpose of this study was to explore barriers and facilitators to skin checks and pressure relieving behaviours.
Methods/Overview: People with a SCI were recruited to semi-structured interviews featuring questions designed using a behaviour change framework, the Theoretical Domains Framework (TDF). Transcripts were double-coded according to their relevance to the 14 determinants of behaviour proposed in the TDF (knowledge; skills; social influence; beliefs about consequences, etc.).
Results: 35 participants were interviewed [age: 50.6, SD 14.8 (29-81); time since injury: 18.5, SD 14.3 (0.5-50 years); injury level: quadriplegic (66%), paraplegic (34%)]. Preliminary results suggest that participants were unaware of frequency recommendations for skin checks and pressure relief (Knowledge). Awareness of one's susceptibility to PUs was present (Knowledge) but often only became salient after experiencing a PU, and/or hearing PU horror stories (Reinforcement). Skin checks were not believed to require skills (Skills), but there were some differences in the quality of care received (Environment). Some intended to perform skin checks everyday (Intention), whilst others relied on sensory cues (Behavioural regulation) and situations (Memory and attention) to guide their skin checks. For pressure relieving behaviours, the location of adoption varied (Behavioural regulation/Environment) and they were sometimes considered to interfere with activities

(Belief about consequences). Having alternate reasons to engage in pressure relief was an enabler (Intention) and effective equipment was considered crucial (Environment).
Conclusions: Several factors influence skin care in people with SCI. Our findings can help design a tailored intervention to reduce pressure ulcers in the SCI community.

Keywords: Behaviour Change, Self-Management, Knowledge Translation

Source of Funding: Rick Hansen Institute - Postdoctoral Fellowship funding (2 years) (no grant number available)

Third Place Award Submission - KG150
Category: Knowledge Generation

Garment devices for delivery of complex functional electrical stimulation in individuals with spinal cord injury

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Background/Objectives: Functional electrical stimulation (FES) has been used for individuals with spinal cord injury (SCI) to efficiently re-educate their impaired neural circuits or to regain compensatory uses of their paralyzed muscles (FES therapy). The therapeutic impact of these FES treatments could be even higher if they could be applied routinely and/or during activities of daily living. However, delivering complex FES therapy in the community is limited by current equipment. We aim to solve this issue by developing stimulation devices that can be easily used at home, without professional assistance.
Methods/Overview: We designed novel wearable devices, the stimulation garments, to deliver FES on several predefined muscles without use of conductive gel. The devices have the appearance of stockings, which can stimulate lower-limbs (e.g., to stand up), and shirts capable of stimulating upper-limbs (e.g., to pick up objects). Up to 8 different muscles can be activated independently. The fabric electrodes and necessary wires are incorporated in the garment. We tested its usability with healthy individuals.
Results: Stimulation using the fabric-based electrodes was as comfortable as using conventional self-adhesive electrodes for delivering FES. The garments were tight enough to maintain the electrodes' position but did not limit the user's movements and comfort. The presetting and wiring of the electrodes allowed fast donning and doffing without requiring particular knowledge in anatomy. Sequential activation of hand, elbow and shoulder muscles with the shirt prototype induced a smooth drinking-like motion without the individual's participation.
Conclusions: Initial prototype tests showed satisfying usability with healthy individuals. Consumer and clinicians' opinions toward these stimulation garments will be qualitatively assessed through several focus groups to ensure their design matches the end-users' expectations. The first pilot tests of these stimulation garments with individuals with SCI are under preparation.

Keywords: Health Care Technology, Treatment Efficacy, Clinical Engineering

Source of Funding: Spinal Cord Injury Ontario (post-doctoral fellowship) and AGE-WELL (Graduate Student and Postdoctoral Awards)

Third Place Award Submission - SS155
Category: Student Submission

Clustering recurrent hand postures of individuals with spinal cord injury in wearable camera video

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Background/Objectives: Recovery of hand function is a priority for individuals with tetraplegia after a spinal cord injury (SCI). Existing hand function assessments are limited to a clinical setting. Use of wearable cameras allows for monitoring at home or in the community, providing data that is more representative of everyday hand function. Manual analysis of the resulting lengthy videos is infeasible, but automatic summarization could enable interpretation by a clinician. This study seeks to develop an algorithm that can identify recurrent hand postures of individuals with SCI in wearable camera video and summarize its findings in a report. The report is intended for use by a clinician to evaluate recovery of hand function.
Methods/Overview: The clustering algorithm employed was based on the Determinantal Point Process. Image features were extracted by representing each hand using a masked histogram of orientated gradients descriptor, which has been shown to work well for videos of able-bodied individuals. We validated this approach using 1,125 hand images from 3 individuals with SCI.
Results: 80.3% of hand images were assigned to a correct cluster. 51.8% of clusters formed were redundant. Some infrequent postures were not detected, corresponding to 13.6% of the images.
Conclusions: Clustering hand postures in individuals with SCI is feasible and has applications in the automated summarization of wearable camera video. Further algorithm optimization is needed to reduce cluster redundancy and the number of undetected postures. This work will facilitate the evaluation of interventions for recovery of hand function, thus helping to restore independence after SCI.

Keywords: Computer Vision Systems, Rehabilitation Outcome, Engineering, Biomedical

Source of Funding: This work was supported in part by the Natural Sciences and Engineering Research Council of Canada (RGPIN-2014-05498) and the Rick Hansen Institute (G2015-30).

Third Place Award Submission - SS157
Category: Student Submission

Single neuron control in brain-machine interfaces

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Background/Objectives: In the development of brain-machine interfaces (BMI), operant conditioning of neural activity is a strategy that has recently re-emerged from the need to design BMI systems that feel natural and intuitive to the user. In this strategy, a single cortical neuron is conditioned to produce an activity pattern that

determines when the BMI is triggered. The objective of this study was to compare performance differences between 2 types of cortical neurons undergoing a BMI task: fast-spiking, which produce fast trains or bursts, and regular-spiking, which produce slow trains of activity.
Methods/Overview: A rat was implanted with an electrode array in the motor cortex and trained to trigger a reward dispenser by activating a single cortical neuron at progressively higher firing rates. Biofeedback of the firing rate was provided as the change in brightness of a light-emitting diode. The rat was trained in 10-20-minute long experiments at a time. Neurons were classified based on their firing behaviour and spike waveform shape.
Results: We found significant performance differences between fast-spiking neurons and regular-spiking neurons. Fast-spiking neurons were able to reliably produce the desired activity pattern within minutes of training, often immediately after trial onset. In contrast, regular-spiking neurons did not show any signs of being under the effect of operant conditioning of neural activity.
Conclusions: Improving the performance and usability of BMI systems has important implications for brain-controlled assistive devices, which are used on activities of daily living by the spinal cord injury population.

Keywords: Brain-Machine Interface, Engineering, Biomedical, Graduate Students

Source of Funding: Natural Sciences and Engineering Research Council of Canada CREATE-CARE Graduate Scholarship Ontario Council on Graduate Studies and the National Council of Science and Technology of Mexico (CONACYT) Graduate Scholarship Physicians' Services Incorporated

Poster Submission - CA100
Category: Clinical Application

A systematic review on the health economics of the spinal cord injury or disease among veterans of war

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Background/Objectives: Information on health-care utilization and the economic burden of disease are essential to understanding, service demands and accessibility, practice patterns, and may ultimately be used to enhance the quality of care through altered resource allocation. Given this, a systematic review and critical appraisal of literature was undertaken to examine, for the first time, the economics of caring for veterans with spinal cord injury or disease (SCI/D).
Methods/Overview: Medline, EMBASE and PsycINFO databases were searched for articles on economic impact of management of SCI/D veterans, published from 1946 to September 2016. The search criteria included subject headings ("spinal cord injury" OR "spinal cord injuries") AND ("trauma" OR "wounds and injuries"), AND ("military" OR "military personnel" OR "war" OR "veterans" OR "combatants" OR "soldiers"), limited to "humans". This systematic review included all original articles that reported on health economics on the management of veterans with SCI/D. Case reports, animal studies, conference abstracts only, and editorials were excluded. The STROBE statement was used to determine publication quality.
Results: The search identified 1,573 publications, 13 articles fulfilled the inclusion/exclusion criteria with 12 articles focused on costs of management of SCI/D veterans; and, one cost-effectiveness analysis. Overall, the health care costs for the management of veterans with SCI/D are substantial ($30,770 to $62,563 in 2016 USD per veteran per annum) and, generally, greater than the costs of caring for patients with other chronic diseases. The key determinants of higher total health-care costs are cervical level injury, complete injury, time period (i.e. first year post-injury and end-of-life year), and presence of pressure ulcers. The only cost-effectiveness analysis revealed that a new employment program was effective but not cost saving.
Conclusions: There is growing evidence for the economic burden of SCI/D and its determinants among veterans, whereas there is a paucity of comparative studies on interventions including cost-effectiveness

analyses. Further investigations are needed to fulfill significant knowledge gaps on the economics of caring for veterans with SCI/D.

Keywords: Cost Effectiveness, Medical Care Costs, Healthcare Costs

Source of Funding: Wings for Life Research Foundation

Poster Submission - CA101
Category: Clinical Application

Epidemiology of traumatic spinal cord injuries acquired by soldiers during wartime

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Background/Objectives: Wartime requires efficiency and provides opportunity to improve medical knowledge that can eventually translate into enhanced civilian management. This study, for the first time, systematically reviewed and critically appraised the literature on the epidemiology of war-related spinal cord injuries (SCIs).
Methods/Overview: Medline, EMBASE and PsycINFO databases were searched for articles on epidemiology of war-related SCI among combatants, published from 1946 to September 2016. The search criteria included subject headings ("spinal cord injury" OR "spinal cord injuries") AND ("trauma" OR "wounds and injuries"), AND ("military" OR "military personnel" OR "war" OR "veterans" OR "combatants" OR "soldiers"), limited to "humans". This systematic review included all original articles that reported on: incidence, demographics, or injury characteristics of the war-related SCIs; bodily injuries associated with SCI; or frequency of SCI among other bodily injuries. Case reports, animal studies, conference abstracts only, and editorials were excluded. The STROBE statement was used to examine the quality of the publications.
Results: The literature search identified 1,573 publications, of which 25 articles fulfilled the inclusion and exclusion criteria in the following topics: 17 articles reported demographics, level and severity of SCI, mechanism of injury and/or associated bodily injuries; 5 articles reported the incidence of war-related SCI; and 6 articles reported the frequency of SCI among other war-related bodily injuries. Overall, military personnel with war-related SCI were typically young, white men, with predominantly thoracic or lumbar level, severe degree of SCI (complete or AIS A) secondary to gunshot or explosion and often associated with one or more other bodily injury.
Conclusions: The results of this review suggest that soldiers with war-related SCIs are distinct from spinal cord injured individuals seen among the general population. Although the clinical implications of war-related SCIs were not completely understood, their features are potentially associated with poorer prognosis that offset the few positive prognostic factors.

Keywords: Physical Medicine and Rehabilitation, Physiatry, Burden of Illness

Source of Funding: Wings for Life Research Foundation

Poster Submission - CA102
Category: Clinical Application

Fall incidence and contributors after SCI: a systematic review

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Background/Objectives: Falling is a consequence of spinal cord injury (SCI), and can lead to injury and activity restriction. Understanding why and how often individuals with SCI fall will enable design of effective fall prevention interventions. The objective of this review is to synthesize information concerning fall incidence and the factors contributing to falls, among individuals with SCI in inpatient and community settings.
Methods/Overview: Eight databases were systematically searched, with resultant records screened for inclusion/exclusion. The 17 included studies were analyzed on the basis of fall rates, injury characteristics, and contributors of falls. Rates were compared across settings and level of impairment. The contributors were categorized according to the Biological, Behavioural, Social & Economic and Environmental Model of fall risk.
Results: Eight studies examined falls prospectively while the remainder used retrospective methods, increasing the likelihood of biased results. Most studies sampled (6 months and the variability of rates increased with shorter study durations. Studies focused on community-dwelling individuals; only one study included inpatients. Fall rates were higher in the community than in inpatient rehabilitation. Within one year, 75-76% and 31% of community-dwelling ambulators and wheelchair users, respectively, fall. In contrast, 13% of inpatients fall. Most contributors to falls were categorized as biological (e.g. decreased strength). A few environmental and behavioural contributors were reported, such as environmental hazards and exercise frequency, respectively.
Conclusions: Among individuals with SCI, fall incidence in the community is high. The contributors were biological, behavioural and environmental in nature, and many are modifiable. Future research should prospectively sample rates for one year.

Keywords: Information Retrieval, Physical Medicine and Rehabilitation, Rehabilitation Outcome

Source of Funding: Rick Hansen Institute and the Ontario Neurotrauma Foundation

Poster Submission - CA103
Category: Clinical Application

Feasibility of a central recruitment process for research participation for individuals with spinal cord injuries during inpatient rehabilitation

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Background/Objectives: The central recruitment (CR) process aims to reduce patient burden, improve communication about current and future research opportunities, and enhance participation by streamlining the recruitment process for inpatients with spinal cord injury (SCI). Design: A Quality Improvement Initiative
Methods/Overview: Nurses determined patient suitability for research approach and introduction to a patient research liaison (PRL). The PRL completed chart abstraction and determined patient eligibility for studies based on inclusion/exclusions criteria, provided each inpatient with information regarding research processes, and/or obtained consent to future contact for research purposes. Eligible patients met with the PRL or study coordinator for an informed consent discussion, depending on the complexity of the study design. During this time period recruitment was ongoing for the Rick Hansen Spinal Cord Injury Registry, two multi-site cohort studies, 3 prospective observational studies, and 2 intervention studies.

Results: From July 2011 – December 2016 75% (n= 1301/1732) of all admissions were deemed suitable by nurses for approach about research participation, based on language fluency, current mental and physical health, and clinical judgment. Of these, 90% agreed to chart review, and 83.3% agreed to future research contact. During peak study recruitment periods many participants were eligible for multiple studies and 52% consented to more than one study while an inpatient at TRI.
Conclusions: Dialogue with a PRL yields high rates of willingness to discuss research opportunities, consent for screening, study participation, and consent for future research contact. In addition, patient burden is reduced by restricting multiple research personnel from approaching inpatients.

Keywords: Research, Genetic, Information Processing, Physiatry

Source of Funding: Ontario Neurotrauma Foundation ONF Grant Number: 2011-SCI-MENTOR-884

Poster Submission - CA104
Category: Clinical Application

When participation isn't enough: the international classification of functioning, disability and health, revised and applied for functional gains of a client with chronic spinal cord injury.

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Background/Objectives: The International Classification of Functioning, Disability and Health classifies and describes the functioning, health status, and impairments of individuals with health conditions, inclusive of spinal cord injury (SCI). ICF domains include health condition, body structure and function, activities, participation, and contextual influences. These descriptive domains allow healthcare professionals to look beyond the client's disability and focus on the client's participation in meaningful activities. Persons with chronic SCI may require clinicians to use an alternative mindset to look beyond participation and facilitate their performance. Objective:This case report describes the functional gains made by a 54-year-old female client with a 40-year history of C5-6 tetraplegia. The physical therapy focus replaced activity with capacity and participation with performance in the ICF.
Methods/Overview: A retrospective case study augmented by qualitative statements regarding function from the client's perspective.
Results: After 6 months of customized physical therapy intervention tailored towards the patient's self-identified goals, improvements in functional reaching, lower extremity strength, static and dynamic balance, and ambulation. Qualitative descriptors of improvement by the patient include: "my general health has improved greatly, as I have experienced less back pain, greater flexibility, improved endurance, mood and immune function."
Conclusions: Using an alternative perspective of the ICF framework had significant and salient impact on the client's functional capacity and performance, which positively influenced the client's quality of life. Exploration of a client's maximal capacity to complete a functional activity may lead to optimizing their performance and ultimate satisfaction with enhanced participation domains within the ICF framework.

Keywords: Physical Medicine and Rehabilitation, Rehabilitation Outcome, Treatment Effectiveness

Source of Funding: This is a retrospective case report and analysis, the submission fees for this poster are self-funded by the author.

Poster Submission - CA105
Category: Clinical Application

Treatment patterns of in-patient spasticity medication use among survivors of traumatic spinal cord injury: an observational canadian cohort study

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Background/Objectives: To describe treatment patterns of anti-spasticity medication use following traumatic spinal cord injury (SCI) in the post-injury in-patient hospital setting.
Methods/Overview: Prospective cohort study using the Rick Hansen SCI Registry (RHSCIR) and retrospective medical chart review. Individuals with traumatic SCI between 2005 and 2014 prospectively enrolled in the Vancouver site RHSCIR were eligible for inclusion. The primary outcome measure was the use of oral or injectable spasticity medications during in-patient hospitalization post-injury.
Results: In 771 patients, higher neurological level and more severe injury were associated with higher anti-spasticity medication use (p
Conclusions: This is the first report describing anti-spasticity medication use in a large prospective cohort with traumatic SCI in the post-injury in-patient setting. Results from our study help inform clinicians and patients with provision of "real-world" spasticity treatment patterns over time. The infrequent use of BoNT is an interesting finding, especially as it is considered a first line spasticity management option in other neurological conditions such as stroke, in which there have been numerous randomized controlled trials on its use. Currently there are no randomized controlled trials on BoNT for SCI spasticity management; further research is needed to determine its effectiveness in this population.

Keywords: Physiatry, Physical Medicine and Rehabilitation, Rehabilitation Outcome

Source of Funding: None

Poster Submission - CA106
Category: Clinical Application

Interim results of implementation of the spinal cord independence measure (scim iii) into clinical practice in spinal cord injury rehabilitation programs across canada

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Background/Objectives: The Spinal Cord Independence Measure III (SCIM) is a validated measure of function recommended internationally but is not widely used in Canada. In 2014, the SCIM was added to the Rick

Hansen SCI Registry data set to facilitate the implementation of this measure into spinal cord injury programs across Canada. The objective was to describe the interim results of implementing the SCIM in 15 rehabilitation programs.
Methods/Overview: A knowledge translation framework [Consolidated Framework for Implementation Research (CFIR)] informed the implementation of the SCIM into clinical practice (Implementation Science 2009;4:50)(Fig. 1).
Results: As of December 2016, 6 of 15 rehabilitation programs were using the SCIM in clinical practice. Surveys completed by 44 clinicians identified they 'agree' or 'strongly agree' that the following were anticipated barriers to SCIM implementation in their program: time (61%), staff turnover (48%), and training (36%). Individualized strategies were provided throughout the implementation process to address program-identified barriers.
Conclusions: The CFIR framework identified facilitators and barriers to implementing the SCIM in rehabilitation programs. A multi-level approach involving continuing to facilitate the implementation at the remaining 9 rehabilitation programs and working to include the SCIM as part of the National Rehabilitation System data set are being pursued.

Keywords: Rehabilitation Outcome, Physical Medicine and Rehabilitation, Physical Medicine

Source of Funding: This study was supported by financial contributions from the Rick Hansen Institute and the Government of Canada through Health Canada and Western Economic Diversification Canada

Poster Submission - CA107
Category: Clinical Application

Effects of personalized adapted locomotor training (palt) on walking function in individuals in the subacute stage after spinal cord injury: a prospective case series

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Background/Objectives: While intensive locomotor training in individuals with chronic spinal cord injury (SCI) has been studied and implemented in some centers, there is a paucity of studies on its effectiveness in subacute SCI when the potential for recovery is greater. This prospective case series evaluates the effects of Personalized Adapted Locomotor Training (PALT) on walking outcomes in individuals with subacute SCI.
Methods/Overview: This case series included 7 individuals with motor incomplete (6 AIS-D, 1 AIS-C), C2-T8 SCI (5 males, 56.7±5.8 years old). Individuals with traumatic (N=4) and non-traumatic (N=3) SCI were enrolled at 3.6±0.4 months and 4.4±1.1 months post-injury, respectively. Participants were categorized as ambulatory (N=5; LEMS=81±8.2) or non-ambulatory (N=2; LEMS=61,72) before PALT. PALT was applied 4 times/week and comprised of 60 minutes of body-weight supported treadmill training and 30 minutes of overground (OG) training. Regardless of level and severity of injury, treadmill training and OG training were progressed (i.e. increasing duration, speed). Total number of sessions ranged from 49-131. Walking speed (10-meter walk test) and walking distance (6-minute walk test) were measured.
Results: Ambulatory individuals increased fast and self-selected walking speeds by 0.48±0.28m/s and 0.37±0.11m/s, respectively, and walking distance by 185.1±30.4m. Post-PALT, one non-ambulatory participant demonstrated fast (0.58m/s) and self-selected (0.38m/s) walking speeds, and the ability to walk a distance of 152m. The second non-ambulatory participant did not regain the ability to walk. All individuals tolerated intensive therapy during the subacute phase.

Conclusions: PALT had positive effects on walking function in all but one participant with subacute SCI.

Keywords: Rehabilitation Outcome, Treatment Effectiveness, Physical Medicine and Rehabilitation

Source of Funding: Ontario Neurotrauma Foundation Grant Number: 2013-SCI-RECOV2-974

Poster Submission - CA108
Category: Clinical Application

Spinal cord injury primary care: needs assessment from multiple perspectives

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Background/Objectives: James Milligan, Loretta M. Hillier, Craig Bauman, Lindsay Donaldson, Joseph Lee
Methods/Overview: This study gathered multiple perspectives on the primary care for persons with SCI as related to care gaps and needs. Surveys were completed by consumers (N=14) and 12 primary care providers (PCP) who referred persons with SCI to the Centre for Family Medicine mobility clinic. Interviews were completed with an expert panel representing rehabilitation specialists and community service providers (N=8). Questions were asked related to care gaps and barriers and needs for care improvements.
Results: Across all respondent groups similar barriers and gaps in care were identified. A high proportion (>50%) of consumers and PCPs reported low frequencies ("never" or "hardly ever") of thorough examinations performed on an examination table, being weighed, or skin examinations in the absence of complaints and identified lack of time and specialized equipment as significant barriers to care. Consumers identified needs for care improvements related to bone health, bladder and bowel issues and chronic pain. PCPs reported the need for greater: consumer self-management, access to specialists for consultation, specialized primary care services for SCI, and access to SCI-related practice guidelines and education. Expert panel participants validated survey results and identified gaps in access to community programs and home care, geographic inequities, and limited integration and continuity of care across health sectors.
Conclusions: Care gaps and needs were identified that can inform the development of recommendations and initiatives to improve primary care for persons with SCI.

Keywords: Multidisciplinary Approaches, Best Practice Implementation, Healthcare Delivery

Source of Funding: Ontario Neurotrauma Foundation Grant Number: 2014-SCI-MOBCLIN-991

Poster Submission - CA109
Category: Clinical Application

Mobility clinic team composition: optimizing care for individuals with spinal cord injury

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Background/Objectives: Specialized interprofessional primary care-based mobility clinics are a significant opportunity to improve spinal cord injury (SCI) care, however, there are no gold standards to inform ideal team composition.
Methods/Overview: The purpose of this study was to explore the ideal mix of skill sets and competencies for mobility clinics. Twelve individual interviews were conducted with primary care and rehabilitation clinicians and representatives from professional associations representing health disciplines. Participants received briefing notes on the mobility clinic model of care and roles of each discipline within this model. Questions were asked related to discipline specific scope of practice, ideal team composition to meet consumer needs, and opportunities for expanding and sharing discipline roles.
Results: Discipline specific role descriptions within the Mobility Clinic were perceived to be comprehensive and accurate; in some cases additional activities were suggested for some disciplines. Suggestions were made for cross discipline sharing of roles/ activities (e.g., some social worker activities can be assumed by occupational therapists (OT) or nurse practitioners (NPs). Recommendations for core team members included a physician, nurse, OT, and exercise therapist and a representative from SCI Ontario or community service navigators, with linkages to specialists or interprofessional rehabilitation teams for consultation support. Potential roles were described for disciplines not currently represented in this care model (NPs, physiotherapists, physician assistants, recreation therapists).
Conclusions: As there exists a critical balance of optimizing care and availability of resources, this study informs appropriate mobility clinic team composition, adaptable within the context of existing human resources.

Keywords: Clinical Application, Multidisciplinary Approaches, Healthcare Delivery

Source of Funding: Ontario Neurotrauma Foundation Grant Number: 2014-SCIMOBCLIN-991

Poster Submission - CA110
Category: Clinical Application

Evaluation of an online, theory-based bladder self-management program for persons with SCI

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Background/Objectives: To evaluate an online, theory-based self-management intervention focused on enhancing skills and behaviours targeted to maintain or improve bladder health in persons with spinal cord injury (SCI).
Methods/Overview: ?URInCharge? is an online, self-management web-based program currently under evaluation (n = 30 persons with SCI - 10 inpatients, 20 outpatients/community). Key components of the program includes: 1. an introductory session from an inpatient nurse (if inpatient) or SCI peer coach (if community); 2. entry of various information to enable customization and evaluation including: demographics, bladder health, SCI and bladder-related patient reported outcomes (PROs), usability and feasibility; 3. customization of the program to participants? self-management needs and behavioural set (i.e., readiness and intention to act) as guided by questions based on the Health Action Process Approach; 4. goal setting and action planning processes, support from a peer and/or nurse clinician about bladder concerns, customized resource centre, symptom tracker, integrated calendar, and discussion boards. Evaluation surveys were repeated at 1 and 2 months, and 1-month post-trial. After the initial use, participants used the program at their own pace based on personal preference.
Results: Pre-trial pilot information indicated participant satisfaction with the program and an initial pre-trial focus

groups of persons with SCI (n=3) showed promising results, with all participants rating the program highly in terms of limited efficacy, practicality, demand and acceptability according to the Bowen et al. (2009) feasibility framework. More information based on user experience is currently being collected.
Conclusions: Feedback and results of the trial will be used to make continued changes and upgrades to the program. In addition, it is hoped that the most effective components of the URinCharge program will be incorporated into a larger online self-management program currently in development. Additionally, we seek to integrate this work with service delivery models that link inpatient and outpatient rehabilitation programming efforts with community agencies such as SCI Ontario.

Keywords: Self-Management, Physical Medicine and Rehabilitation, Clinical Application

Source of Funding: Craig H Neilsen Foundation Grant Number: 290502

Poster Submission - CA111
Category: Clinical Application

Examination of rehabilitation length of stay, outcomes, rehabilitation cost weights, total volumes and total weight cases for traumatic and non-traumatic spinal cord injury rehabilitation using SCI diagnosis-based targets

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Background/Objectives: To compare the length of stay (LOS), proportion of patients discharged within target LOS, rehabilitation outcomes (functional change and proportion discharged home), total admissions and total weighted cases between patients with traumatic and non-traumatic spinal cord injury (SCI).
Methods/Overview: In June 2013, new LOS targets were implemented in our inpatient rehabilitation program using SCI diagnostic groups and admission FIM. Previously, LOS targets were based on Canadian Institute for Health Information's Rehabilitation Patient Groups (RPG), which differentiates by SCI etiology (trauma, non-trauma). The following data were examined: average LOS, % discharged within target LOS; % discharged home and change in functional independence (FIM). In Ontario, 40% of hospital funding is determined by Health-Based Allocation Model (HBAM). HBAM uses RPG to determine rehabilitation cost weights and therefore both total number of rehabilitation cases and total weight cases based on RPG were also examined.
Results: From April 1, 2015 to March 31, 2016, 319 patients were admitted for SCI rehabilitation. Overall mean LOS was 59 days, with 70% of patients discharged within their target LOS; 82% were discharged home with an average FIM change of 32.3. Patients with non-traumatic SCI were older and had more co-morbidities, however had similar outcomes in terms of FIM change and % discharged home. Although patients with non-traumatic SCI represented 60% of total cases, non-traumatic SCI admissions accounted for only 45% of total weighted cases.
Conclusions: The use of objective LOS targets based on SCI diagnosis has resulted in standardization and transparency related to LOS determination regardless of etiology of SCI. However, case weighting based on RPG results in lower hospital funding per case for non-traumatic SCI in comparison to traumatic SCI in Ontario.

Keywords: Health Costs, Rehabilitation Outcome, Healthcare Delivery

Source of Funding: None

Poster Submission - CA112
Category: Clinical Application

Translation from english to french and transcultural adaptation of the mini bestest

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Background/Objectives: The Mini BESTest is a comprehensive balance evaluation extensively used by rehabilitation professionals and researchers, especially among those working with individuals with a motor incomplete spinal cord injury (SCI) undergoing intensive functional rehabilitation. In this population, the Mini BESTest present good to excellent reliability, validity and responsiveness. However, it is not yet available in French, which limits its implementation in French-speaking clinical environments. Hence, the aims of this project were 1) to perform the translation of the Mini BESTest from English to French and the transcultural adaptation and 2) to assess the intra- and inter-rater reliability as well as the internal consistency of the French version of Mini BESTest.
Methods/Overview: The translation and transcultural adaptation followed a well-established seven-stage process: 1) Initial forward translations in French by 2 persons, with and without medical background; 2) Comparison and merge of these translations into one French version; 3) Back-translation in English by a professional translator with a medical background; 4) Consolidation of all previous versions into a single, pre-final version by the expert committee; 5) Pre-testing of the French version by 5 physiotherapists (PTs) providing their comments following the evaluation of 2 individuals with SCI; 6) Final adjustments on the French version of the Mini BESTest; 7) Reliability testing of this version by filming the evaluation of 30 individuals with various disabilities, including SCI. Two PTs familiar with the original version of the Mini BESTest will evaluate the videos twice at 2-week interval. Inter-rater and intra-rater reliability will be determined using ICC and internal consistency using Cronbach's alpha.
Results: In stages 2 and 4, the review committee verified transcultural equivalence and reached a consensus on the wording of the French version so that it has the same connotation as the original version while being easy to understand by French-speaking rehabilitation professionals, researchers and their target population. The preliminary French version was judged suitable to go through subsequent stages of the transcultural adaptation (5 to 7).
Conclusions: This French version of the Mini BESTest will eventually allow French-speaking rehabilitation professionals and researchers to evaluate balance performance using this comprehensive evaluation. Moreover, its implementation in French-speaking clinical environments will be facilitated.

Keywords: Rehabilitation Outcome, Physical Medicine and Rehabilitation, Physical Examinations and Diagnoses

Source of Funding: Rick Hansen Institute

Poster Submission - CA113
Category: Clinical Application

When participation isn't enough: modification to the international classification of functioning, disability and health model for persons with chronic spinal cord injury, perspectives from a clinician, an academic, and a researcher.

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Background/Objectives: The International Classification of Functioning, Disability and Health classifies and describes the functioning, health status, and impairments of individuals with health conditions, inclusive of spinal cord injury (SCI). ICF domains include health condition, body structure and function, activities, participation, and contextual influences. These descriptive domains allow healthcare professionals to look beyond the client's disability and focus on the client's participation in meaningful activities. Persons with chronic SCI may require clinicians to use an alternative mindset to look beyond participation and facilitate their performance. This world café model interactive presentation will highlight 6 variable patient cases of persons with chronic spinal cord injury. Using roundtable case discussion, the presenters will challenge participants to replace the ICF domains of activity with capacity and participation with performance. Actual outcomes of the cases will then be presented to participants, and perspectives from the clinician's point, the academic's, and the researcher's will be offered.
Methods/Overview: Retrospective case studies of persons with chronic spinal cord injuries will be presented in segments to participants followed by discussion facilitated by presenters.
Results: Actual results of each case will be discussed.
Conclusions: Using an alternative perspective of the ICF framework may have significant and salient impact on the client's functional capacity and performance, which may positively influence the client's quality of life. Exploration of a client's maximal capacity to complete a functional activity may lead to optimizing their performance and ultimate satisfaction with enhanced participation domains within the ICF framework. Discussion of the perspective of each profession will provide participant with insight to a multidisciplinary approach for patients with chronic spinal cord injury.

Keywords: Integrative Approaches, Healthcare Delivery, Treatment Effectiveness

Source of Funding: This presentation does not have any funding source associated with it aside from the submission cost and any conference costs which are self-funded by the presenters.

Poster Submission - CA114
Category: Clinical Application

Implementation of new spinal cord rehabilitation inter-professional discharge summary

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Health Network, Toronto, ON, Canada; [5]Department of Occupational Science and Occupational Therapy, University of Toronto, Toronto, ON, Canada

Background/Objectives: To develop an effective discharge documentation process following inpatient spinal cord (SCI) rehabilitation to optimize communication.
Methods/Overview: An inter-professional SCI working group was formed to improve discharge communication following inpatient rehab. Toronto Rehab's Best Practice Process was used to guide implementation.
Results: To understand Patient Need related to discharge communication, data was examined from Patient Satisfaction Surveys, patient interviews and focus groups. Key themes were gaps and delays in information transfer between inpatient rehab and community providers and duplication of discharge assessments. A literature review and environmental scan of SCI and other rehab programs found several Best Practices: inter-professional documentation, caregiver roles, plans for managing areas of risk; and psychosocial readiness. Gap Analysis found variability between and within professions regarding content and timeliness of documentation; inconsistency in documentation for specific domains of SCI; lack of actionable plans and inconsistency in documentation sent to outpatient providers. In Preparation phase, a pre-implementation survey was sent to inpatient and outpatient staff, focus groups were held with all professions to understand barriers and enablers, and targeted chart reviews were completed. A new Spinal Cord Inter-professional Discharge Summary (SCI-DCS) was created and piloted across all units. Feedback from staff was used to refine the SCI-DCS. Implementation of the SCI-DCS incorporated implementation science and Lean principles such as integration into existing processes, replacing not adding documentation, extensive coaching and staff education, and monitoring systems to ensure completion. In June 2016, the SCI-DCS was implemented as the standard of care for inter-professional discharge documentation across our SCI Rehab program. Evaluation to date has shown significant staff buy-in and high completion rates (98%). Feedback from outpatient staff has been positive particularly the comprehensive, inter-professional nature of the SCI-DCS with a focus of identification of current issues and plans across all SCI domains. A 6-month post-implementation survey will be conducted in January 2017.
Conclusions: The new SCI-DCS was developed and implemented in a systematic manner with a focus on providing comprehensive, inter-professional discharge information to enable effective and efficient communication in the transition from SCI rehab to the community.

Keywords: Rehabilitation Outcome, Best Practice Implementation, Clinical Decision Support Systems

Source of Funding: None

Poster Submission - CA115
Category: Clinical Application

Exploring key processes in implementation planning: electrical stimulation therapy to improve pressure injury healing in persons with spinal cord injury

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Background/Objectives: Purpose: To describe key processes and associated outputs achieved when planning implementation of evidence based practice, including electrical stimulation therapy (E-Stim).
Methods/Overview: Knowledge-to-Action, the National Implementation Research Network, and the ADAPTE process provided guidance and a systematic approach for planning best practice implementation: 1) defining the practice, 2) identify the barriers and facilitators to implementing EST, and 3) adapting the

practice to the local environment with the assistance of local stakeholders. An evolving approach to implementation was used to implement and field test new practices using an iterative Plan, Do, Study, Act (PDSA) cycles with a sample of individuals with SCI and pressure injuries in South Western Ontario.
Results: A number of key processes were put into place to support best practices in pressure ulcer care and E-Stim treatment including: 1) Establish customized electronic platform that facilitates communication between patients and their care team working within several different health organizations; 2) Develop a specialized interdisciplinary team at a regional rehabilitation centre that builds capacity in community providers; 3) Foster partnerships with number of key stakeholders who collectively have broad representation across all health care sectors; 4) Define a clear governance structure and decision making processes and encourage active participation of selected representatives on these committees and working groups. 5) Produce a process map that lays out the steps involved in starting, delivering and terminating best practices related to pressure ulcers and E-Stim treatments; 6) Create resources using a variety of media to raise awareness and provide advanced training about pressure ulcer best practices in general and E-Stim treatment, specifically
Conclusions: Promoting practice change across health care organizations is complex and requires active engagement from several stakeholders.

Keywords: Best Practice Implementation, Knowledge Implementation, Technology, Health

Source of Funding: Rick Hansen Institute Grant Number:G2015-34

Poster Submission - CA116
Category: Clinical Application

Evaluation of an electrical stimulation therapy education program for the healing of pressure ulcers in people with spinal cord injury

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Background/Objectives: Electrical stimulation therapy (E-Stim) involves applying low levels of electrical current to speed wound closure. Despite recommendations by many best practice guidelines, E-Stim is seldom used by clinicians. The purpose of this study is to determine whether we can improve health care provider's knowledge, attitudes and practice for the use of E-Stim.
Methods/Overview: A quasi experimental design was used to evaluate the effectiveness of an E-Stim educational program consisting of online videos (E1) and one hands on session (E2). Information about E-Stim knowledge and use practices was collected prior to E1 and post E1 and E2. Participants will also be followed up 6 months after completing the education program.
Results: A total of 46 participants have completed E1 and E2. In response to the attitude and practice question "I do not feel I have the advanced knowledge and skills that are required to apply E-Stim to wounds", 68% of providers answered "agree/strongly agree" prior to E1 and E2. This decreased to 11% after the education program. Mean knowledge scores prior to education sessions were 52.5 (20.3) which increased to 80.1 (8.2) post E1 and E2. Knowledge data were analysed using a repeated measures analysis of variance (ANOVA) showing that the effect of education on health providers knowledge was significant, $F(2,54) = 37.8$, $p < .05$. Post hoc analyses showed significant increase in provider E-Stim knowledge post E1 and E2 compared to baseline knowledge ($p < .05$).
Conclusions: Provision of E-Stim education to health care providers significantly increases provider knowledge in regards to the use of E-Stim for individuals with chronic wounds. Education also resulted in improved attitudes for incorporating E-Stim into practice. Pending evaluation 6 months after receiving education will determine if the increase in provider's knowledge and improved attitudes for the use of E-Stim is sustainable.

Keywords: Best Practice Implementation, Healthcare Delivery, Knowledge Implementation

Source of Funding: Rick Hansen Institute Grant Number: G2015-34

Poster Submission - KG117
Category: Knowledge Generation

Transformational leadership training for SCI peer mentors: a pilot randomized controlled trial

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Background/Objectives: The transformational leadership (TFL) style is reflected in leaders who go beyond their self-interests to inspire, motivate and empower their followers (Bass & Riggio, 2006). Use of TFL leadership behaviours by SCI peer mentors has been linked to various adaptive behavioural and psychological outcomes in SCI mentees (Beauchamp et al., 2015). This pilot randomized controlled trial (RCT) tested the hypothesis that adults with SCI who receive peer mentorship from a TFL-trained peer mentor will perceive their mentor to use TFL behaviours more frequently and be more supportive than adults receiving mentorship from an untrained mentor.
Methods/Overview: Twenty-three SCI peer mentors (70% male; M age = 47.4 ± 12.1) were randomly allocated to a TFL training (TFL-T) or waitlist control (WLC) condition. TFL-T mentors received a 1-day TFL workshop and monthly emails that provided tips on using TFL behaviours in a SCI peer mentorship context. Sixteen adult mentees with SCI (50% male; M age = 49.1 ± 12.9) received mentorship from a TFL-T or WLC mentor. Mentees completed standardized measures of their mentors' use of TFL behaviours and supportiveness at 3- and 6-month follow-ups. Mentees were blinded to their mentor's experimental condition.
Results: Independent samples t-tests showed TFL-T and WLC mentors were perceived to use TFL behaviours to the same extent (ps) .34) and to be equally supportive (ps) .51). Although TFL-T and WLC mentors spent comparable time with their mentees (p = .15), total time spent with a TFL-T mentor--but not a WLC mentor--was positively correlated with mentees' perceptions of mentors' TFL behaviour use and supportiveness (rs = .80-.99, ps (.05).
Conclusions: Overall, a single training session and emailed prompts were insufficient at changing SCI peer mentors' use of TFL behaviours. However, TFL-trained mentors who spent more time with mentees were perceived as using TFL behaviours more frequently and being more supportive. Untrained mentors did not show increasing TFL use or supportiveness as their time with mentees increased. This pattern of results may suggest that as mentor-mentee contact time increased, TFL-trained mentors had more opportunity to practice and display TFL behaviours conducive to creating a supportive relationship. Further investigation is warranted of more intensive peer mentorship training programs that incorporate elements of TFL.

Keywords: Rehabilitation Outcome, Data Analysis, Statistical, Clinical Decision Support Systems

Source of Funding: Research supported by a SSHRC Partnership Development Grant

Poster Submission - KG118
Category: Knowledge Generation

Psychometric properties of the japanese orthopedic association (joa) score in the assessment of patients with cervical spondylotic myelopathy

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Background/Objectives: Cervical spondylotic myelopathy (CSM) is the most common non-traumatic cause of spinal cord impairment in the world. The Japanese Orthopedic Association (JOA) Score is the most accepted outcome measure for assessment of the degree of impairment and disability in this population. Given this, a systematic review was undertaken to critically evaluate the psychometric properties of the JOA Score when used for assessment of patients with CSM.
Methods/Overview: Papers focused on the reliability, validity and responsiveness of the JOA Score were obtained from Medline, PsycINFO, EMBASE, APC Journal Club and Cochrane databases (1975 to 2015). Additional papers were captured in a secondary search using the bibliographies from the initial search.
Results: The primary search identified 59 publications of which 9 fulfilled the inclusion criteria. An additional 18 publications were subsequently captured. The key findings include: (a) 1975 JOA Score originated the Revised JOA Score (1994) and three modified versions with at least two publications (1991, 1993, 1999 JOA Scores) that are substantially different from each other; (b) while the 1975 JOA Score is the most appropriate instrument for Asian population, the 1991 JOA Score is the most adequate version for use among Western population.
Conclusions: The results of this systematic review indicate that all versions of the JOA Score substantially differ among themselves regarding their content and cultural context, and extent of prior psychometric evaluation. While the 1975 JOA Score is the most appropriate version for assessment of Asian population (especially, those whom eat with chopsticks), the 1991 JOA Score is the most suitable version for evaluation of Western population. Further investigation of the psychometric properties of those versions of the JOA Score is recommended.

Keywords: Medical Information Science, Physical Medicine and Rehabilitation, Rehabilitation Outcome

Source of Funding: Toronto Rehabilitation Institute Foundation

Poster Submission - KG119
Category: Knowledge Generation

A randomized trial of functional electrical stimulation for walking in incomplete spinal cord injury: effects on secondary complications and gait and balance

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Background/Objectives: To determine the efficacy of functional electrical stimulation therapy (FES-T) assisted walking compared to aerobic and resistance training with respect to body composition, bone biomarkers and bone strength, improvements in gait and balance, and quality of life and participation in individuals with a spinal cord injury (SCI).
Methods/Overview: Parallel-group randomized controlled trial. Methods: Individuals with chronic (=18 months) incomplete SCI (level C2 to T12, AIS C or D) were recruited and randomized to FES-T assisted walking (Intervention), or aerobic and resistance training (Control) sessions thrice weekly for 16 weeks. Thirty-four individuals were randomized (17 per group); 27 remained at 12 months.

Results: There were no significant main effects of FES-T assisted walking on body composition variables in intention-to-treat analyses with group means. There was a significant group-by-time interaction for muscle area from baseline to 12 months (P = 0.04). Intention-to-treat analysis of muscle area change scores between baseline and 12 month revealed a significant difference between groups (mean (SD) muscle area change score 212 (517) mms for FES-T, -136 (268) mms for control, P = 0.026). Participants in the FES-T arm had a significant decrease in CTX and a significant OC increase upon intervention completion (P(0.05). Significant changes were not observed in the Control group. Neither group experienced a significant change from baseline in sclerostin, BMD and pQCT levels. SCIM mobility sub-score improved over time in the intervention group compared with the control group (baseline/12 months: 17.27/21.33 vs. 19.09/17.36, respectively). On all other outcome measures the intervention and control groups had similar improvements. Irrespective of group allocation walking speed, endurance, and balance during ambulation all improved upon completion of therapy, and majority of participants retained these gains at long-term follow-ups. No significant between-group differences were detected for Satisfaction with Life Scale, Lawton Instrumental Activities of Daily Living, Craig Handicap and Assessment Reporting Technique, and Reintegration to Normal Living Index, and perceptions of intervention(s) outcomes, both groups reported positive gains in wellbeing from trial participation.
Conclusions: Whereas individuals in FES group had higher gains in SCIM mobility scores and improvement in bone turnover, both groups benefited from the program as seen on all other outcome measures.

Keywords: Physical Medicine and Rehabilitation, Biomedical Technologies, Health Care Technology

Source of Funding: This project was supported by the Ontario Neurotrauma Foundation [2004-SCI-SC-04] and by the Toronto Rehabilitation Institute – University Health Network.

Poster Submission - KG120
Category: Knowledge Generation

Restoration of upper limb function in an individual with cervical spondylotic myelopathy using functional electrical stimulation therapy: a case study

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Background/Objectives: Non-traumatic spinal cord pathology is responsible for 25 to 52% of all spinal cord lesions. Studies have revealed that spinal stenosis accounts for 16 to 21% of spinal cord injury (SCI) admissions. Impaired grips as well as slow unskilled hand and finger movements are the most common complaints in patients with spinal cord disorders such as myelopathy secondary to cervical spondylosis.This study was designed to examine changes in the upper limb function following functional electrical stimulation therapy (FEST) in a patient who suffered loss of hand function due to myelopathy secondary to cervical spondylosis.
Methods/Overview: The participant was a 61 year old male who had C3-C7 posterior laminectomy and instrumented fusion for cervical myelopathy. The participant presented with progressive right hand weakness that resulted in his inability to voluntary open and close the hand, and to manipulate objects unilaterally with his right hand. Participant was assessed using Toronto Rehabilitation Institute Hand Function Test (TRI-HFT), Action Research Arm Test (ARAT), Functional Independence Measure (FIM), and Spinal Cord Independence Measure (SCIM).
Results: The pre-post differences in scores on all measures clearly demonstrate improvement in voluntary hand function following 15 one-hour FEST sessions. The changes observed were meaningful and have resulted in

substantial improvement in performance of activities of daily living.
Conclusions: These results provide preliminary evidence that FEST has a potential to improve upper limb function in patients with non-traumatic SCI, such as myelopathy secondary to cervical spondylosis.

Keywords: Biomedical Technologies, Engineering, Biomedical, Physical Medicine and Rehabilitation

Source of Funding: Natural Sciences and Engineering Research Council of Canada (NSERC – Grant #249669) and Toronto Rehabilitation Institute.

Poster Submission - KG121
Category: Knowledge Generation

Implementation of longitudinal study participant retention methods & development of a standardized operating procedure to minimize participant attrition: Rick Hansen Spinal Cord Injury Registry (RHSCIR)

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Background/Objectives: Successful implementation and management of RHSCIR requires routine data collection across the continuum of care. Participant retention is challenging and there is a paucity of guidance regarding longitudinal retention strategies. The objectives are to provide a detailed overview of the current gaps in community follow-up (CFU) implementation; and, describe the key elements of a new standard operating procedure (SOP) intended to increase participant retention after rehabilitation discharge from January 1 to December 31, 2016, at the Toronto Rehabilitation Institute (TRI) RHSCIR site.
Methods/Overview: Following review of the national reports from the Rick Hansen Institute revealing a lower-than-expected CFU completion rate at our site, an audit of current barriers to retention and a review of the literature on retention strategies was performed. A SOP for augmenting retention was implemented.
Results: Common reasons for incomplete CFU interviews included outdated contact information (6%), refusal to complete interview (3%), concurrent secondary health conditions (1%), consent withdrawal (2%) or interim death (2%). Several strategies identified to increase cohort retention included a minimum of ten telephone contacts, validating contact information or death via health records systems, mailing reminders, and electronic questionnaire completion. To systematically implement these strategies, a SOP was developed which provided a framework for CFU completion and outlined standard procedures to retain participants.
Conclusions: This SOP provides the routine procedures to facilitate retention and ensure good research practices when contacting participants within the community. We plan to evaluate the effectiveness of the aforedescribed SOP on study retention rates at TRI in comparison with national averages.

Keywords: Physical Medicine and Rehabilitation, Decision Aids, Decision Modeling

Source of Funding: Rick Hansen Institute Grant Number: G2016-07

Poster Submission - KG122
Category: Knowledge Generation

Effectiveness of retention strategies to minimize participant attrition: the Rick Hansen Spinal Cord Injury Registry (RHSCIR)

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Background/Objectives: A key obstacle in longitudinal research is retaining participants. Minimizing potential biases resulting from participant attrition while preserving the internal and external validity are necessary in longitudinal studies.1. To determine the effectiveness of a new standard operating procedure (SOP) for increased community follow-up (CFU) completion and participant retention at the Toronto Rehabilitation Institute (TRI) RHSCIR site. 2. To compare retention from January 1 to December 31, 2016 to previous local and national CFU rates.
Methods/Overview: An SOP was implemented during the 2016 calendar year and study participants due for a CFU were contacted (n = 151). Descriptive statistics were calculated to summarize local retention rates.
Results: SOP implementation resulted in a 70% CFU completion rate (CR). The observed reasons CFUs were not completed included: pending CFU completion (13%), unable to reach (6%), lack of response to mailed CFU (4%), interview declined (3%), deceased (2%), withdrawn consent (2%), missed participants (0.7%). National CRs were 50%, 49%, and 32% at 1-, 2-, and 5-year in comparison to TRI CRs 61%, 98%, and 51%, respectively. CFU completion rates were consistently higher than national averages at 1-, 2- and 5- year CFU by 11%, 49%, and 19%, respectively (P
Conclusions: SOP implementation increased CFU rates to 70%. We aim to move towards an 80% CR in the next year. Employing a variety of retention strategies and implementing the CFU SOP was crucial to attaining high retention rates and increasing generalizability of the RHSCIR data.

Keywords: Physical Medicine and Rehabilitation, Decision Aids, Data Analysis, Statistical

Source of Funding: Rick Hansen Institute Grant Number: G2016-07

Poster Submission - KG123
Category: Knowledge Generation

Implementing a newly designed self-management mobile app for SCI in the inpatient and early community settings: a feasibility study

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Background/Objectives: Background: With decreasing lengths of inpatient rehabilitation, it is essential that people with spinal cord injury (SCI) develop self-management skills prior to community discharge. Objectives: To determine the feasibility of a study to explore a newly developed self-management mobile application (app) in people with SCI.
Methods/Overview: We enrolled rehabilitation inpatients who had experienced their first SCI in this feasibility study. All participants received 1-2 training sessions and were followed up with weekly while in rehabilitation and approximately 1-2 times per month after community discharge. Participants completed questionnaires regarding their function, and self-management confidence at admission, discharge, and 3-months post discharge. Several feasibility metrics were evaluated including adherence, uptake of the intervention, and intervention burden.

Results: Twenty participants (85% male) with AIS classifications of A/B: 65%, C/D: 35% were enrolled. Participants ranged from 21-80 yrs of age (mean: 41) and most participants had tetraplegia (75%) with a mean SCIM-III score of 33. Three-quarters of participants owned a Smartphone and 15% had previously used a health app. Participants were involved in the study for an average of 176 days (Inpatient rehabilitation: 67, community: 110). The rehabilitation and community phases had 85% and 70% retention, respectively. Following inpatient rehabilitation, participants significantly improved their bowel self-management confidence (p(0.01) and exhibited trends for improvement in confidence managing bladder, autonomic dysreflexia, and pain.
Conclusions: We demonstrated that it is realistic to introduce individuals to a self-management app during in-patient rehabilitation and it would be viable to conduct a larger efficacy trial in this setting.

Keywords: Self-Management, Health Information Technology, Clinical Application

Source of Funding: Emerging Innovations & Innovative Technologies Grant from the Rick Hansen Institute Grant Number: Rick Hansen #2015-11

Poster Submission - KG124
Category: Knowledge Generation

The Canadian physical activity monitoring study: a subgroup analysis of youth with spinal cord injury

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Background/Objectives: Research has identified physical activity (PA) determinants and behavioural patterns among adults with SCI. Less focus though has been directed towards youth with SCI. This study examined the PA and screen-time behaviours of Canadian youth (ages 12-21 years) with SCI. Secondary objectives included the assessment of motivation and perceptions of parental support for PA. The data presented are a subset of a larger on-going study examining daily PA behaviours of youth with physical disabilities.
Methods/Overview: Participants completed two, 30 to 45-minute telephone interviews over a 4-week period to assess PA and screen-time behaviours using the 24-hour Multimedia Activity Recall for Children and Adolescents. Autonomous and controlled forms of motivation for PA were assessed at Time 1, while perceptions of parental support for PA were tested at Time 2. Descriptive statistics were conducted to examine overall means for: daily minutes of PA and screen-time activities; autonomous versus controlled forms of motivation; and perceived parental support.
Results: Eight participants (Mean age = 17.75 years ± 2.19; 100% paraplegia; 50% male; 63% White; 75% manual wheelchair users) completed both assessment periods. Participants spent 43.13 minutes per day (SD = 48.06) in PA, with 63% of that time spent in sports. Daily screen-time activities were engaged in for 232.83 minutes (SD = 130.68). Autonomous forms of motivation for PA (Mean = 10.71 out of 16, SD = 4.02) were rated higher than controlled forms of motivation for PA (Mean = 8.5 out of 16, SD = 4.02). Perceptions of parental support for PA were low (Mean = 2.28 out of 4, SD = 1.13).
Conclusions: Findings suggest sport and autonomous motivation for PA to be prevalent in this sample of youth with SCI. Strategies for reducing screen-time behaviours and enhancing parental support for PA should be further explored among youth with SCI.

Keywords: Self-Management, Rehabilitation Outcome, Physical Medicine and Rehabilitation

Source of Funding: Social Sciences and Humanities Research Council of Canada Grant Number: 895-2013-1021

Poster Submission - KG125 Category: Knowledge Generation

Validation of a two-stage screening model to predict moderate to severe obstructive sleep apnea in chronic tetraplegia

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Background/Objectives: Prevalence of Obstructive Sleep Apnea (OSA) in people with chronic spinal cord injury (SCI) is estimated at between 28% and 77%. Current guidelines recommend polysomnography (PSG) for all people with SCI and symptoms of OSA. However PSG is a resource intensive and frequently inaccessible test, especially in SCI. A two-stage model of questionnaire followed by overnight oximetry has been found to accurately detect moderate to severe OSA in the able-bodied. This study aimed to determine whether a similar two-stage model can detect moderate to severe OSA in chronic tetraplegia.
Methods/Overview: An existing dataset of 78 people with tetraplegia was examined to determine predictors of OSA for inclusion in a new questionnaire. Cut-offs for the model were estimated with Receiver Operating Characteristics (ROC) curve analysis. Model accuracy was evaluated in the development dataset and is being prospectively validated in 100 participants with chronic, traumatic tetraplegia across four international SCI units.
Results: Multivariate analysis identified injury completeness, age, sleepiness, self-reported snoring and apneas for the new questionnaire (ROC Area Under Curve 0.89 (95%CI 0.82-0.96)). Oxygen desaturation index was also highly predictive (ROC AUC 0.95(0.91-1 .00)). To date, 76 of 100 participants have completed the validation study. The two-stage model had a sensitivity of 90%(74-97) and a specificity of 90%(78-96) in the development group, and 76%(60-87) and 77%(62-87) in the validation group.
Conclusions: Interim analysis indicates the screening model may predict moderate to severe OSA in chronic tetraplegia. This could substantially increase the detection of OSA in tetraplegia and improve access to treatments.
Source of Funding: National Health and Medical Research Council, Post Graduate Scholarship Grant Number: APP1114181 Spinal Cord Injury Network PhD scholarship 2014 Grant Number: N/A
The Stoke Mandeville-Masson Research Awards 2015 Grant Number: N/A

Poster Submission - KG126
Category: Knowledge Generation

Examining long-term leisure time physical activity patterns among people with spinal cord injury

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Background/Objectives: Leisure time physical activity (LTPA) levels tend to be very low in people with a spinal cord injury (SCI), with as many as 50% of adults participating in zero minutes of LTPA. However, there remains little understanding of long-term LTPA patterns among adults with SCI. The purpose of this study was to monitor and explore LTPA patterns in a sample of adults with SCI over a period of five years.
Methods/Overview: Adults with SCI (N = 234) participated in this study and responded to a validated 3-day activity recall measure assessing their LTPA. This measure was completed once a year, for five consecutive years. Of the 234 participants, 48 (20%) participated in zero minutes of LTPA across the five years. They were therefore removed from the analysis, leaving a sample of 186 participants who participated in some LTPA over time. Latent Class Growth Modelling was used to determine LTPA patterns over time.
Results: Three LTPA patterns emerged from the analysis: increased LTPA, decreased LTPA, and stable inactive. The "increased LTPA" pattern represented 2% of the sample (n = 3) who were participating in approximately 50 minutes of LTPA at Time 1, which increased by 27 minutes per year, over five years ($p < .01$). The "decreased LTPA" pattern represented 10% of the sample (n = 19) who significantly decreased their LTPA by approximately 17 minutes per year, even though they accumulated approximately 94 minutes of LTPA at Time 1 ($p < .01$). The "stable inactive" pattern consisted of 88% of the sample (n = 164) who did not show fluctuations in their LTPA, accumulating approximately 14 minutes of LTPA at Time 1 through to Time 5 ($p = .99$).
Conclusions: Of the three LTPA patterns that emerged, only a small set of adults increased their LTPA over time. Therefore, it would be important to identify the factors that lead to increases in LTPA among these individuals. Unfortunately, most adults with SCI do not participate in much LTPA and do not change over time. These findings further highlight the need to develop and deliver effective physical activity interventions to increase and maintain LTPA participation in adults with an SCI.

Keywords: Data Analysis, Statistical, Knowledge Generation, Patient Monitoring

Source of Funding: Social Sciences and Humanities Research Council of Canada Grant Number: 833-2007-1006

Poster Submission - KG127
Category: Knowledge Generation

What does spinal cord injury peer mentorship look like? a case study of two mentor-mentee dyads

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Background/Objectives: Researchers have suggested that spinal cord injury (SCI) peer mentorship is beneficial, however very little is known about the interactions between mentors and mentees. The objective of this study is to explore two mentor-mentee dyads to better understand their SCI peer mentorship relationships.
Methods/Overview: A multiple case study design was used to investigate 1 female dyad (mentor age 50, SCI injury at C7, 30 years since injury; mentee age 30, SCI injury at L1/L2, 1 year since injury) and 1 male dyad (mentor age 60, SCI injury at C5-C7, 40 years since injury; mentee age 60, SCI injury at C5/C6, 5 years since injury). Each participant took part in three separate qualitative interviews to inquire into their experiences with SCI peer mentorship.
Results: Although participants' comments about their relationships did not appear to be unique to SCI peer mentorship (e.g., being respectful, engaged, and empathetic), some nuances were apparent. For example, the mentees said they preferred to engage with a mentor who was of the same sex, whereas mentors did not consider their counterpart's sex to be important. Additionally, both members of the male dyad articulated having a very strong relationship with the other, as highlighted by the meaning each said they derived from their face-to-face or telephone interactions. Perhaps due to the strength of the relationship, the male mentee cited more benefits from SCI peer mentorship (e.g., confidence, social support) than the female mentee.

Conclusions: Findings from this study provide an initial account of two SCI peer mentorship relationships. More research is needed to understand the complexities of these relationships as well as determine what is needed to optimally provide care and support for mentees and mentors.

Keywords: Knowledge Generation, Healthcare Delivery, Rehabilitation Outcome

Source of Funding: SSHRC

Poster Submission - KG128
Category: Knowledge Generation

Peer mentorship and resiliency in adults with spinal cord injury

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Background/Objectives: Peer mentorship programs for adults with spinal cord injury (SCI) are designed to link trained mentors with fellow adults living with SCI to help them adjust to life with an SCI. Although preliminary support exists for these programs, resiliency has rarely been examined as an outcome of SCI peer mentorship. The purpose of the present study is to determine whether participation in a peer mentorship program lead to increased acceptance (appreciating new things), spirit (setting goals to achieve), and social (trusting others will help) resiliency.
Methods/Overview: A sample of 131 Canadian adults with SCI, where half participated in a peer mentorship program as a mentee (n=68), were invited to report on their resiliency and demographic characteristics (gender, income, years since injury, level of injury, and mobility).
Results: Mean comparisons found that participation in peer mentorship promoted increased social resiliency ($t(128)=3.00$, $p=.003$), but not acceptance and spirit resiliency. Additional analyses examined the moderating role of demographic characteristics and found that peer mentorship was related to increased spirit and social resiliency, but only for men ($F(1,125)=5.61$, $p=.019$) or adults with paraplegia ($F(1,124)=4.77$, $p=.03$; $F(1,124)=6.91$, $p=.01$). Additionally, adults who have participated in peer mentorship and have been injured longer are more likely to report increased acceptance ($F(3,115)=6.70$, p
Conclusions: Peer mentorship can promote increased social resiliency, but its impact on other types of resiliency depends on participants' demographic characteristics. Overall, the results support that peer mentorship can promote additional positive outcomes for adults with SCI.

Keywords: Habilitation, Rehabilitation Outcome, Self-Care

Source of Funding: Social Sciences and Humanities Research Council Grant#430-2014-00168

Poster Submission - KG129
Category: Knowledge Generation

Towards optimal electrode configurations for sequential functional electrical stimulation

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Background/Objectives: Functional electrical stimulation (FES) provides people with spinal cord injury opportunity for cardiovascular and neuro-musculoskeletal conditioning. However, motor unit recruitment during FES is incomplete and synchronized with each stimulus pulse, reducing performance and limiting therapeutic benefits. FES that sequentially rotates electrical pulses among multiple electrodes (SEQ) has been shown to improve performance. Optimal electrode configurations for SEQ stimulation have not been established; however, targeting separate muscle motor points may further improve performance. The objective of the present experiments is to identify electrode configurations that maximize knee extensor torque and minimize motor unit recruitment overlap (extent to which each electrode activates the same motor unit).
Methods/Overview: Isometric knee extensor torque was recorded from 5 participants. Data collection is ongoing. Motor points of vastus lateralis (proximal, central, distal), rectus femoris (proximal, distal), and vastus medialis (proximal, distal) were identified. Surface electrodes were positioned over each motor point. Paired electrical pulses (doublets; 10 ms inter-stimulus-interval) were delivered for all possible electrode combinations (7 motor points; 127 electrode combinations) across a range of intensities (25, 50 and 75% peak-twitch-torque).
Results: Together, stimulation at the medial (proximal, distal) and lateral (proximal, central) vastii accounted for ~69% of the torque generated across all stimulation intensities. The exerted torque of each electrode combination could be accounted for by linear summation of individual motor point contributions (R2)0.92).
Conclusions: Electrode configurations incorporating motor points of the medial and lateral (proximal, central) vastii maximized knee extensor torque, with minimal motor unit recruitment overlap. Targeting these motor points is expected to maximize efficiency for SEQ stimulation of the knee extensors. Further data collection is required to confirm these conclusions.

Keywords: Physical Medicine and Rehabilitation, Engineering, Biomedical, Biomedical Technologies

Source of Funding: Canadian Institutes of Health Research Fellowship Grant Number: 0040678

Poster Submission - KG130
Category: Knowledge Generation

A Double-blinded crossover trial assessing the effect of cannabinoids on spasticity in spinal cord injured persons.

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Background/Objectives: People with spinal cord injury (SCI) often state that spasticity common and is an important factor in decreased quality of life. Many studies have revealed effectiveness of cannabinoids for treating neurogenic pain, yet few studies have evaluated the effects of cannabinoids on spasticity. Thus the hypothesis of this study is that flexible dosing of nabilone will lead to clinically and statistically significant reductions in spasticity in persons with SCI.
Methods/Overview: This was a randomized double blinded, placebo controlled crossover study. Patients with SCI were 18-65 years old, American Spinal Injury Association Impairment Scale (AIS) A-D, Cervical 2-thoracic12,)12 months post injury, and had spasticity at least Modified Ashworth Scale (MAS) grade 2 in the most affected muscle (MAM). Primary outcome was improving by at least 1 in MAM group in active group, as opposed to placebo, and secondary was percent of group who had overall change in MAS at least 30% from baseline with active treatment as opposed to placebo, percent achieving at least 50% improvement, and overall improvement.
Results: 4 subjects entered and completed the study. Recruitment issues were the ready availability of nabilone by prescription and medical cannabis that patients were not willing to forego to participate in this study. Subjects were randomly placed in placebo arm or active arm first, with titration phase of four weeks, maintenance phase at self-selected dose for 7 weeks, then washout for four weeks, then crossed over to the opposite arm. 100% (4/4) had significant improvement in the most problematic muscle group with nabilone, compared to only 50% (2/4) with the placebo. Degree of improvement for the most affected muscle was 1.625 MAS (81.75% change) in active compared to 0.75 MAS (36.75%) improvement in placebo. Given the small numbers this was not

statistically significant, but is of clinical importance. Overall MAS improved with the active group compared to placebo, with baseline mean 1.28, placebo arm 1.55, active 0.418 MAS ($p=0.002$). Overall MAS improvement) 30% was seen in 0% of subjects in placebo arm compared to 100% of subjects in active arm, and MAS improvement) 50% was seen in 0% placebo, 75% of active treatment.
Conclusions: Nabilone had a dramatic effect in overall reduction of spasticity in muscles on the MAS when all spastic muscles were tested. This reduction was seen also in the most affected muscle group, but not statistical significant likely due to extremely small numbers.

Keywords: Physical Medicine and Rehabilitation, Emerging Evidence, Treatment Effectiveness

Source of Funding: MSCIRC/Canadian Paraplegic Association MB/Health Sciences Centre Foundation

Poster Submission - KG131
Category: Knowledge Generation

Brain-computer-interface-triggered functional electrical stimulation therapy for upper limb rehabilitation in spinal cord injury

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Background/Objectives: Functional electrical stimulation therapy (FEST) is a highly effective method for restoring voluntary movement after stroke and spinal cord injury (SCI). Combination of FEST with brain-computer interfaces (BCI) has been suggested as a viable tool for enhancing the effects of motor rehabilitation after paralysis. BCI technology translates brain signals into control commands for electronic devices. Despite very promising early results, research has focused on rehabilitation of stroke survivors with only a handful of studies exploring this new therapeutic intervention with the SCI population. Objective: To measure the efficacy of a BCI-triggered FEST to restore hand function after spinal cord injury.
Methods/Overview: Ten individuals with an incomplete spinal cord injury (AIS B,C, or D, C3-C7) will receive 40 one-hour BCI+FEST sessions delivered five times a week in addition to their regular inpatient occupational therapy. In these sessions participants will be asked to perform a series of functional hand movements repeatedly. Their intention to move will be detected by a BCI through analysis of the alpha (8-12 Hz) and beta (13-30 Hz) EEG activity. The BCI in turn will activate the electrical stimulation to produce the intended movement.
Results: Preliminary results of this three-year project will be presented along with a detailed description of the BCI+FEST system.
Conclusions: Our initial tests suggest that BCI+FEST system can produce clinically meaningful changes in arm function after chronic severe hemiplegia resulting from stroke. Similarly, the technology may have an important role in rehabilitation after SCI.

Keywords: Brain-Computer Interface, Engineering, Biomedical, Physical Medicine and Rehabilitation

Source of Funding: Ontario Neurotrauma Foundation Grant Number: 2016-RHI-EEG-1020

Poster Submission - PC132
Category: Policy Change

Delayed diagnosis of episodes of autonomic dysreflexia: experiences demanding more effective knowledge translation

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Background/Objectives: Autonomic dysreflexia is a potentially life-threatening clinical condition that can occur in patients with severe, high-thoracic/cervical spinal cord injury (SCI). Although autonomic dysreflexia is considered a medical emergency, prior studies indicate that autonomic dysreflexia is still under-recognized. This case series illustrates delay in the diagnosis and proper management of episodes of autonomic dysreflexia.
Methods/Overview: This case series includes consecutive patients with a delayed diagnosis of autonomic dysreflexia during admission in tertiary acute care hospitals in Toronto, Ontario. The cases were selected based on the experience from a trainee during his Neurology residency and fellowship from July 2009 to June 2015.
Results: The three cases are briefly reported herein: Case 1 - A 38 year-old woman with a traumatic, chronic motor incomplete C4 who developed severe, refractory headache and head sweating during the second postoperative day of cholecystectomy; Case 2 - A 60 year-old, Asian woman with new diagnosis of neuromyelitis optica who presented with labile blood pressure, a trend to low baseline blood pressure and hypertensive episodes associated with facial flush and sweating, and headache; Case 3 - A 54 year-old man with history of newly diagnosed adeonocarcinoma of lung with T4-T5 spine metastases was admitted to Intensive Care Unit with respiratory failure due to Guillain-Barre Syndrome and developed labile arterial blood pressure with a trend to hypotension and frequent hypertensive episodes.
Conclusions: All three cases had a delayed diagnosis and management of episodes of autonomic dysreflexia for several hours from the onset of characteristic signs and symptoms. This trainee's experience reinforces the need for more effective knowledge transfer strategies in order to improve timely diagnosis and proper management of autonomic dysreflexia.

Keywords: Medicine, Evidence-Based, Patient Monitoring, Physical Medicine and Rehabilitation

Source of Funding: Toronto Rehabilitation Institute Foundation

Poster Submission - SS133
Category: Student Submission

Evaluation of the efficacy of the keeogo dermoskeleton

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Background/Objectives: The Keeogo is a user-initiated dermoskeleton designed to help individuals with mobility impairments participate more effectively in daily activities such as walking and climbing stairs. The purpose of this study was two-fold: (1) to determine the specific functional characteristics of users with neurological impairments that may predict successful use of the device, and (2) to quantify the functional benefits that the dermoskeleton has on successful users.

Methods/Overview: Thirteen individuals (7 males; 6 females; 524.6 years old) with mobility impairments due to neurological disease or injury were recruited. The Berg Balance Test (BBT), and Timed Up and Go (TUG) were used to identify baseline characteristics in participants. The 6-minute walk test (6MWT) and 25-foot walk test (25FWT) were performed with the participants wearing and not wearing the dermoskeleton; a successful user of the Keeogo displayed a =15% improvement in walking performance while wearing the device. Functional benefits of wearing the Keeogo were quantified by having successful users perform sit-to-stands over a force plate. Ground reaction forces and muscle activation in key leg muscles (tibialis anterior, rectus femoris, and biceps femoris) were analyzed.
Results: Successful users of the Keeogo have a moderate level of functionality. (BBT score 46- 51; TUG 9.9-13.3sec). Scores above or below these ranges predict less benefit from using the Keeogo.
Conclusions: This is the first study providing data to help identify which individuals with neurological impairment might benefit from using the Keeogo dermoskeleton, together with new information quantifying its functional benefit to the user.

Keywords: Physical Medicine and Rehabilitation, Rehabilitation Outcome, Technology, Health

Source of Funding: None

Poster Submission - SS134
Category: Student Submission

Reliability and minimal detectable change of a new treadmill-based progressive workload incremental test to measure cardiorespiratory fitness in manual wheelchair users

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Background/Objectives: Cardiorespiratory fitness training is commonly provided to manual wheelchair users (MWUs) in rehabilitation and physical activity programs, emphasizing the need for a reliable and accurate task-specific incremental wheelchair propulsion test. Objective: Quantifying test-retest reliability and minimal detectable change (MDC) of key cardiorespiratory fitness measures following performance of a newly developed continuous treadmill-based wheelchair propulsion test (WPTTreadmill).
Methods/Overview: Twenty-five MWUs completed the WPTTreadmill on two separate occasions within one week. During these tests, participants continuously propelled their wheelchair on a motorized treadmill while the exercise intensity was gradually increased every minute until exhaustion by changing the slope and/or speed according to a standardized protocol. Peak oxygen consumption (VO2peak), carbon dioxide production (VCO2peak), respiratory exchange ratio (RERpeak), minute ventilation (VEpeak) and heart rate (HRpeak) were computed. Time to exhaustion (TTE) and number of increments completed were also measured. Intra-class correlation coefficients (ICC) were calculated to determine test-retest reliability. Standard error of measurement (SEM) and MDC90% values were calculated.
Results: Excellent test-retest reliability was reached for almost all outcome measures (ICC=0.91-0.76), except for RERpeak (ICC=0.58), which reached good reliability. TTE (ICC=0.89) and number of increments (ICC=0.91) also reached excellent test-retest reliability. For the main outcome measures (VO2peak and TTE), absolute SEM was 2.27 mL/kg/min and 0.76 minutes, respectively and absolute MDC90% was 5.30 mL/kg/min and 1.77 minutes, respectively.

Conclusions: The WPTTreadmill is a reliable and accurate test to assess cardiorespiratory fitness among MWUs. TTE and number of increments could be used as reliable outcome measures when VO2 measurement is not possible.

Keywords: Monitoring, Physiological, Physical Medicine and Rehabilitation, Rehabilitation Outcome

Source of Funding: Partnership between l'Ordre professionnel de la physiothérapie du Québec (OPPQ) and the Réseau provincial de recherche en adaptation-réadaptation (REPAR).

Poster Submission - SS135
Category: Student Submission

The Optimization of sexual health resource information and services for persons with spinal cord injury

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Background/Objectives: Although regaining sexual function has been noted to be a very high priority for individuals with spinal cord injury (SCI), sexual health remains one of the least likely areas of focus in the rehabilitation process, with a considerable gap in appropriate education and resources that address sexual health concerns in this population. To address these gaps in knowledge, the aim of the present study was to obtain the perspectives of persons with SCI about their preferences on obtaining knowledge on sexual health.

Methods/Overview: A fundamental qualitative description methodology was used, which involved using semi-structured interviews (approximately 30 minutes) with 13 community-dwelling adults with SCI (8 men; 5 women) to ask them about their experiences acquiring knowledge and perspectives on sexual health post-SCI. The interviews were transcribed, and the data were coded and evaluated for emerging themes and sub-themes by the investigation team through a ''code-recode'' technique.

Results: Six main themes with accompanying sub-themes were explored: 1) sexual health issues; 2) useful strategies; 3) unhelpful strategies; 4) Timing; 5) barriers ; and 6) availability of resources. Some of the key considerations noted by participants were that services be; anonymous, accessible, frequent, affordable, mandatory (routine), casual and supported by peers.

Conclusions: The findings of the study highlight that people with SCI find resources on sexual health and approaches for learning about sexuality inadequate. The findings from this study can be used to inform the development of appropriate sexual health services and improve access to information through tailored needs based program development.

Keywords: Treatment Effectiveness, Physical Medicine and Rehabilitation, Physical Medicine

Source of Funding: Toronto Rehab Institute University of Toronto

Poster Submission - SS136
Category: Student Submission

Life after personalized adaptive locomotor training: a qualitative follow-up study

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Background/Objectives: Personalized adapted locomotor training (PALT) is an intensive, locomotor-focused program tailored to each participant's goals and abilities for individuals with incomplete spinal cord injury (SCI). Although intensive locomotor training improves physical and psychological outcomes in individuals with SCI1; only a few studies have examined outcomes more than one year after locomotor training discharge.2-5 Objective. To understand the experiences of individuals with SCI regarding their ability to function and participate in daily activities 12-24 months after PALT participation.
Methods/Overview: Semi-structured interviews were completed with six participants with SCI (1 AIS C, 5 AIS D, C4-T8; 4 traumatic SCI; mean age 57+10 years). All participants completed PALT one to two years prior to evaluation. A thematic analysis was used to analyze interviews. Member-checking, triangulation, reflexivity and data trails were employed to enhance research rigor.
Results: Findings revealed three themes: 1) Rehabilitation experiences were positively influenced by PALT. However, disappointment was experienced after PALT ended and their recovery was perceived as incomplete. 2) Greater focus on experience-dependent falls strategies are needed to prepare for potential falls and near-falls. 3) Comparisons between pre-injury and pre-injury functioning triggered psychological declines in those who had not resumed meaningful activities such as working and driving.
Conclusions: The results suggest areas in which PALT can be improved, namely more gradual discharge transitions, greater integration of fall prevention strategies and preparation for community integration into the program, recalibrating expectations and support adjustments to current abilities. 1. doi:10.1080/09638288.2016.1277395 2. doi: 10.1038/sj.sc.3100670 3. doi: 10.1177/0888439003255508 4. doi: 10.1136/jnnp.71.1.93 5. doi: 10.1053/apmr.2001.23752

Keywords: Patient Monitoring, Treatment Effectiveness, Physical Medicine and Rehabilitation

Source of Funding: Ontario Neurotrauma Foundation

Poster Submission - SS137
Category: Student Submission

Importance of modelling detail in the development of peripheral nerve interfaces

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Background/Objectives: Neural interfaces that can extract sensory or motor information from peripheral nerves have applications in neuroprosthetic systems, which may help to restore function after spinal cord injury. There is a need for improved computer modeling of peripheral nerve recordings, in order to guide the design of neural interfaces. Current models do not typically incorporate all relevant aspects of the nerve's anatomy, and in particular neglect fascicular branching. This simplification could have potential implications for the conclusions made from these models. The objective of this study was to compare the modeling conclusions obtained with a novel, more anatomically detailed model, compared to a previous simplified model.
Methods/Overview: Two finite element models were created of a rat sciatic nerve, one which reflected progressive branching of the fascicles and another which was an extension of a single traced cross-section, and therefore uniform along the length of the nerve. Compound action potentials were propagated through both models and a spatiotemporal template matching algorithm was applied to discriminate the activities of different neural pathways. The performance of this algorithm was compared in both models.
Results: The performance in the anatomically accurate model differed by a minimum of 0.01% to a maximum of 31.89% compared to the simplified model across different test cases.
Conclusions: These findings suggest that the use of more anatomically accurate models may be an important factor to consider when modelling neural recordings. These models can help guide the development of neural interfaces to create improved neuroprosthetic systems.

Keywords: Engineering, Biomedical, Computer Models, Digital Signal Processing

Source of Funding: Natural Sciences and Engineering Research Council of Canada Grant Number: RGPIN-2014-05498 Institute of Biomaterials and Biomedical Engineering at the University of Toronto

Poster Submission - SS138
Category: Student Submission

Prospective monitoring of falls after spinal cord injury: circumstances, causes and consequences

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Background/Objectives: Up to 75% of ambulatory individuals with spinal cord injury (SCI) fall each year according to retrospective surveys.1 Little is known about the causes and consequences of falls after SCI.Our objective is to describe the rate, circumstances and physical consequences of falls in ambulatory individuals with SCI.
Methods/Overview: Ambulatory individuals with SCI were followed for one year to prospectively record fall details. Participants were asked to complete a survey (online or paper) within 24 hours of falling. The survey queried details about the fall (e.g. location, time of day), perceived cause of the fall (e.g. moving quickly, distracted) and injuries sustained. A researcher contacted participants every three weeks to ensure the surveys were being completed and document any changes in their health.
Results: Twenty-five participants with SCI were followed for one year (6 females, 59.3+18.5 years old, 5 AIS C, 20 AIS D, C1-L4, 16 traumatic SCI). Twenty participants (80%) reported a total of 66 falls, with the number/participant ranging 0-12 (median=2). Most falls occurred at home (74.2%), in the morning or afternoon (77.3%), while walking (43.9%). Falls were attributed to a variety of reasons, including a slip or trip (28.8%) and feeling the legs give way (15.2%). Most falls (60.6%) did not result in injuries. Minor cuts and bruises were the most common injuries; however, five falls (7.6%) required medical attention.

Conclusions: The fall rate is high among ambulatory individuals with SCI. Most falls in this sub-group of SCI occur at home and during daylight hours. 1.Spinal Cord 2007;45:37-40.

Keywords: Physical Medicine and Rehabilitation, Physical Medicine, Burden of Illness

Source of Funding: Saskatchewan Health Research Foundation Grant Number: 3660

Poster Submission - SS139
Category: Student Submission

Evidence informed protocols for the treatment of sublesional osteoporosis after sci

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Background/Objectives: Sublesional osteoporosis (SLOP) is a disease process characterized by excessive bone resorption, regional declines in hip and knee region bone density and bone quality after acute traumatic spinal cord injury (SCI). SLOP results in an increased risk for lower extremity fragility fractures, which are associated with increased morbidity and 5 year mortality post fracture. Objectives: To develop evidence informed protocols (EIP) for selecting drug therapy, addressing medication side effects or discontinuing ineffective therapy among patients with SCI, SLOP and high fracture risk.
Methods/Overview: A Working Group consisting of four SCI rehabilitation specialists, completed a systematic review of drug treatment options following SCI and incorporated expert opinion/clinical experience. The synthesized findings were used to develop a series of clinical practice flow diagrams regarding pharmacological considerations prior to selecting, continuing or stopping pharmacotherapy for SLOP.
Results: Five flow diagrams were developed with each flow diagram addressing specific clinical conundrums, selecting initial SLOP therapy, dealing with adverse effects of therapy and when to stop ineffective therapy. These EIP are an extension of prior published clinical paradigms for SLOP diagnosis and fracture risk stratification. Each diagram includes symbols to distinguish between strong evidence and authors opinions.
Conclusions: These EIP are intended to fill the gaps between the evidence articulated in Spinal Cord Research Evidence (SCIRE) and the day to day challenges of clinical practice.

Keywords: Therapies, Decision Aids, Decision Modeling

Source of Funding: None

Poster Submission - SS140
Category: Student Submission

Evaluation of the 2016 praxis bridging the gap conference: knowledge and network growth

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Background/Objectives: The 2016 Praxis Bridging the Gap Conference was aimed at developing solutions for overcoming the challenges of translating SCI research into practice. Guided by the COM-B model of behaviour change, the purpose of this evaluation was to assess the effects of Praxis on attendees' capability, opportunity, motivation, and behaviour (COM-B) of translating SCI research into practice. Additional outcomes included participants' knowledge of the barriers to effective knowledge translation (KT) in SCI and changes in professional networks for developing KT solutions.
Methods/Overview: Conference attendees responded to a questionnaire pre-conference and immediately post-conference (N= 64; Mage= 45.4 [SD= 12.1]). Participants completed questions assessing COM-B variables and knowledge, and were asked to identify groups they needed to work with to expand their network for translating SCI research. T-tests were conducted to examine change in COM-B and knowledge, while networks were examined using a McNemar's chi-squared analysis.
Results: Only knowledge improved from pre- to post-conference (t(59)=3.83, p=
Conclusions: The Praxis Conference successfully improved attendees' knowledge about the barriers and solutions to translating SCI research into practice, and increased the number of groups participants believed they needed to work with for more effective KT in SCI research. Future SCI conferences could build on the successes of Praxis to develop strategies to increase attendees' motivation, opportunity, and capability to overcome challenges for translating SCI research.

Keywords: Behaviour Change, Knowledge Translation, Community Groups

Source of Funding: Rick Hansen Institute Grand Number: RHI Grant G2016-25

Poster Submission - SS141
Category: Student Submission

Expanded cohort identification algorithm identifies greater SCI population service need and potential health care costs

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Background/Objectives: To compare the demographic characteristics and 5 year costs for two incident traumatic spinal cord injury (SCI) cohorts identified from administrative health care data using two different diagnostic algorithms.
Methods/Overview: Individuals with a new incident case of SCI between 2005 and 2010 were identified in Ontario administrative data using inpatient hospital records. Two algorithms identified the cohorts. The first cohort was individuals hospitalized with SCI as the most responsible diagnosis (MRDx). The second cohort contains individuals hospitalized with SCI as either the most responsible or secondary diagnosis with a primary traumatic injury diagnosis (TDx/MRDx). Demographic information including age, neighbourhood income, sex, rurality, location of injury, received inpatient rehabilitation and concurrent traumatic brain injury (TBI) were collected. Mean 5-year health care costs from the perspective of the Ministry of Health and Long-term care was also calculated.
Results: A total of 920 individuals were identified in MRDx compared to 1,716 in (TDx/MRDx). The demographic characteristics were similar between the two groups. There were differences in concurrent TBI (7% in MRDX, 12% in TDx/MRDx (p

Conclusions: Identification of incident cases using the TDx/MRDx algorithm identifies a larger administrative data cohort. This has significant implications for estimating SCI incidence, and projecting potential health care costs and health care service needs in Ontario.

Keywords: Burden of Illness, Healthcare Delivery, Informatics, Medical

Source of Funding: Ontario Neurotrauma Foundation Grant Number: 2009-RHI-MTNI-804

Poster Submission - SS142
Category: Student Submission

Using tele-health to enhance physical activity and motivation in adults with spinal cord injury: a preliminary analysis

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Background/Objectives: Motivational interventions promoting physical activity are needed for adults with spinal cord injury (SCI), especially those based in self-determination theory (SDT). SDT explains that a social environment can enhance the quality of motivation (higher autonomous and lower controlled motivations). Creating a social environment to enhance motivation can be done using innovative methods such as tele-health. The purpose of the study is to evaluate a tele-health, self-determination theory-based intervention aimed to enhance quality of motivation and physical activity in adults with SCI.
Methods/Overview: Twenty-four adults will be recruited and randomized to either the control or intervention group. The intervention group will receive one video-based counselling session per week, for a total of eight weeks. The control group will continue with their regular routine. Both groups will respond to a questionnaire at three time points. To date, two participants in each group have completed the baseline and mid-intervention assessments. For this preliminary analysis, change scores were calculated for autonomous and controlled motivation, and physical activity at mid-intervention compared to baseline. Using the change scores, Cohen's d effect sizes were calculated for each variable given the small sample.
Results: Compared to the control group, the experimental group reported a large decrease in controlled motivation (d=-1.03) and a small increase in autonomous motivation (d=0.26) after four weeks. Small effects were also observed for the change in aerobic activities (d=0.29) favoring the experimental group over the control group and no intervention effect on strength activities (d=0.01).
Conclusions: These preliminary analyses indicate that participants who are receiving the intervention tend to experience an enhanced quality of motivation. Upon completion, this randomized control trial will contribute to the SCI physical activity intervention literature by determining the effectiveness of a video-based tele-health intervention on motivation and physical activity among adults with SCI.

Keywords: Health Technology, Behaviour Change, Graduate Students

Source of Funding: Craig H. Neilson Foundation, Psychosocial Research Grants grant number: 430-2014-00168

Poster Submission - SS143
Category: Student Submission

Novel tetrapolar nerve cuff electrode design to record low-noise bi-directional nerve activity

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Background/Objectives: Advances in electrode technology have facilitated the development of neuroprostheses for restoring motor/sensory function in disabled individuals. Among myriad neural interfaces, the cuff electrode offers an attractive tool for communicating with the peripheral nervous system. The tripolar cuff electrode is the most common nerve cuff design; however, the physical symmetry of this configuration generates compound action potential (CAP) recordings that are identical regardless of whether the neural activity is afferent or efferent in nature. The goal of this computational study was to design a nerve cuff configuration able to achieve low-noise directionally-sensitive recording of peripheral nerve activity.
Methods/Overview: We investigated the feasibility of using a tetrapolar (4 electrode contacts) nerve cuff. The rational for this design was based on the use of two sets of tripolar electrode signals which are measured differentially in a bipolar configuration for differentiating recorded efferent/afferent neural activity. In this manner, we obtained two low-noise signals that are subtracted to yield a directionally-sensitive ENG. A finite element model was implemented (Comsol Multiphysics) to simulate 800 CAPs recorded by a tetrapolar nerve cuff electrodes for 3um, 5um, 10um and 20um fibres. A spatiotemporal template matching algorithm was applied to discriminate afferent and efferent activity.
Results: The afferent/efferent signal-to-noise ratio classification accuracy was 78.6±24.9% across 4 different noise levels (e.g., 0 dB, -5 dB, -12 dB, and -20 dB) corresponding to each fibre's signal.
Conclusions: The preliminary results indicate that directional sensitivity can be achieved using a tetrapolar cuff electrode.

Keywords: Computer Models, Engineering, Biomedical, Bio-Engineering

Source of Funding: Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grant Grant number:496560 Canada Foundation for Innovation (John R. Evans Leaders Fund)

Poster Submission - SS144
Category: Student Submission

Application of electrical stimulation enhances neural precursor cell migration in vivo

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Background/Objectives: Neural stem and progenitor cells (NSPCs) reside in the periventricular region of the adult brain and spinal cord. In injury models, NSPCs proliferate and a small NSPC population is recruited to the injury site. However, insufficient numbers are recruited for functional recovery. Towards the goal of developing therapeutic strategies to promote neural repair, we propose to enhance this migration by building on our previous in vitro work demonstrating rapid and directed NSPC cathodal migration using clinically relevant charge-balanced stimulation. Herein we asked whether electric stimulation (ES) promotes directed NSPC migration in the adult brain and whether directly reprogrammed human NSPC (drNSPC) migrate in response to ES in vitro. Objectives: To determine if ES can direct NSPC migration in vivo and drNSPC migration in vitro.
Methods/Overview: Fluorescent NSPCs derived from a transgenic mouse were collected and transplanted into the cortex and corpus callosum of adult wild type mice. Electrodes were implanted lateral and medial to the transplanted NSPCs. The brains were stimulated 3 times/day for 30 minutes for 3 days beginning 2 days post-transplant (400 Hz, 250 mV/mm). Following ES, brains were removed and the numbers, location and differentiation of transplanted cells were examined. drNSPC migration was analyzed in the presence or absence of ES in vitro.
Results: Enhanced NSPC migration was seen in ES stimulated brain tissue relative to non-stimulated brains. drNSPCs exposed to ES undergo directed anodal migration in vitro.
Conclusions: ES enhances NSPC migration and demonstrates promise as a method to promote NSPC homing toward injury sites.

Keywords: Engineering, Biomedical, Biology, Molecular, Biomedical Technologies

Source of Funding: Krembil Foundation, Ontario Institute of Regenerative Medicine, Connaught Innovation Award Program and the Health Commercialization Fellowship

Poster Submission - SS145
Category: Student Submission

Novel measure to assess dynamic stability during walking

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Background/Objectives: Slips and falls are growing problems among the elderly and patients with motor disabilities. Accurate evaluation of dynamic stability during gait is critical to reducing the risk of falling in these populations. Although current assessments have been focusing on regulating the body's center of mass (COM) within the base of support of the feet, these methods only predict the occurrence of instability without characterizing its nature or severity. Our team has proposed a novel assessment measure involving a desired center of pressure (dCOP), calculated as the location of the body's center of pressure where no moment occurs around the COM. Here we investigated the effectiveness of our method in evaluating the dynamic stability during gait in comparison with other measures.
Methods/Overview: Kinetic and kinematic data were recorded and analyzed for fourteen healthy subjects walking on an instrumented treadmill under four conditions with different dynamic stabilities: (1) naturally, (2) in sync with a metronome, (3) while performing a cognitive task, and (4) with arms restrained.
Results: We have found that our measure using dCOP appropriately differentiates the dynamic stabilities among these conditions.
Conclusions: This novel measure will contribute to the improvement of fall risk assessment and the development of assistive technologies for vulnerable populations.

Keywords: Engineering, Biomedical, Knowledge Generation, Graduate Students

Source of Funding: University of Toronto

Poster Submission - SS146
Category: Student Submission

To explore soft tissue properties and pressure relief over the ischial tuberosity in individuals with spinal cord injury who are wheelchair users

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Background/Objectives: To characterize soft tissues and pressure relief (PR) over the ischial tuberosity (IT) in individuals with sub-acute spinal cord injury (SCI) in order to develop a methodology to track ischial tissue health (ITH). Relevance: Difficulty with PR over the IT due to immobility results in prolonged soft tissue deformation (1), damage (2), and ischemia and reperfusion injury (3) leading to increased risk of pressure ulcer development.
Methods/Overview: High frequency ultrasound (HFUS) was used to measure the soft tissues overlying the IT in 15 individuals with sub-acute SCI who were wheelchair users. Skin, subcutaneous tissue and muscle thickness and texture (echogenicity and contrast) were extracted from the images using MATLAB Image Processing Toolbox. PR was measured using SENSIMAT technology (4) by recording changes in pressure over both ITs for two continuous hours of sitting during daily activities. Relationships between PR and soft tissue measures were assessed using Spearman's rank order correlations.
Results: All 15 individuals did not engage in enough offloading (PR range: 0-12.6% of sitting time) to match clinical practice guidelines, however IT offloading occurred bilaterally (n=3) and unilaterally (n=4). In the remaining eight, offloading was negligible. In addition, there were no significant correlations between percent offloading of the soft tissues over the IT and all thickness and texture measures (r values: -0.28 to 0.47).
Conclusions: A prospective longitudinal evaluation of established metrics of soft tissues over the IT and offloading in individuals with SCI are warranted in order to develop more robust strategies for promotion of ITH and ischial pressure ulcer prevention. References: 1. Makhsous, M., et al. (2011). http://doi.org/10.1002/ca.21119 2. Lévêque,et al. (2002). Dermatology, 205(4), 353–357. http://doi.org/10.1159/000066433 3. Kottner, J.et al (2015). Journal of Tissue Viability, 24(3), 114–122. http://doi.org/10.1016/j.jtv.2015.04.002 4. SENSIMAT www.sensimatsystems.com

Keywords: Rehabilitation Outcome, Health Information Technology, Clinical Application

Source of Funding: The Ontario Student Opportunity Trust Fund Ontario Neurotrauma Foundation-Résau provincial de recherche en adpatiation-réadaptation (ONF-REPAR) Research Grant Health Innovation Award, Faculty of Medicine, University of Toronto

WCA158 - Preconference Workshop - November 9, 14:20-15:50
Category: Clinical Application

Assessment of upright mobility after spinal cord injury: a "how-to" guide to the canadian spinal cord injury standing and walking assessment tool

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Background/Objectives: The Standing and Walking (S&W) Assessment Tool is a guide for the progressive staging and assessment of standing and walking ability in individuals with spinal cord injury (SCI). It combines staging of mobility status with established measures of balance and walking in order to standardize walking assessment after SCI. Development of the S&W Assessment Tool for the Rick Hansen Spinal Cord Injury Registry (RHSCIR) was a pan-Canadian initiative involving more than 25 clinicians, researchers and individuals with SCI. Through a recent validation study, physiotherapists using the S&W Assessment Tool highlighted the need for standardized training in its use. In response, we have created a training workshop for therapists, therapy assistants and researchers who are currently using, or interested in using, the S&W Assessment Tool in their practice or research. After completing the workshop, participants will be able to 1) stage individuals with SCI according to the S&W Assessment Tool, 2) identify strategies to assist the implementation of the Tool in their clinical environment, and 3) recognize how patient-, site- and national-level data provided by the Tool can be used to inform SCI rehabilitation practice and research.
Methods/Overview: The workshop will involve lecture-based and case-based learning, along with hands-on practice of staging.
Results: The results of a recent validation study will be discussed, along with proposed changes to the S&W Assessment Tool that may strengthen its validity.
Conclusions: The workshop will provide participants with the knowledge, skills and resources needed to implement the S&W Assessment Tool in clinical and research settings.

Source of Funding: Rick Hansen Institute Grant Number: RHI Grant #G2017-19

WKG167 - Preconference Workshop - November 9, 14:20-15:50
Category: Knowledge Generation

Novel wearable technologies for tracking upper limb function in the community after spinal cord injury

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Background/Objectives: The ultimate goal of the rehabilitation process is to restore the ability to function independently in the community. While upper limb (UL) interventions are a crucial component of this process after cervical spinal cord injury (SCI), methods to directly measure UL function in the community are currently lacking. Wearable technologies may be able to overcome this limitation, providing new insights into the neurorehabilitation process and leading to new models of care delivery. This workshop will provide an overview of wearable technologies relevant to monitoring UL function.
Methods/Overview: The workshop will consist of: 1. Presentations describing recent technological advances relevant to UL monitoring, with an emphasis on wearable cameras and electronic textiles. 2. Interactive case studies to analyze the potential contributions of different technologies, and how they relate to existing outcome measures. 3. Open discussions on the best strategies to incorporate existing and emerging wearable technologies into UL neurorehabilitation, in research and clinical environments.
Results: After attending this workshop, attendees will: 1. Understand the roles that wearable technologies can play in the assessment of upper limb function after cervical SCI. 2. Understand the advantages and disadvantages of currently available technologies, and be able to assess their suitability for a particular research question or clinical scenario. 3. Become aware of new wearable technologies under development, and understand their potential contributions.
Conclusions: Attendees will learn to critically evaluate how different wearable technologies can contribute to UL functional evaluation and recovery.

Source of Funding: Rick Hansen Institute Grant Number: #G2015-30

WPC173 - Preconference Workshop - November 9, 14:20-15:50
Category: Policy Change

Spinal cord injury primary care and community support summit: proceedings and recommendations

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Background/Objectives: Currently significant challenges exist in delivering and accessing primary care services for persons with spinal cord injury (SCI).
Methods/Overview: A 2016 provincial summit brought together multiple stakeholders to direct research, education, and innovation in primary and community care for SCI. This workshop presents the summit proceedings and recommendations based on the perspectives of consumers, primary care providers, specialists, funders, researchers and program leaders. Over 100 individuals representing people with SCI, care partners, primary care and rehabilitation clinicians, community services, researchers, and policy makers. Perspectives on SCI management and access to care were shared by primary care, neurosurgery, rehabilitation, and members of the SCI community. Panel discussions were delivered by members of the SCI community and primary care clinicians, sharing their lived experiences of primary care and their experiences managing and providing SCI primary care, respectively. Workshop discussions provided an opportunity to identify key barriers and gaps in SCI primary and community care and potential solutions.
Results: This summit identified barriers, gaps, and potential solutions in five target areas: Application of best practices (knowledge empowerment, online repository of SCI resources), knowledge translation (SCI network for information management), accessibility of services (environmental) and systemic issues (regional equity), research (aligning funding to support care, non-traumatic SCI identification, SCI primary care data access), and communication (improved access to patient information).

Conclusions: This summit identified priorities for improving SCI primary care, brought together key stakeholders capable of advancing SCI primary care, and will help shape policy direction and SCI care.

Source of Funding: Ontario Neurotrauma Foundation Grant Number: n/a

WCA164 - Preconference Workshop - November 9, 14:20-17:35
Category: Clinical Application

Leaders lounge: sharing ideas for program planning

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Background/Objectives: 1. Identify best practices in SCI program planning from across the country 2. Take home one best practice that you can implement in your care setting. Audience: Administrators, Physicians and other clinicians involved in the planning and delivery of SCI care.
Methods/Overview: The session will have three parts – • Brag and steal – submit your 1-2 slides (5 minute presentation) to demonstrate a practical application, resource, or tool that can be shared with other leaders • The journal of negative results – what ideas have you tried that haven't worked that you could save others from trying? Submit your 1-2 slides (5 minute presentation) • Open forum – what questions do you have for like minds across the country? What trends are you noticing that need more discussion? Bring your questions for an informal round-table.
Results: This session will bring together leaders from across the country to discuss lessons learned in the area of inpatient and outpatient program planning. The focus will be on inpatient and outpatient models and delivery of care, discharge planning and sustainable length of stay management.
Conclusions: Clinical leaders from across Canada will share their experiences and challenges in the delivery of spinal cord injury program planning. This dialogue will enable programs to reflect upon current best practices and to work together with their national counterparts to develop future benchmarking activities.

Source of Funding: None

WCA161 - Conference Workshop - November 10, 14:15 - 15:15
Category: Clinical Application

"Teach-back sci" - patient oriented discharge strategy (pods): describing a process for optimizing transitions from inpatient spinal cord injury rehabilitation to community

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Background/Objectives: In 2015, the Spinal Cord Rehab Program (SCRP) at the University Health Network developed, piloted and evaluated an initiative aimed at helping patients with spinal cord injury (SCI) consolidate rehabilitation learning and enhance self-efficacy in preparation for discharge. To understand the needs of individuals with SCI, the project team consisting of two patient partners, conducted patient interviews, developed an SCI PODS template and conducted pilot testing of the new process. The main features of SCI PODS includes: a teach-back style meeting using self-management best practices by a neutral clinician facilitator and a document written in the patient's words summarizing their understanding of their medications, care plan, signs and symptoms and how to manage them. The PODS document also includes an individualized appointment and contact list. PODS has been the standard care in SCRP since May 1, 2015.
Methods/Overview: A panel of clinicians, leaders and a patient partner involved in PODS will describe the method used to develop and implement this unique approach to planning for discharge. The workshop will include a project overview and key processes and patient and staff outcomes. The panel will share the approach taken to develop and create the unique SCI PODS strategy. Participants will engage in a PODS style meeting to consolidate their own learning of the process.
Results: Pilot data post-PODS indicated that patients felt more confident about understanding their medications and how to take them. Knowing who to call with questions and concerns post discharge went from 33% pre-pods to 83% post pods. A 25% improvement in overall confidence in the discharge process was an improvement given the multiple processes and strategies in place to facilitate discharge to the community. Further discussion in the workshop will focus on the experiences of the team and lessons learned. The aim will be to engage audience members in active discussion and reflection about how they might implement a similar discharge strategy in their own setting.
Conclusions: Participants in this workshop will gain an understanding of the PODS process, documentation and meeting developed to enhance patient self-efficacy and safety prior to discharge, consolidate rehab learning and identifying outstanding needs before discharge. This discussion will enable participants to determine if this approach would be beneficial in their setting and provide them with a framework for achieving similar programs with their teams.

Source of Funding: Toronto Central Local Health Integration Network

WCA166 - Conference Workshop - November 10, 14:15 - 15:15
Category: Clinical Application

Case-based application of the canpainsci neuropathic pain clinical practice guidelines: a workshop

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Background/Objectives: Neuropathic pain (NP) is a common secondary complication after spinal cord injury (SCI). The treatment of NP in acute SCI may improve motor recovery, and the management of chronic NP is important to reduce pain intensity, maintain function, and improve quality of life. However, successful management of NP is often challenging. The clinical evidence for management of chronic NP after SCI was recently reviewed as part of the CanPainSCI Clinical Practice Guidelines (CPG), resulting in recommendations for screening and diagnosis, treatment, and models of care. This workshop aims to apply, assess and discuss NP after SCI using the CanPainSCI CPG. Learning Objectives: 1) Apply the CanPainSCI CPG in different scenarios using a case-based approach; 2) Assess the research and clinical implications of the CanPainSCI CPG; 3) Discuss the long-term goals and priorities for: (a) research into NP after SCI, and (b) improving the clinical management of this common complication.

Methods/Overview: This workshop involves interactive, small-group based case studies focusing on the application of the CPG. The discussion will be facilitated by a multi-disciplinary panel including persons with lived experience, clinicians, and researchers.
Results: This workshop will provide practical examples for the clinical use of the CanPainSCI CPG, allowing participants to gain an appreciation of the current recommendations for management of NP after SCI, as well as gaps in the available evidence. The future research and clinical priorities that should be addressed in order to improve the care of those with NP will be discussed. Barriers to pursuing these priorities, including the challenges of conducting research in NP after SCI, will also be discussed. The importance of integrating the person with lived experience throughout the research to practice spectrum will be emphasized.
Conclusions: This workshop will review the findings of the CanPainSCI CPG, and explore a long-term vision to improve NP management after SCI in Canada. This workshop is relevant to persons living with SCI, clinicians, researchers, and administrators.

Source of Funding: Ontario Neurotrauma Foundation/Rick Hansen Institute Grant Number: 2012-ONF-RHI-PM2-964

WKG170 - Conference Workshop - November 10, 14:15 - 15:15
Category: Knowledge Generation

The 2017 International physical activity guidelines for adults with sci

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Background/Objectives: Physical activity can improve fitness and reduce the risk for developing chronic health conditions. However, most Canadians with SCI are insufficiently active to reap these benefits. SCI-specific, evidence-based clinical practice guidelines are important to support the health and fitness-promoting efforts of SCI consumers, clinicians, service providers, and scientists. In 2016-2017, an international project involving systematic and stakeholder-engaged processes, was undertaken to update the original Physical Activity Guidelines for Adults with SCI (2011). In this workshop, the project, its outcomes, and the resulting knowledge products will be presented. An SCI consumer, an SCI community service leader, and an SCI scientist will share their perspectives on the implications of the new guidelines for Canadians with SCI, as well as strategies for disseminating and implementing the guidelines.
Methods/Overview: The guideline development process was guided by AGREE-II (Appraisal of Guidelines for Research and Evaluation) as well as the principles and values of community-engaged research. Steps consisted of: (a) conducting a systematic review of relevant literature to provide a guideline evidence base; (b) holding three international consensus panel meetings to formulate the guidelines; and (c) engaging with SCI consumers and other end-users to develop a knowledge translation strategy for promoting and implementing the new guidelines.
Results: The process resulted in a new guideline for the prescription of physical activity to improve the cardiometabolic health of adults with SCI. The original 2011 guideline was upheld for the prescription of physical activity to improve cardiorespiratory fitness and muscle strength in adults with SCI. Canadians with SCI identified, and provided direction on, several knowledge translation strategies to maximize guideline reach and impact.
Conclusions: A scientifically rigorous, systematic and community-engaged process has resulted in the formulation of an updated set of physical activity guidelines, including a new guideline to improve cardiometabolic health outcomes. By engaging with key stakeholders throughout the guideline development and knowledge translation processes, we can maximize the potential reach of the guidelines and their impact on the health and fitness of adults with SCI.

Source of Funding: This project was financially supported by the Rick Hansen Institute (Grant# G2016-21), The Peter Harrison Foundation (Grant# J13307), HEFCE Catalyst Funding awarded to Loughborough University (UK), and the Social Sciences and Humanities Research Council of Canada (Grant# 895-2013-1021).

WCA159 - Conference Workshop - November 10, 16:15 - 17:15
Category: Clinical Application

An interactive workshop in the assessment and treatment with cannabinoids for neuropathic pain and spasticity in people with spinal cord injury

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Background/Objectives: People with spinal cord injury (SCI) consistently rank both neuropathic pain and spasticity amongst the top symptoms that severely interfere with their quality of life. Unfortunately, these symptoms often remain very difficult to treat. From this workshop, the learner will: • Have awareness of the use of medicinal cannabinoids in neuropathic pain and spasticity, including historical use • Understand the potential therapeutic mechanisms of cannabinoids, in particular THC and CBD • Critique current evidence of cannabinoids and inhaled herbal cannabis, for neurogenic pain and spasticity. • Know how to prescribe cannabinoids for pain and spasticity in the clinical setting and be able to counsel a patient about the selection of cannabinoids when appropriate • Understand the rules and regulations for accessing medical marijuana in Canada, and be able to counsel a patient, when appropriate, on the informed process of obtaining medical cannabis.
Methods/Overview: 2 internationally known experts in managing pain and spasticity in SCI with cannabinoids will have interactive presentations and case discussions involving consumers.
Results: The use of cannabinoids for the treatment of neuropathic pain and spasticity has been increasing in recent years, due to both emerging research and clinical evidence, as well as the increasing exposure in the media, and easier process to access to medical cannabis in Canada. Considerable progress has been made in understanding the role of cannabinoids, with increasing evidence of the effectiveness for neuropathic pain, to the extent that cannabinoids have been moved up a step in the Canadian Pain Society Guidelines for neuropathic pain to third line. A number of clinical studies have also suggested that cannabinoid therapy may reduce spasticity. Several cannabinoid-based medicines are available including: Nabiximol, an oromucosal spray of THC and CBD indicated in Canada for multiple sclerosis related spasticity and neurogenic and cancer pain, and nabilone, a synthetic cannabinoid used for pain and spasticity with off label prescription. In Canada, cannabis can be produced and sold in dried leaf form or oil form from over 30 Health Canada approved licensed providers. Recent changes in regulations also allow patients to grow medical cannabis for personal medical use once a medical document has been provided by their physician.
Conclusions: Cannabinoids, when appropriately prescribed, can be useful in the management of neurogenic pain and spasticity in SCI.

Source of Funding: None

WKG172 - Conference Workshop - November 10, 16:15 - 17:15
Category: Knowledge Generation

Family caregiving for veterans with spinal cord injury - stresses and benefits

Susan Charlifue

Craig Hospital, Englewood, CO, USA

Background/Objectives: The purpose of this study was to gain insight into family caregiver issues from the perspective of the caregivers themselves, and to use this information to develop an instrument to assess caregiver distress and benefit in SCI
Methods/Overview: Twelve focus groups were convened at three Veterans Administration facilities across the US. Participants were family caregivers who agreed to have the sessions audiotaped and transcribed. The transcripts were then coded by three staff members (the lead investigator and two research assistants) to identify themes. Further analysis was performed using NVivo-8 qualitative software.
Results: Fifty-nine family caregivers participated in the focus groups. They were predominantly female (97%), spouses of their care recipient (73%) and had been caregiving for an average of 12.6 years. They provided care to their family member an average of 9.6 hours a day. Positive themes included a change in self-awareness, feeling appreciated, and increased compassion. Negative themes included having no time for oneself, lack of appreciation from family members, dissatisfaction with hired carers and agencies and strains on family relationships. A number of health issues were identified including fatigue, sleep deprivation, emotional strain and depression. Participants identified several changes in life that they had to make in order to provide care to their family members, including changing or abandoning outside work, difficulty with finances, limitations in leisure pursuits and loss of friendships. However, caregivers did identify several sources of strength that helped them work through negative issues, including having a solid faith network, and having family, friends and co-workers for social support. The workshop will include specific statements from these family caregivers that clearly identify, in their own words, the positive and negative issues they face on a daily basis.
Conclusions: Caregivers of veterans with SCI experience many emotional and physical challenges as well as benefits. It is critical to understand their issues as they are often the only lifeline for the veteran with SCI and they provide a valuable and often irreplaceable service. If their needs are overlooked and their health and well-being fails, it will compromise the success of their loved one with SCI. Clinicians and health care providers can assist by periodically checking in with the family as a whole to identify areas of concern and need.

Source of Funding: US Department of Defense, Spinal Cord Injury Research Program (Congressionally Directed Medical Research Program) Grant Number W81XWH-11-2-0213

WKG168 - Conference Workshop - November 10, 16:15 - 17:15
Category: Knowledge Generation

Locomotor training using an overground robotic exoskeleton in individuals with a chronic motor complete spinal cord injury: *Lessons learned from a feasibility study in terms of recruitment, attendance, learnability performance, effects, safety* and *satisfaction*

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The learning objectives of the workshop are to:
1. Define the main features of a wearable robotic exoskeleton for overground walking
2. Report recruitment, attendance, learnability, performance, and safety issues
3. Identify potential supralesional and sublesional musculoskeletal adaptations
4. Share customer's perceived technology comfort, usability, health benefits and risks and satisfaction

5. Provide an opportunity to exchange on how wearable robotic exoskeletons for overground walking could be incorporated into adapted physical activity program offered in the community

Background/Objectives: For individuals who sustain a complete motor spinal cord injury (SCI) and rely on a wheelchair as their primary mode of locomotion, overground robotic exoskeletons represent a promising solution to stand and walk again. Although overground robotic exoskeletons have gained tremendous attention over the past decade and are now being transferred from laboratories to clinical settings, their effects remains unclear given the paucity of scientific evidence and large-scale clinical trials are recommended to strengthen evidence. This study aims 1) to examine the feasibility of a locomotor training program with an overground robotic exoskeleton in terms of recruitment rate, attendance rate, performance, learnability, and safety, 2) to explore its effects on the musculoskeletal systems, and 3) to measure satisfactions and perceived health benefits among individuals with a chronic complete spinal cord injury (SCI).
Methods/Overview: Individuals with a SCI were invited to participate in a 6 to 8-week locomotor training program with a robotic exoskeleton encompassing a total of 18 sessions. Selected participants underwent a comprehensive screening process and completed two familiarization sessions with the robotic exoskeleton. The outcome measures are the rate of recruitment of potential participants, the rate of attendance at training sessions, the ability to walk with the exoskeleton and its progression over the course of the program, and the adverse events. Supralesional and sublesional musculoskeletal adaptations were measured with clinical and laboratory measures, respectively. Satisfaction and perceived health benefits were measured using a web-based questionnaire.
Results: Out of 49 individuals with a SCI who expressed their interest in participating to the study, only 14 of them initiated the program (recruitment rate=28.6%). Thirteen individuals with SCI completed the program and attended 17.6±1.1 sessions (attendance rate=97.7%). Their greatest standing time, walking time, and number of steps taken during a session were 64.5±10.2 minutes, 47.2±11.3 minutes, and 1843±577 steps, respectively. During the training program, these last three parameters increased by 160%, 279%, and 413%, respectively. At the end, when walking with the exoskeleton, most participants required one therapist (85.7%), needed stand-by or contact-guard assistance (57.1%), and used forearm crutches (71.4%). Four participants reported training-related pain or stiffness at the upper limb during the program. One participant sustained bilateral calcaneal fracture and stopped the program. Beneficial effects on the supralesional and sublesional musculoskeletal health were found. Individuals with a SCI who completed the program reported an excellent level of satisfaction (95.2±7.8/100mm).
Conclusions: Larger clinical trials investigating the effects of locomotor training program with an overground robotic exoskeleton are feasible among individuals with complete motor SCI. However, issues related to recruitment rate and safety will need careful consideration.

Source of Funding: Rick Hansen Institute Grant Number: G2015-14 Fonds de la recherche du Québec-Santé Grant Number: 32549

WCA170 - Conference Workshop - November 10, 14:15-15:15
Category: Clinical Application

Getting the right care to the right person at the right time!! collaborative practice amongst those wishing to improve the care of people living with pressure ulcers.

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Background/Objectives: People with SCI and other conditions that impair mobility are very susceptible to pressure ulcers. However, pressure ulcer care available to those living in the community is often disjointed and clinicians

working in the field are not connected. Electrical Stimulation therapy (E-Stim) is a treatment that has long been known to accelerate healing, however, few clinicians provide this treatment. E-Stim treatment is an excellent example of a best practice that requires a number of people from different backgrounds to come together to make a sustainable change in practice. It takes collaboration to identify appropriate recipients, secure appropriate equipment and resources, and deliver daily treatments in a safe and effective manner.
Objectives
1) Review key processes put in place for a best practice implementation project that used KT frameworks to promote sustainable practice changes.
2) Share educational strategies and resources that promote awareness and provide advanced training about Pressure Ulcer care and E-Stim to providers with a variety of backgrounds
3) Develop and discuss ways to connect and support those interested in implementing pressure ulcers best practices including E-Stim
This interactive session is designed to link clinicians, care providers and consumers interested in promoting best practices in pressure ulcer care provided in the community. Learnings and preliminary results from a large multi-year best practice implementation project will be used to understand challenges and opportunities facing people working in this field. Discussions stemming from this session will inform future collaborative initiatives that brings together people from across Canada who are interested in promoting optimal pressure ulcer care with better clinical outcomes. Lessons learned from this best practice implementation project will certainly be generalizable to other health settings and interventions.
Methods/Overview: This interactive session is designed to link clinicians, care providers and consumers interested in promoting best practices in pressure ulcer care provided in the community. Learnings and preliminary results from a large multi-year best practice implementation project will be used to understand challenges and opportunities facing people working in this field.
Results: Discussions stemming from this session will inform future collaborative initiatives that brings together people from across Canada who are interested in promoting optimal pressure ulcer care with better clinical outcomes. Lessons learned from this best practice implementation project will certainly be generalizable to other health settings and interventions.
Conclusions: Based on our experiences with this implementation project it is certainly understandable why there has been limited uptake of EST and other best practices related to pressure ulcer care in the community. The system is complex, processes are cumbersome, and communication between key stakeholders is lacking. This makes purposeful and carefully planned implementation projects like this one critically important if meaningful practice changes are to be made in the current health care system.

Source of Funding: Rick Hansen Institute Grant No. G2015-34

WKG171 - Conference Workshop - November 10, 16:15 - 17:15
Category: Knowledge Generation

Sci research today ~ video series designed to educate, empower, and inform.

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Background/Objectives: A video series designed to empower the patient consumer to advance leadership and organization development surrounding advocacy for spinal cord research. The videos are designed to demonstrate how each person can effect incremental change that will ultimately lead to a cure. By giving hope, creating opportunities and engaging stakeholders in finding a cure for paralysis, we can change the acceptance of the status quo. Being that in the immediate aftermath of a spinal cord injury people are highly motivated but when they hit that five-year mark, many people begin to become complacent and lose their

motivation to find a cure. They begin to accept their fate. Keeping people engaged is the key to making a difference. The urgent demand for a cure needs to be upheld.
Methods/Overview: The videos will begin breaking down the biology of the spinal cord and what happens following an injury. The research sections will be broken into five divisions including using cell replacement strategies, stem cells, using technology to 'wake up" the spinal cord, drugs that can protect the spinal cord from further injury and drugs that can dissolve the barrier of regeneration ~ the glial scare. A section highlighting all the obstacles that come along with research on a small population like spinal cord injury including a lack of funding and the timely process of clinical trials. Each video will end with a call to advocacy outlining how you can become an advocate with an interactive guide.
Results: The development of knowledgeable consumers with leadership skills who have a primary interest in advancing research with the sole objective to find a cure for paralysis.
Conclusions: A consumer who is knowledgeable about current trends in spinal cord research and able to make informed decisions about care and treatment.

Source of Funding: Canadian Spinal Research Organization and the Ontario Neurotrauma Foundation

WCA162 - Conference Workshop - November 11, 15:30-16:30
Category: Clinical Application

Moving from prioritization to implementation: the spinal cord injury rehabilitation care high performance indicators (SCI-high) project

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Background/Objectives: Health indicators are key to understanding the quality of rehabilitation care (RC) and identifying actionable opportunities for improving health system performance over time. The aim of the SCI-HIGH project is to advance Spinal Cord Injury (SCI) RC for Canadians by 2020. The project goal is to establish a comprehensive framework of structure, process & outcome indicators to improve standards of SCI RC in the first 18 months after inpatient rehabilitation admission.
Methods/Overview: An external advisory committee of stakeholders was assembled to rank the top 10 of 37 RC domains using an established prioritization methodology (Hanlon method) and feasibility scoring. Eleven RC domains were identified and national working groups formed to develop and implement structure, process and outcome indicators relevant to these RC domains. Working groups deliberated regarding health system deficiencies and gaps in knowledge generation and clinical application. Ishikawa diagrams , outcome measure audits, clinical practice guidelines, and optimal models of service delivery were used to inform the working group's consensus processes and subsequent indicator outputs. Potential indicators were piloted to assess feasibility and inform standard operating procedure (SOP) development and formulation of preliminary benchmarks.
Results: The intended workshop attendees would include administrators, practice leaders and health authorities. An overview of the prioritization process, working group agendas, and identified indicators for 11 RC domains will be presented. The prioritized RC domains include: bladder continence, cardiovascular integrity, community participation and employment, emotional wellbeing, informed self-management, reaching, grasping & manipulation, sexual health, skin integrity, urinary tract infection, walking, and wheeled mobility. Intended processes to support national indicator implementation and linkage of the indicators with Accreditation Canada SCI standards will be outlined.
Conclusions: Workshop participants will have the opportunity to provide the SCI-HIGH project team with feedback regarding the indicators and projected implementation plans and timelines.

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WCA160 - Conference Workshop - November 11, 15:30-16:30
Category: Clinical Application

Shifting the focus: delivering peer-led, person-centered peer mentorship in SCI inpatient rehabilitation and community settings

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Background/Objectives: Throughout North America, person-centered approaches are being incorporated into service provisions for persons with spinal cord injury (SCI). Peer involvement is expanding in rehabilitation and community settings whereby trained mentors help fellow adults with SCI adopt a more active role in self-management and home/community reintegration. The objective of this workshop is to demonstrate different approaches to person-centered peer mentorship and discuss research findings that validate their importance.

Methods/Overview: This workshop will highlight interrelated examples of person-centered peer mentorship across the rehabilitation-community spectrum. First, a SCI peer mentor-mentee interaction will be demonstrated and discussed. Next, two successful US peer mentorship programs will be presented: an inpatient rehabilitation initiative and a health empowerment community-based program. Two Canadian project discussions will highlight the effectiveness of providing standardized training to peer mentors using a person-centered Transformational Leadership (TFL) approach and lessons learned from an evaluation of an existing, community-based peer mentorship service. Throughout the workshop, we will engage participants in discussing the person-centered approaches presented.

Results: In the US inpatient rehabilitation initiative, adults who received mentorship (i.e., mentees) reported lower rehospitalization and greater changes in self-efficacy compared to adults who did not receive peer mentorship (i.e., non-mentees; $p < .05$). Similarly, mentees in the health empowerment community-based trial demonstrated greater positive change in health activation, social/activity limitations, and life satisfaction compared to non-mentee controls ($p < .05$). After completing a one day TFL training program, peer mentors of a Canadian program indicated that they intended to use TFL behaviours more frequently compared to their past use ($p < .05$). Although feelings of competence and relatedness mediated the peer mentorship – quality of life relationship ($p < .05$) in an existing Canadian community-based program, more questions surrounding evaluating such programs emerged.

Conclusions: Person-centered approaches have improved outcomes for adults with SCI in inpatient rehabilitation and community settings. Workshop participants will leave with an empirical and applied understanding of person-centered approaches to peer mentorship.

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WCA163 - Conference Workshop - November 11, 15:30-16:30
Category: Clinical Application

The ability network - an international initiative to optimize the management of spasticity following spinal cord damage

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Background/Objectives: The treatment of spasticity following spinal cord damage (SCD) has been hampered by a lack of consensus on definitions for spasticity/disabling spasticity, as well as the relative absence of clinical guidelines and concise algorithms to support decision-making. Objectives: The workshop will provide an overview of the activities of the Ability Network. The Ability Network - an international panel of clinical experts - was initiated to develop recommendations/algorithms to guide and standardize the assessment, treatment, and evaluation of outcomes of disabling spasticity following SCD.
Methods/Overview: The Ability Network consists of 18 clinical experts from Australia, Canada, Europe (9 countries), and the United States. Three working groups were established - definition and assessment, outcomes and access, and clinical pathway. Consensus was sought on common definitions through facilitated, in-person meetings. Literature reviews of existing measures and face-to-face meetings were conducted to incorporate clinical experience and develop expert consensus. The process led to the development of recommendations for initial assessment, clinical management, and evaluation of treatment outcomes.
Results: Consensus was reached for the definitions of spasticity/disabling spasticity (Burns AS, et al. Arch Phys Med Rehabil 2016;97(12):2222-2228). A clinical algorithm was developed to guide treatment and aid clinical decision-making. Recommendations were drafted to guide initial assessment and outcome evaluation using the International Classification of Functioning, Disability and Health (ICF) framework - Body Functions & Structure, Activities, and Participation. The exercise revealed a relative lack of accepted and validated measures for Activities and Participation.
Conclusions: The work of the Ability Network will facilitate treatment decisions that take into account the impact of disabling spasticity on health status, patient preferences, treatment goals, tolerance for adverse events, and caregiver burden.

Source of Funding: Medtronic, Inc., Minneapolis MN, USA, provided sponsorship and logistical support in the form of meeting services, project coordination, literature reviews, and manuscript preparation. Face-to-face meetings were supported by independent facilitators. Scientific direction, work, and dissemination activity was determined independently by the authors and other participating members of the Ability Network

WKG169 - Conference Workshop - November 11, 15:30-16:30
Category: Knowledge Generation

Towards better management of Obstructive Sleep Apnoea (OSA) in tetraplegia

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Background: Prevalence of OSA in people with chronic spinal cord injury (SCI) is estimated at between 28% and 77%; three to five times higher than in the able-bodied. OSA is associated with reduced quality of life and substantial neurocognitive deficits in people with SCI. Current guidelines recommend polysomnography (PSG) for all people with SCI and symptoms of OSA, and continuous positive airway pressure (CPAP) for those with a positive diagnosis. However PSG is a resource intensive and frequently inaccessible test, especially in SCI. Most people remain undiagnosed and access to treatment is typically delayed by long waiting lists and complex clinical pathways. To address these problems in the able-bodied population, alternative screening and treatment models have been developed.
Objectives: This workshop aims to present the current literature regarding the management of OSA in the able-bodied and SCI populations, including our validation of an alternative screening model for detecting moderate to severe OSA in chronic tetraplegia. We will also present our qualitative research describing current clinical practice in the diagnosis and management of OSA in SCI. Using this information, workshop participants will discuss how alternative screening and treatment models could be integrated into the clinical care of people with tetraplegia, to improve diagnosis rates, access to treatments, and ultimately, quality of life.
Design and Methods: A two-stage model of questionnaire followed by oximetry, initially developed and validated in the able-bodied, was modified in an existing dataset of 78 people with tetraplegia. Model accuracy was evaluated in the development dataset and is being prospectively validated in 100 participants with chronic, traumatic tetraplegia across four international SCI units. A sub-set of this sample has been implemented with CPAP and participants are being prospectively followed to determine adherence rates, qualitative and quantitative determinants of CPAP use. In-depth semi-structured interviews are being conducted with physicians managing people with tetraplegia to describe current practice in the management of OSA and to identify factors influencing practice.
Results: Multivariate analysis identified five risk factors for inclusion in the new screening questionnaire. To date, 76 of 100 participants have completed the validation study. The two-stage model had a sensitivity of 90%(95%CI=74–97) and a specificity of 90%(78–96) in the development group, and 76%(60–87) and 77%(62–87) in the validation group. Better CPAP adherence appears associated with more severe OSA and higher early use, but CPAP adherence overall is poor. Qualitative analysis of participant interviews suggests that many participants do not recognise the extent of their OSA symptoms until after they are treated. Most spinal physicians do not routinely screen for symptoms of OSA. When OSA is suspected, patients are typically referred to specialist sleep/respiratory services for diagnosis and ongoing management.
Conclusions: There is potential for safe, alternative screening and treatment models that could substantially increase the detection of OSA in tetraplegia and improve access to treatments.

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WSS 174 – Conference WorkshopCategory: Knowledge Generation

Developing an effective mentor and mentee relationship: What graduate students and young investigators should know and do.

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This workshop will provide an overview of the important aspects that graduate students and young investigators should consider prior to selecting their mentors. While interpersonal affinity plays a role in the choice for a mentor, there are many other attributes that the graduate students and young investigators should consider before making their decision. The key elements of a well suited mentor, mentee's roles and responsibilities, and an effective mentor-mentee relationship will be reviewed. Attendees will have the opportunity to meet with experienced mentors to clarify their questions in small groups.

At the end of this session, participants will be able to:

- Describe how to find or select the right mentor;
- Identify the mentee's roles and responsibilities;
- Describe the key attributes of an effective mentor-mentee relationship;
- Recognize quality mentorship based on the small group discussions with experienced mentors.

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