J Rehabil Med 2010; 42: 995–1007

Canadian Association of Physical Medicine and Rehabilitation

58th ANNUAL SCIENTIFIC MEETING ABSTRACTS

May 26–29, 2010
The Fort Garry Hotel, Winnipeg, MB, Canada

A 01

HOW DOES DISABILITY ARISING FROM GROSS MOTOR FUNCTION INFLUENCE EMPLOYMENT IN ADULTS WITH CEREBRAL PALSY?

David Berbrayer, MD, BSc
Toronto, Ontario

Objective: Increasing number of cerebral palsy (CP) are surviving to adulthood. This presents with new challenges to achieve health and well being by promoting social participation and independence. Improved survival amongst children with CP presents with new needs to achieve health and well being ranging from independent living to establishing a family. Clinical management has not kept pace demonstrated by restricted social participation of children with CP transitioned to adulthood. The purpose of this study is to characterize the effects of gross motor function on employment in adult CP. *Design:* Adults of working age (19–60 years) in Ontario with a diagnosis of CP were recruited to participate. Ontario Federation of Cerebral Palsy (OFCP) was informed of the study through a digital poster containing the inclusion criteria and participation instructions were hosted on the OFCP website. This group was assessed for type of CP, gross motor function (Gross Motor Function Classification Scale (GFMCS)), employment characteristics (Canadian Community Health Survey Cycle 1.1), and functional disability (Barthel Index). The 5 level GMFCS scale (validated for adult CP) assesses self-initiated movements involving mobility, transfers, and sitting taking into account the need for assistance and the quality of such movements. The Canadian Community Health Survey (CCHS). encompassed information on employment type, occupation, characteristics, and reasons behind unemployment. The Barthel Index (BI) was included as a measure of daily independence and functionality. Scored out of 100, it assessed the individual's ability to perform activities of daily living and mobility. Univariate analysis was conducted using SAS JMP v8.0 software. The survey was available electronically, hosted online by Survey Monkey. *Results:* A total of 25 adults with CP participated in this study. Mean age was 33 ± 12 years ($\pm$ SD) with a range of 21–59 years. The gender distribution favours women composing 60% of the study group. Of the broad cerebral palsy types, spastic was the most prevalent at 80%. The spastic CP classifications in order of prevalence were spastic diplegia (36%), spastic quadriplegia (16%), spastic hemiplegia (12%), spastic monoplegia (8%), and spastic triplegia (8%). GMFCS levels displayed a distribution between low grade and high grade groups approaching equal at 56% and 44%, respectively. Adults with CP consistently experienced lower employment rates both in the last 7 days and the last 12 months than the general population of Ontario. Underrepresentation was observed in management and goods producing sectors including farming, forestry, fishing, mining, processing, manufacturing, and utilities. High GMFCS showed a trend as a predictor of unemployment OR 2.50 [0.38,16.42], $p = 0.407$ (7 days), OR 4.50 [0.70,28.79], $p = 0.208$ (12 months). Those who were employed worked fewer hours per week and weeks per year than the general population of Canada. GMFCS was a significant predictor of functional disability ($p = 0.001$). *Conclusions:* This study reinforces the fact that existent adult-oriented care programs do not meet the needs of this evolving population. The employment rate in adult CP is lower than the general population. Those employed experience differing labour characteristics than the general population such as weeks worked per year and occupation typ A high level of gross motor dysfunction in adults with CP likely prevents successful participation in the labour force. However even those who are able to find work experience differing employment characteristics than adults without disability. These findings highlight the significance of physical impairment and provide information to guide the further development of adult-oriented services for CP patients as they age.

A 02

SOCIAL FACTORS ASSOCIATED WITH INDEPENDENT LIVING IN ADULTS WITH SPINA BIFIDA

David Berbrayer, MD, BSc
Toronto, Ontario

Objective: Today, most patients with spina bifida are surviving to adulthood, resulting in novel issues in health care and quality of life. One such issue is the ability to live independently. Several factors influencing this ability have been identified, one of which is social support networks, a key determinant of health. *Purpose:* This study investigates the role of social support networks in the ability of adults with spina bifida to live independently. *Design:* This is a case control study of adults over 18 years with spina bifida who were living independently and members of the Spina Bifida and Hydrocephalus Association (SBHAO).The research design was observational and retrospective. Independent living was defined for the purposes of this study as living alone, or living with a partner. The controls were adults with spina bifida who were living dependently. Dependent living was defined as adults living with family, in group homes, or institutions. 60 members of the SBHAO were randomly selected by computer program to receive invitation letter. The invitation letter described the project with invitation to participate in an online survey website. Fourteen adults with spina bifida completed online surveys: one demographic survey and 3 quantitative surveys. The quantitative surveys consisted of the Lubben Social Network Scale-Revised (12 items of social isolation by determining the perceived social support from family and friends), the Participation Scale (18 items assess the severity of community and socio-economic participation restrictions) and Barthel Index (10 items, measure various activities of daily living, mobility and functionality). *Results:* For each survey, the results for all participants together were analyzed. The mean total score for all participants was obtained, along with the mean, median, and range. Results were compared for the independent living group versus the dependent living group. The mean total scores (mean, median and range) for each group were calculated. A two-tailed, unpaired *t*-test assuming unequal variance was performed to determine statistical significance between the mean total scores of the independent living and dependent living groups. Level of significance was defined as $p < 0.05$. Eight participants met criteria for independent living and 6 for dependent living. There were no significant differences found between the independent and dependent living groups for the Lubben Social Network Scale-Revised, the Participation Scale or the Barthel Index. However, the scores of the dependent living group featured wider ranges than those of the independent living group, and followed a bimodal distribution. The Participation Scale identified that the independent living group experienced a mild level of participation restriction, whereas the dependent living group experienced a moderate level. *Conclusions:* Although no significant differences were found between individuals living independently and dependently, those living dependently possess a wider range of social support and functional ability. The bimodal distribution of this group suggests that there may be two groups of individuals living dependently: those who do so out of necessity, and those who possess the support and ability to live independently but choose to live dependently.

A 03

PARALYMPIC ATHLETES CLASSIFICATION. WHAT IS MISSING?

Andrei Krassioukov, MD, PhD, FRCPC[1,2,4], David Mikhail, BSc[1,4], Shirley Wong, MSc[1], Patricia Mills, MD[1,2], Amira Tawashy, MSc[1,3], Darren Warburton, MD[2], Janice Eng, MD[1,3]

[1]ICORD, [2] Div of Physical Medicine and Rehabilitation, Department of Medicine, [3]Department of Physical Therapy, University of British Columbia, [4]University of Western Ontario, London, ON

Objective: This study was conducted to establish baseline cardiovascular parameters and prevalence of orthostatic hypotension among paralympic wheelchair athletes with spinal cord injury (SCI). *Design:* Prospective, cross-sectional study designed to examine the prevalence and manifestation of orthostatic hypotension in wheelchair athletes competing in different paralympic sports. *Participants/methods:* Continuous systolic and diastolic blood pressure (SBP, DBP) and heart rate were recorded at rest and in response to a passive sit-up orthostatic test. All athletes were members of international rugby teams. Examinations were performed 30 min after their last game. Athletes also filled out a questionnaire on cardiovascular dysfunctions. *Results:* For the first part of the study, we examined 25 male wheelchair rugby players from five teams during international wheelchair rugby competition (22 with cervical SCI, 3 with thoracic SCI). Average age was 32 years and an average of 13 years post injury at the time of testing. The supine resting SBP varied from 121 to 80 mmHg (average 105 ± 12 mmHg). Average resting DBP was 75 ± 9 mmHg. On assumption of sitting position, ~43% of the athletes SBP decreased by more than 20 mmHg (average -24±14 mmHg), consistent with orthostatic hypotension. Furthermore, 6 athletes developed dizziness following the test. *Conclusion:* Our observations suggest that, despite continuous training, resting hypotension and orthostatic hypotension are still common among these athletes. These conditions could tempt wheelchair athletes to use "boosting" to increase BP and possibly improve their athletic performance. Investigations for sport-specific differences in cardiovascular control will be important to introduce autonomic evaluation as an essential component for classification of elite wheelchair athletes. *Support:* Disabilities Health Research Network (DHRN), International Paralympic Committee (IPC), The C. Neilsen Foundation.

A 04

SPINAL CORD INJURY IN MANITOBA: A PROVINCIAL EPIDEMIOLOGICAL STUDY

James McCammon, BMRPT, BSc (Med), Karen Ethans, MD, FRCPC, BSc
Winnipeg, Manitoba

Spinal Cord Injury (SCI) can be caused by diverse traumatic and non-traumatic etiologies, with resultant varying degrees of neurological damage. The burden of disability associated with SCI demands for concentrated efforts to maximize prevention of SCI as well as appropriate distribution of healthcare resources. Our aim in this study is to define the epidemiological trends and identify any populations at risk of SCI for the province of Manitoba, Canada. We reviewed records for subjects in three cohorts (1981–1985, 1998–2002, 2003–2007) from two provincial sources. Inclusion criteria included all of those people admitted to hospital with SCI. A total of 553 individuals (M/F = 419/134) with spinal cord injury were studied for variables such as age, level of injury, severity of injury, First Nations status and etiology of injury. The results demonstrate that there are significant differences between traumatic and non-traumatic spinal cord injury in Manitoba and that Manitoba trends in SCI are in keeping with those seen on a national and international level. Finally this study demonstrates that unambiguous differences exist between First Nation and non-First Nation Manitobans with SCI. This research was supported by grants from the Manitoba Paraplegia Foundation and the Manitoba Medical Services Foundation.

A 05

TRANSDERMAL LIDOCAINE AND KETAMINE FOR NEUROPATHIC PAIN: A RETROSPECTIVE CHART REVIEW

Emily Tam, MD, Andrea D Furlan, MD
Toronto, Ontario

Objective: To evaluate the effectiveness and tolerability of a transdermal preparation of lidocaine and ketamine for the management of neuropathic pain. *Design:* Retrospective chart review.*Setting:* Ambulatory setting, university-affiliated rehabilitation centre. *Participants:* People ($n = 21$) with neuropathic pain symptoms. *Interventions:* Medical records of people with neuropathic pain and given a prescription of a transdermal cream containing lidocaine and ketamine between May 30, 2007 and June 1, 2009 were reviewed. *Main Outcome Measures:* Descriptive and quantitative data analyses were performed. The effectiveness of the transdermal preparation was evaluated by the number of patients with improvement divided by the total number of patients who received a prescription of the transdermal preparation. *Results*: A total of 854 patient charts were reviewed. The most common underlying diagnoses relating to neuropathic pain was trauma. A number of co-medications were used, the most frequent being opioids. Two people experienced adverse skin reactions that led to discontinuation of the transdermal cream. Four groups of patients were identified: those with a clearly stated diagnosis of neuropathic pain and prescribed a transdermal compound containing lidocaine and ketamine with follow-up (Group A) or without follow-up (Group B), and those with a suggested diagnosis of neuropathic pain with (Group C) or without follow-up (Group D). Effectiveness of the transdermal cream was seven out of eight (87%) for Group A and one out of three (33%) for Group C. In total, 8 out of 11 patients (73%) benefited from a transdermal cream containing lidocaine and ketamine. *Conclusions:* Transdermal cream containing ketamine and lidocaine was effective in 73% of patients with acute neuropathic pain and may be a good alternative to oral medications.

A 06

EFFICACY OF BOTULINUM TOXIN A INJECTION FOR NEUROGENIC DETRUSOR OVERACTIVITY AND URINARY INCONTINENCE – A RANDOMIZED DOUBLE-BLIND PLACEBO CONTROLLED TRIAL

S Herschorn[1], J Gajewski[2], Karen Ethans[3], J Corcos[4], K Carlson[5], G Bailly[2], R Bard[3], L Valiquette[6], R Baverstock[5], S Radomski[1], L Carr[1], A Casey[3]
[1]University of Toronto, [2]Dalhousie University, [3]University of Manitoba, [4]McGill University, [5]University of Calgary, [6]University of Montreal

Objective: People with neurogenic detrusor overactivity (NDO) secondary to spinal cord injury (SCI) or multiple sclerosis (MS) often experience incontinence, high bladder pressures, and decreased quality of life (QOL), even with the use of intermittent catheterizations and concomitant anticholinergics. The aim of this study was to determine the efficacy of intravesical botulinum toxin (BoNTA) on NDO in this group of patients. *Study design, materials and methods:* This was a prospective, multicentre, randomized, double-blind study of 57 subjects (34 males, 23 females), mean age of 42.8 years, with NDO secondary to SCI ($n = 38$) or MS ($n = 19$). Subjects were eligible if they had urinary incontinence (minimum of once/day) despite current anticholinergic treatment. Following a screening period with baseline 3-day voiding diary and urodynamics studies, subjects received intra-detrusor injections of BoNTA, 300 U ($n = 28$), or placebo/saline ($n = 29$) via cystoscpy at 30 sites, sparing the trigone. Follow-up visits were at 6, 24 and 36 weeks, with UDS, subject questionnaires (the International Consultation on Incontinence Questionnaire (ICIQ) and Urinary Incontinence-Specific Quality of Life Instrument (I-QOL)), adverse event assessment, and a 3-day voiding diary completed prior to the visit. At week 36, subjects were offered open-label BoNTA (300U). Further assessments occurred at 48 and 60 weeks (voiding diary and questionnaires). The primary

outcome was frequency of incontinence episodes (IE) on the diary and secondary parameters were changes in UDS and questionnaires at 6 weeks. Efficacy and safety analyses were conducted on an intent-to-treat basis. Continuous data was summarized using descriptive statistics; categorical data was summarized in frequency tables. *Results:* Treatment groups were similar at baseline. Frequency of IE in the BoNTA group demonstrated marked, significant reduction versus placebo at 6 weeks that persisted to week 36. Significant improvement in the BoNTA group occurred with UDS parameters by week 6 and persisted to week 24, and in QOL through to week 36. Following open-label injection at 36 weeks, both groups experienced significant improvements in incontinence and QOL questionnaires that persisted through 60 weeks. Adverse events were similar between treatment groups. Mild transient upper body weakness was reported by 2 subjects in the BoNTA group. *Conclusions:* BoNTA injections into the detrusor are well tolerated and provide clinically significant and beneficial improvements in adults with NDO and incontinence refractory to antimuscarinics. These improvements were seen up to 9 months following injection.

		Detrusor vol. at 1st detrusor contraction (median)	Vol. at max detrusor pressure (median)	Frequency of incontinence: Daily freq (mean ± SD)	Frequency of incontinence: % Δ from BL (median)	I-QOL Δ from BL (mean)
BL	B	132.5 ml	200.5 ml	3.06 ± 1.69	–	–
	P	124.5 ml	200.0 ml	4.03 ± 2.36	–	–
Wk 6	B	357.0 ml**	490.0 ml***	1.31 ± 1.25***	–57.1%***	19.52 ± 22.93***
	P	200.0 ml	230.0 ml	4.76 ± 2.91	12.5%	–2.23 ± 13.24
Wk 24	B	200.0 ml**	328.5 ml*	1.56 ± 1.52***	–47.5%***	16.27 ± 22.72*
	P	130.5 ml	223.0 ml	3.98 ± 2.71	0.0%	0.44 ± 16.73
Wk 36	B	173.0 ml	299.0 ml	2.37 ± 1.92*	–25.0%*	7.91 ± 10.84*
	P	112.0 ml	208.0 ml	4.21 ± 2.70	0.0%	–1.91 ± 15.39
Wk 48	B	N/A	N/A	1.56 ± 1.69§	–55.0%§	21.5 ± 23.81§
	P	N/A	N/A	1.86 ± 2.19§	–57.14%§	21.64 ± 25.73§
Wk 60	B	N/A	N/A	1.43 ± 1.21§	–50.45%§	15.36 ± 20.98†
	P	N/A	N/A	1.54 ± 1.82§	–66.25%§	16.55 ± 21.13†

BL (Baseline); B (BoNTA); P (Placebo).

Treatment group comparisons: *p<0.05; **p<0.01; ***p<0.001. Compared to baseline: †p<0.01; §p<0.001.

A 07

IMPROVING COMPLETION RATES OF THE E-STROKE MEDICAL ASSESSMENT FORM

Alexander Lo, MD, Nicola Tahair, MSc, Mark Bayley, MD, FRCPC

University of Torono, Toronto, Ontario

Objective: The E-Stroke electronic stroke referral system coordinates all stroke rehabilitation referrals between hospitals in the Greater Toronto Area. The E-Stroke Medical Assessment Form is completed by the acute care physician and summarizes the patient's medical history, including which investigations have been completed to inform secondary stroke prevention. The goals of this project were to 1) update the Form to reflect best practice guidelines, 2) improve its user-friendliness, 3) increase its completion rate, and 4) increase the completion rate of requisite stroke work-up investigations, prior to patients' referral for rehabilitation. *Methods:* 1,305 referrals received by E-Stroke between 2004 and 2007 were reviewed, and the completion rate of each field on the Form was calculated, as was the completion rate of investigations requested in the "Stroke work-up" box (Carotid Dopplers, echocardiogram and sleep study). The Form was then updated to reflect best available evidence and streamlined to improve ease of use. The first 136 referrals received using the new Form were audited to compare completion rates to the previous results. *Results:* Completion rates of the fields in the original Form ranged from 63–100%, while investigation completion rates were poor (53% for both echocardiograms and Carotid Dopplers, and 0.70% for sleep studies). Eleven alterations to the Form were made, including replacing 'sleep study' with '24-hour Holter monitoring' in the "Stroke work-up" box, and decreasing the total number of fields from 25 to 19. Completion rates for almost all fields in the new Form increased (range 77–100%), as did completion of echocardiograms and Carotid imaging (+20.1% and 24.1%, respectively, p = 0.000). *Conclusions:* The E-Stroke Medical Assessment Form was successfully updated to improve user-friendliness and reflect best practice guidelines. The implemented changes increased the completeness of referrals received from acute care, and increased completion rates of echocardiograms and carotid imaging in acute stroke patients.

A 08

COGNITIVE REHABILITATION OUTCOMES FOLLOWING ANOXIC BRAIN INJURY: A CASE-CONTROLLED COMPARISON WITH TRAUMATIC BRAIN INJURY

Nora K Cullen, MD

University of Toronto, Toronto, Ontario

Objectives: (*i*) To examine the differences in the cognitive recovery of anoxic brain injury (AnBI) patients compared to matched traumatic brain injury (TBI) controls using neuropsychological assessment data; and (*ii*) to explore between-group differences in the relationship between neuropsychological measures and functional outcomes at rehabilitation discharge to identify specific neuropsychological measures that can best predict rehabilitation outcomes following AnBI and TBI. *Design:* Retrospective, matched case-controlled design. *Setting:* Inpatient rehab unit with a multidisciplinary clinical team including PT, OT, SLP, SW, RT, Nursing, Audiology, and Physiatry. *Participants:* Ten patients with primary diagnosis of AnBI were matched with 10 patients with TBI. *Methods:* AnBI patients were matched to TBI controls within the same timeframe on age (±6 years), acute care length of stay (±11 days), and FIM™ scores (±12). Baseline data also included demographic variables. *Main Outcome Measures:* Neuropsychological Tests (14 Tests), Functional Independence Measure (FIM™), and Disability Rating Scale (DRS). *Results:* There is no significant difference in demographic characteristics for AnBI vs. TBI. Test scores in language communication (MAE Token Test; 37.75 vs. 41.4, p < 0.05) and mental speed and attention (SDMT oral; 25.71 vs. 40.5, p < 0.05) were significantly lower for AnBI compared to TBI. For the AnBI group, significant correlations between mental speed (SDMT oral; r = 0.93, p<0.01) and FIM™, and language and memory (WMS-III Logical Memory I; r = 1, p < 0.001) and DRS. For the TBI group, perceptual organization (Block Design; r = 0.73, p < 0.05), language and communication (MAE Token Test; r = 0.76, p < 0.05), and executive function (Spatial Span Backwards; r = 0.82, p < 0.05 and COWA; r = 0.8, p < 0.05) were all significantly correlated to FIM. *Conclusion:* After controlling for potential confounding factors, cognitive outcomes following AnBI were found to be worse compared to TBI, suggesting that the current rehabilitation care may not be as effective for AnBI patients. There is a need to optimize therapeutic interventions to fully address the cognitive needs of patients with AnBI. This study also demonstrated the utility of certain neuropsychological tests in predicting rehabilitation outcomes. *Support:* We would like to thank the PSI Inc. for their generous support of this project and the staff of the Toronto Rehab, Acquired Brain Injury Service for their assistance in data collection.

A 09

CANADIAN FRIEDREICH'S ATAXIA PATIENT SUPPORT PROGRAM: DEMOGRAPHIC PROFILE OF PATIENTS WITH IDEBENONE PRESCRIPTIONS FOR SYMPTOMS OF FRIEDREICH'S ATAXIA AND RESULTS OF A PATIENT SURVEY

William T Andrews, MD
Santhera Pharmaceuticals (USA), Inc., Charlestown, MA

Objective: The number of people in Canada who have FRDA is estimated at 400. Idebenone, a potent antioxidant and electron carrier that facilitates mitochondrial ATP production, was approved with conditions (NOC/c) in July 2008 in Canada for the treatment of symptoms associated with Friedreich's Ataxia (FRDA). The Canadian FRDA Patient Support Program was initiated in October 2008 to provide support for patients, caregiver, and physicians. It maintains a database of all Canadian patients who received idebenone (CATENA®) prescriptions. *Methods:* Demographic characteristics of program participants are collected under strict observation of confidentiality. Patients who had been taking idebenone for 3 to 6 months were surveyed for their assessment of changes in their ability to manage activities of daily living (ADL). *Results:* Of 121 patients with confirmed FRDA who are currently enrolled in the program (51 male, 70 female; mean age, 28.6 years [n=120], range 2–73 years), most reside in Quebec (66 [54.5%]), Ontario (22 [18.2%]), British Columbia (13 [10.7%]), or Alberta (12 [9.9%]), with <3% in each of the other provinces. Of 12 patients responding to the survey, 7 answered all and 5 answered most questions. Most surveyed patients reported that ADL was the same or had improved since starting idebenone: speech (n = 12/12), swallowing (n = 9/9), dressing (n = 8/9), personal hygiene (n = 8/8), falling (n = 9/9), walking (n = 8/10), quality of sitting position (n = 8/9), bladder function (n = 8/9), fatigue (n = 9/9), ability to exercise (n = 7/8), and ability to sit straight (n = 9/9). *Conclusion:* The FRDA Patient Support Program improves insight into the demographics of the Canadian FRDA population. In a survey of program participants, most respondents reported that ADL symptoms were the same or better since therapy with idebenone started. *Support:* Study supported by Santhera Pharmaceuticals (USA), Inc.

A 11

THE EFFECT OF CONDUCTION BLOCK ON STRENGTH AND FATIGUE IN ULNAR NEUROPATHY

Matti Allen, MSc, Timothy J Doherty, MD, PhD, FRCPC
Schulich School of Medicine and Dentistry, The University of Western Ontario

Objectives: Conduction block (CB) from focal neuropathy is often associated with weakness and fatigue in affected muscles. Ulnar neuropathy at the elbow (UNE) provides an excellent model to examine the relationships between electrophysiologically defines CB and quantitative measurement of weakness and fatigue. *Methods:* Eight healthy control subjects (47 ± 14 yrs) and nine patients (53 ± 3 yrs) with clinical and electrophysiological features of UNE with CB were studied. All underwent bilateral, ulnar motor nerve conduction studies recording from the first dorsal interosseous (FDI) muscle as well as quantitative measurement of strength and fatigue of the FDI with a custom dynamometer. *Results:* Strength and fatigue were similar in the dominant and non-dominant hands of controls, and unaffected limb in patients. Varying degrees of conduction block (14%–62%, mean 36%) and conduction slowing (31 m/s ± 7) were observed in those with UNE. CB was associated with significant reductions in strength (42%) and fatigue (23%) on a timed fatigue task. The reductions in strength (r = 0.74) and fatigue (r = 0.60) were strongly correlated with the degree of CB. *Conclusions:* CB in UNE defined by electrophysiological criteria was strongly correlated with weakness and fatigue in the FDI. Fatigue may be simply related to the reduction in strength, but activity or frequency dependent CB may also contribute.

A 12

DOES AN ATHLETE'S LEVEL OF FITNESS IMPACT THE REPORT OF CONCUSSION SYMPTOMS?

DJ Naidu, M Mrazik, C Lebrun, J Matthews White
Glen Sather Sports Medicine Clinic, University of Alberta, Edmonton, AB, Canada

Objective: To measure the relationship between an athlete's level of fitness and self-report of concussion symptoms. *Design:* The current prospective research study sought to explore whether an athlete's level of fitness had an impact on the concussive symptoms reported. *Methods:* A cohort of 95 college athletes (67 males and 28 females) from 5 sports completed the Standardized Concussion Assessment Tool (SCAT1) before, after, and within 24 h of completing the Leger (beep) test. The Leger test has been established as a method to estimate an athlete's VO_2 maximum and overall fitness levels. Athlete's symptom scores on the SCAT1 were added to yield a total score. VO_2 max prediction was obtained from the athlete's performance during the Leger (beep) test. *Results:* After controlling for gender, partial correlations revealed significant relationships between VO_2 max and baseline symptoms scores (r = –0.24, p < 0.05) and VO_2 max and post-activity symptoms scores (r = –0.21, p < 0.05), but not for 24 h symptom scores and VO_2 max. A regression analysis revealed that VO_2 accounted for a significant portion of the variance (Adjusted R^2 = 0.20, p < 0.05) for baseline symptoms scores. *Conclusions:* Conditioning may play a significant role in an athlete's report of concussion symptoms. Further study considering the impact of deconditioning may be helpful for clinical decision making when progressing an athlete back to play.

A 13

STAKEHOLDER TRAINING AND EDUCATION FOR PRESSURE ULCER PREVENTION (STEP-UP)

Valerie Reith, Darlene Cooper
Winnipeg, Manitoba

The STEP-UP program has made a significant change in promoting health for Manitoban's who sustain spinal cord injuries (SCI). In particular, the pressure ulcer prevention program for people discharged from the Health Sciences Rehabilitation Hospital in Winnipeg between 2007–2009. The Coordinator/Health Educator (C/HE) contacted every eligible participant within 10 days of discharge to explain the voluntary project and to schedule an appointment to meet with them in their own home. During the intake visit a jointly developed individualized health and wellness focused rehabilitation plan was written. Four baseline tests were administered and a Pressure Ulcer Prevention Educational Manual was provided to each participant. The initial visit was followed by weekly visits to establish healthy life style habits, reinforce appropriate skin management techniques and review the prevention components in the manual. Baseline tests were repeated three months after intake and at the completion of the project. Weekly visits and telephone follow-up continued until participants were confident with interpretation and implementation of manual material and comfortable independently accessing local community support systems to meet their health needs. Participants of the STEP-UP project were matched by age, gender and level of injury to non-participant new injuries within the same timeframe. There was a zero occurrence of pressure ulcers in the project participants. The control group reported a 35% occurrence of pressure ulcers. This individualized intervention project emphasizes the importance of empowering people with spinal cord injuries to

become self reliant in health management skills resulting in an improved quality of life and overall wellness. Ultimately, the continuation of the project or replication has the potential to improve the quality of life and reduce expenditures in health care related to skin breakdown and the costly interventions to remediate the secondary life threatening condition of pressure ulcers. *Funding source:* Province of Manitoba.

A 14

TRANSIENT GENERALIZED WEAKNESS FOLLOWING BOTULINUM TOXIN INJECTIONS INTO THE DETRUSOR MUSCLE – 2 CASE REPORTS

Karen Ethans[1], A Casey[1], R Bard[1], S Herschorn[2], J Gajewski[3], G Bailly[3]

[1]University of Manitoba, [2]University of Toronto, [3]Dalhouise University

Objectives: To describe 2 cases of transient generalized weakness in people with spinal cord injury following botulinum toxin type A (Botox) injections into the detrusor muscle. *Methods:* In a randomized study (n = 57; 28 botulinum toxin, 29 placebo) performed to assess the effects of botulinum toxin injections into the detrusor muscle for incontinence and neurogenic detrusor overactivity in people with multiple sclerosis and spinal cord injury, side effects and adverse events were recorded, and any possible relation to study drug was followed up. The subjects first were randomized to placebo or botulinum toxin, then after 9 months offered open label botulinum toxin. Botulinum toxin doses were 300u, diluted with 10cc/100u and injected into 30 sites in the detrusor. Herein we report two cases of weakness occurring within days to weeks after injection with botulinum toxin. *Results:* Two of the subjects with spinal cord injury who were randomized to active treatment reported side effects of weakness post injection. Case A was a male with complete C8 tetraplegia. He stated that within days of the first injection he felt weaker in the upper extremities and found it difficult to transfer. This resolved in 23 days. He has since had reinjections with good treatment effect and has not had similar issues recur with weakness. Case B was a female with incomplete paraplegia. She had two injections of botulinum toxin, nine months apart, and had weakness and difficulty transferring for up to 8 weeks post first injection, and for 3 weeks post second injection. She has not had further injections due to lack of funding, despite her claiming that she would continue with this treatment if it was available to her. *Conclusion:* These 2 cases of new onset, short lasting weakness occurring within days to weeks after botulinum toxin into the detrusor suggest possible distant spread of the toxin. In one case the weakness recurred with a second injection; in the other case it did not. Factors that theoretically could be issues that are seen with these subjects compared to other treatments with botulinum toxin are: 1) the extremely high dilution used with the detrusor muscle injections, thus enhancing the risk of intravascular volume penetration, as well as 2) the fact that the smooth muscle of the detrusor may be more vascular than the regularly treated skeletal muscle with other indications. Perhaps future work with detrusor injections should compare dilutions of botulinum toxin injections.

A 15

BARRIERS TO HEALTH MAINTENANCE AND PROMOTION IN WOMEN WITH MULTIPLE SCLEROSIS IN NOVA SCOTIA CANADA: A QUESTIONNAIRE STUDY

Sherry Wang, MD, Christine Short, MD, Joanne Walker, RN

Division of Physical Medicine and Rehabilitation, Dalhousie University and Queen Elizabeth II Health Sciences Centre, Halifax, NS, Canada

Objective: To assess barriers to health maintenance and promotion in women with multiple sclerosis (MS) in Nova Scotia, Canada. *Methods:* This was a questionnaire study designed to collect data on impairment and function, as it relates to, women's health issues, health barriers and health promotion in women with sclerosis MS in Nova Scotia, Canada. The questionnaire was mailed MS to 150 women registered in the Dalhousie University MS treatment and Research Centre database. *Results:* 150 questionnaires were mailed out and we had 102 respondents. Of the respondents 89% reported that their family doctor's office were wheelchair accessible. Although most office buildings themselves were accessible 28.4% reported that the examination table was not accessible and 30.4% reported inaccessible washrooms. The majority of these individuals also reported needing a wheelchair for mobility. Although a significant number (14%) who reported the exam table being inaccessible only required an aid for walking. Those in wheelchairs were examined in their wheelchairs most often. 63.7% responded that they were aware of an accessible women's health clinic at our Women and Children's health Centre, however only 27.3% were willing to use it. Most who reported they would not use this clinic noted it was due to distance to travel or transportation issues. Only 16.7% women reported being uncomfortable discussing certain topics with their doctors. These were usually related to sexual function and incontinence. A significant portion of respondents (23.5%) expressed an unpleasant interaction with a health professional. *Conclusions:* Our questionnaire suggests that there are barriers, physical and possibly attitudinal, to maintaining optimal health in women with MS in Nova Scotia. Information from this questionnaire could be used to further explore these issues and develop strategies to mitigate them.

A 16

THE IMPACT OF THE EVIDENCE-BASED REVIEW OF ACQUIRED BRAIN INJURY (ERABI)

Robert Teasell, MD[1,2], Jo-Anne Aubut, BA[1], Nora K Cullen, MD, MSc[3], Mark Bayley, MD, MSc[3], Shawn Marshall, MD, MSc[4]

[1]Lawson Health Research Institute, London, Ontario, [2]Schulich School of Medicine, University of Western Ontario, [3]University of Toronto, [4]University of Ottawa

Background: A systematic review of rehabilitation interventions for moderate to severe acquired brain injuries (ABI) was conducted and is now in its 5th edition. *Objective:* To evaluate the impact of the ERABI using a number of academic measures. *Methods:* The impact of the ERABI project was measured by the number of journal publications, invited presentations and new research initiatives that utilized the ERABI. *Results:* To date, ERABI has resulted in 13 peer-reviewed articles and 5 published abstracts along with 68 presentations given at provincial, national and international conferences. ERABI formed the evidence-base platform for the Acquired Brain Injury Knowledge Uptake Strategy (ABIKUS) project (2007) which utilized a consensus-based methodology to identify research knowledge translation priorities as well as developing guidelines for the rehabilitation of moderate to severe ABI patients. Knowing the evidence with regard to interventions allowed for development of the research gap analysis which then allowed for consensus-building around research priorities. The ERABI also allows for the development of guidelines supported by best evidence and increases confidence in the strength of those guidelines. To date ERABI has received approximately 5000 hits on its website. *Conclusions:* ERABI has proven to be an effective platform for informing health care professional of best practice, building guidelines and then translating that knowledge into practice and even policy. As well, it allows understanding of research gaps and development of research

priorities. *Support:* We would like to thank the Ontario Neurotrauma Foundation for their ongoing support.

A 17

TRIGEMINAL NEURALGIA AND BOTULINUM TOXIN: A CASE SERIES

Rebecca Charbonneau, MD, Christine Short, MD, Kenneth Chisholm MD
Halifax, Nova Scotia

Objective: To describe a case series of patients receiving botulinum toxin injections for intractable trigeminal neuralgia. *Introduction:* Trigeminal neuralgia is a form of neuropathic pain that causes sudden, usually unilateral, severe, brief, stabbing, recurrent episodes of pain in the distribution of one or more branches of the trigeminal nerve. It is often intractable and the pain is not responsive to oral medications or cannot be tolerated because of side effects. Often patients must undergo invasive surgical treatments that are not without adverse events. Botulinum toxin A (BTXA) has been shown in studies to inhibit the release of acetylcholine from the neuromuscular junction and blocks the release of neurotransmitters such as substance P, calcitonin gene-related peptide (CGRP),and glutamate. Because of these properties it has been proposed as a potential treatment for this type of neuropathic pain without the same permanent side effects of more invasive procedures and without the systemic side effects of oral medications. *Methods:* A case series of five patients. Each patient had failed oral therapy and one had undergone and failed more than one invasive surgical procedure. Three of our patients had lancinating pain and two patients had dysesthetic neuropathic pain. Each patient received subcutaneous botulinum toxin A (Botox) injections in the distribution of their pain. *Results:* In the patients with lancinating pain, 2 had excellent results with pain relief and have continued with intermittent BTXA for their pain management. The third had some relief but felt it was not enough to continue therapy. Of the two patients with dysethetic pain, no pain relief was reported with the BTXA therapy. *Conclusions:* The results of the case series suggest that botulinum toxin may have a role in the the treatment of trigeminal neuralgia. Although the numbers are small we saw the best response in the classic lancinating type. Further research including a randomized placebo controlled trial is needed to investigate this effect to determine if there is a beneficial outcome and who are the appropriate patients to treat.

A 19

POST OPERATIVE MANAGEMENT & REHABILITATION AFTER LOWER EXTREMITY AMPUTATION: A SYSTEMATIC REVIEW

Alice Kam, Amarjit Arneja, John Flannery
University of Manitoba, University of Toronto

Objective: This paper presents a comprehensive systematic review of studies related to pre-prosthetic care of peripheral vascular disease and diabetic amputees in Canada, focusing on post-operative care of stump and early onset versus late onset rehabilitation. *Methods:* Search engine included MEDLINE/PubMed, the Cochrane Database, CINAHL, EMBase, and SCOPUS. All relevant studies up to October 2009 and the bibliographies of selected studies were included. Randomized controlled trials or case-controlled studies related to post surgical stump management or the use of temporary prostheses in trans-tibial amputees were selected. The quality of the selected studies was evaluated based on methodological criteria (i.e., patient selection, intervention, outcome measurements and statistics). *Results:* A qualitative review of studies was performed due to the heterogeneity of selected studies. The methodological strength of each study was evaluated based on a score system. *Conclusions:* Surgical technique has minimal contribution to the rehabilitation outcome. Rigid or semi-rigid dressings achieve earlier stump healing and greater reduction of stump volume following trans-tibial amputation in dysvascular patients. Early rehabilitation appears to be superior to later rehabilitation. The quality of research in the field of amputation continues to be limited to Level B and C evidence due to multiple reasons (including methodology, funding source biasing) with an ongoing lack of patient outcome focused studies.

A 20

USEFULLNESS OF WAITING ROOM AMPUTEE QUESTIONNAIRE COMBINED WITH THE SIGAM MOBILITY GRADE

Michael WC Payne, A Barry Deathe
Department of Physical Medicine and Rehabilitation, The University of Western Ontario

We piloted our Amputee Clinic Lower Extremities questionnaire that contained the validated Socket Comfort Score (SCS) and the Special Interest Group of Amputee Medicine (SIGAM) Mobility Grade. Our goals were to identify prosthetic usage, performance, and recurrent problems both on the individual and program level. 215 amputee patients of all etiologies and at various timepoints completed questionnaires over a three-month period. The usage and performance information was generally helpful on the individual level to identify problems that required additional probing during the visit. Compiling additional data is needed to establish norms of various patient groups to better recognize unstated problems for individuals. 93% of patients reported daily prosthesis use with 81% using more than 8 h per day. 46% reported regular wheelchair use. 47% reported at least one fall in the previous year and 16% in the previous 4 weeks, with no correlation found on the single-item balance confidence question. The SCS is helpful for tracking individuals over time. We altered the SIGAM to contain Canadian-appropriate terminology and added the rollator class of mobility aid; this version requires validation. SIGAM data provides an overview of the mobility of the clinic population and may be a useful program outcome measure. We found the questionnaire useful and will continue to collect normative date. The most frequent complaint was the length of the SIGAM.

A 21

USING PRACTICE-BASED EVIDENCE TO IMPROVE OUTCOMES FOLLOWING TRAUMATIC BRAIN INJURY

Nora K Cullen, MD
University of Toronto, Toronto, Ontario

Objective: To identify the specific medical procedures and therapeutic interventions of inpatient rehabilitation that have the greatest impact on outcomes of acute rehabilitation for traumatic brain injury (TBI), controlling for patient characteristics. *Methods:* Extensive data are collected over a 2.5-year period on 2200 adult patients with TBI and receiving inpatient rehabilitation at 10 North American rehabilitation facilities. Data include patient characteristics, injury severity, process, and outcome variables. Patient demographic data and injury severity are collected through retrospective medical chart review post-rehabilitation. Standardized, discipline-specific point-of-care forms document all rehabilitation assessments and interventions. Outcome is evaluated by functional independence, length of stay, and final discharge location. Follow-up interviews are conducted at 3 months post-discharge and 1 year post-injury to determine if patients have maintained gains made during inpatient rehabilitation. *Results:* As of January 2010, approximately 1000 patients have been enrolled across 10 facilities, including 972 patients already discharged. Preliminary data on patient characteristics (age, sex, severity of illness), key

point-of-care interventions (physiotherapy, occupational therapy, speech language pathology), and outcomes (Functional Independence Measure, length of stay, discharge location) will be presented. The range of inter-facility variation will be presented for patient characteristics and therapy activities. *Conclusions:* This is the largest study of its kind to date. Demographic characteristics of the patient population are consistent with those reported in previous TBI studies. There is significant variation in the timing and quantity of therapeutic interventions across the US and Canada. Ongoing analyses will explore the relationships between these sources of variation and their effects on rehabilitation outcomes to identify specific medical and therapeutic interventions associated with better outcome. *Support:* Ontario Neurotrauma Foundation, National Institute on Disability and Rehabilitation Research (US), Toronto Rehabilitation Institute.

A 22

SPINAL CORD INJURY REHABILITATION EVIDENCE (SCIRE): METHODS AND IMPACT

Robert Teasell, MD[1,2], Janice Eng, PhD[3,4], Dalton Wolfe, PhD[1,2], William Miller, PhD[1,4], Jane Hsieh, MSc[1], Andrea Townson, MD[3,4], Sandra Connolly, BHScOT[1], Swati Mehta, HBSc[1], Brodie Sakakibara, BSc[3,4], the SCIRE Research Group

[1]Lawson Health Research Institute, London, ON, [2]Schulich School of Medicine, University of Western Ontario, London, ON, [3]GF Strong Rehabilitation Centre, [4]University of British Columbia, Vancouver, BC

Purpose: To examine the Spinal Cord Injury Rehabilitation Evidence (SCIRE), a comprehensive systematic review of interventions and other practices in SCI rehabilitation and its impact (www.scireproject.com). *Methods:* A systematic review was conducted using multiple databases. Articles were reviewed to determine inclusion eligibility. Only articles meeting the following criteria were included: 1) human subjects; 2) SCI ≥ 50% of subjects; 3) ≥3 SCI subjects. Selected articles were grouped according to levels of evidence assigned using a modified Sackett scale. Randomized controlled trials (RCTs) were evaluated for methodological quality using the Physiotherapy Evidence Database (PEDro) tool, while non-RCTs were assessed using the Downs and Black tool. Impact of SCIRE was evaluated on four levels: research output, knowledge translation, clinical implementation and community benefit. *Results and Discussion:* A total of 1065 studies have been assessed with SCIRE version 2. 193 studies were RCTs. 115 studies contained level 1 evidence, 199 level 2, 21 level 3, 610 level 4, and 64 level 5. Chapters with the greatest number of RCTs include Bladder ($n=26$), Pain ($n=18$), Sexual Health ($n=17$), Spasticity ($n=15$), Bone Health ($n=14$), and Upper Limb ($n=14$). SCIRE has resulted in over 25 peer reviewed articles and 80 presentations. SCIRE's website initially averaged 604 hits per day in its first year and publications arising from SCIRE already have over 50 cited references with an h-value of 4. SCIRE is being utilized as an evidence-based platform on which to inform numerous working groups in various priority-setting and strategic planning initiatives. SCIRE has already won 4 awards at various national and international conferences. *Conclusion:* SCIRE, although relatively new, has already had widespread impact through its comprehensive and updated synthesis of research knowledge, informing researchers, clinicians and policy makers on research strengths and gaps. *Support:* This work was supported by SCI Solutions Network, Ontario Neurotrauma Foundation, and ICORD/Rick Hansen Man in Motion Foundation.

A 23

PILOT STUDY OF RISK FACTORS FOR CLINICAL DETERIORATION IN PEOPLE WITH SPINAL CORD INJURY WITH POST-TRAUMATIC SYRINGOMYELIA

Karen Smith[1], Ronald Pokrupa[2], Mary Ann McColl, PhD[3]

[1]Department of Physical Medicine & Rehabilitation, [2]Division of Neurosurgery, [3]Centre for Health Services & Policy Research

Objectives of the study: (*i*) To identify participants with spinal cord injury who experienced clinical deterioration over a period of one year; (*ii*) to identify risk factors associated with clinical deterioration; (*iii*) to investigate risk factors associated with the development of post-traumatic syringomyelia. *Methods:(Design)* This is a pilot cohort study of risk factors for clinical deterioration in people with spinal cord injury, with and without post-traumatic syringomyelia, at two different stages post-injury (2–6 years and 12–16 years); *(Sample)* Participants all had a traumatic spinal cord injury either 2–6 or 12–16 years ago. Twenty participants who consented to participate completed the baseline interview and 19 had a baseline MRI performed. Only one participant was diagnosed with syringomyelia based on neuroradiological criteria; *(Measurement)* Participants were administered the Medical History and Current Status Interview at baseline and at one year later. *Outcomes:* The questionnaire collected information on 4 outcome variables: bladder function, bowel function, fatigue and pain. In each case, participants were asked: Does your (bladder function, bowel function, fatigue or pain) ever interfere with ... (area of daily life): Self care activities?; Leisure activities?; Work or home chores?; Personal relationships?; Mobility?; Sleep? The response options ranged from Never (0) to Always (4). Total outcome scores were calculated for the effects of bowel, bladder, fatigue and pain by summing across the six items for each outcome, resulting in four outcome scores out of 24. Higher values on these outcome scores represent a greater degree of dysfunction as a result of the health problem. *ADL:* Using the same items, it is possible also to compute scores on the extent to which health problems interfered with each of the 6 ADL functions mentioned above: self care, work, leisure, relationships, mobility and sleep. These six scales out of 16 result in higher scores for greater dysfunction in this area of daily living. *Results:(Demographic and Lifestyle Characteristics of the Sample)*Participants ranged in age from 29–80 years of age, with a mean age of 45 (± 13.3). There were 13 in the short duration group (4–8 years post-injury) and 6 in the long duration group (15–18 years). The average duration was 9.4 years (±5.3). The gender split is typical for this population – over 80% male. Most of the participants were living with a partner (52.6%); (*Injury Characteristics of the Sample)* About half of the participants are tetraplegic and half paraplegic. Most were injured as a result of car accidents and falls. About half reported that they had at least some, but not necessarily functional, use of muscles below the level of their injury. One participant reports normal feeling and movement below the level of the injury (Frankel/ASIA classification E); (*Comparison of Outcomes over time)* Table I illustrates that there were no statistically significant differences on any of

Demographic and injury related variables	
• Age	• Injury date
• Education level	• Etiology
• Marital status	• Other injuries
• Employment status	• Injuries since SCI
• Sex	• Level of Injury
• Living situation	• Para/Tetraplegic
• Handedness	• Frankel/Asia Classification
Medical conditions and complications	
• Diabetes	• Pressure sores
• High blood pressure	• Fractures
• Stroke	• Carpal tunnel syndrome
• Hearth conditions	• Autonomic dysreflexia
• Bronchitis	• Orthostatic
• Pneumonia	• Hypotension
• Shortness of breath	• Malignancies
• Sleep apnea	

the outcomes of interest from Time 1 to Time 2. The impact of bladder function appears to have remained almost the same over the year, while the other three outcomes appear to have become less problematic in terms of activities of daily living (although none significantly so). It appears that the greatest improvement to have had the least significant effect on ADL over a one-year time period. Table II shows the effect of time since injury on the 4 outcomes of interest. It is noteworthy that the outcomes of interest all prove more troublesome and result in more interference with daily living among the shorter-duration group. In the case of all but fatigue, the difference between the short and long-duration groups is significant. Table III presents a summary of the cases of the seven participants who experienced any deterioration in the outcomes of interest (stratified by the diagnosis of a syrinx). The sample contained only one case of syringomyelia, and this participant suffered a decline in bladder function and fatigue, but none for bowel function or pain. None of the participants suffered a decline in all four functions, but 4 experienced a net deterioration

Table I. *Average outcome scores (and s.d.'s) for health problems (t-test)*

Outcome	Interview 1	Interview 2	Average Change	*p*-value
Bladder	6.21 (4.80)	6.47 (5.38)	–0.26 (3.21)	0.874
Bowel	5.74 (4.86)	4.58 (4.46)	1.16 (4.69)	0.449
Fatigue	4.37 (6.14)	3.21 (4.96)	1.16 (3.08)	0.527
Pain	9.05 (6.12)	6.68 (6.56)	2.84 (5.47)	0.257

Higher scores represent greater interference with daily living (out of 24). Positive change scores represent functional improvement; negative change scores represent functional deterioration.

Table II. *Effect of duration of disability on outcomes of interest (t-test)*

Variable of Interest	Short duration group	Long duration group	*p*-value
Bladder	7.46 (5.09)	3.50 (2.81)	0.045
Bowel	6.92 (5.25)	3.17 (2.71)	0.056
Fatigue	5.38 (6.80)	2.17 (4.02)	0.217
Pain	11.08 (5.48)	4.67 (5.39)	0.038

Higher scores represent greater interference with daily living (out of 24).

Table III. *Cases where change has occurred in the variables of interest*

Diagnosis of Syrinx	Participant ID	Bladder	Bowel	Fatigue	Pain	Total
Yes ($n=1$)	**29**	–5	6	**–1**	7	7
No ($n=8$)	**42**	**–2**	**–8**	**–4**	1	**–13**
	25	**–8**	2	0	–2	–8
	14	2	**–6**	0	1	**–3**
	41	0	**–5**	5	**–2**	**–2**
	36	0	2	0	**–1**	1
	10	0	4	0	**–1**	1
	16	**–2**	0	4	0	2
	9	**–2**	12	6	12	28
Totals		–17	5	10	15	

(14, 25, 41, 42) and five experienced a net improvement (9, 10, 16, 29, 36). In general, it appears that bladder function is the most likely to decline, with only one participant reporting improvement in that area, and a net negative effect for bladder function overall. *Conclusions:* This was a pilot study examining factors associated with clinical deterioration and syringomyelia following traumatic spinal cord injury. Obvious limitations are the small sample size and the presence of only one confirmed case of syringomyelia. The following general conclusions are made: Individuals in the long duration cohort (12–16 years) experienced less interference with ADL attributed to bowel, bladder, fatigue and pain; Bladder function was the most likely area where patients experienced decline. The one case of syringomyelia did not appear to experience complications, functional decline or symptoms that were unique indicating that we must continue to maintain a high index of suspicion for this complication of traumatic SCI. *Support:* Funding support received from Queen's University Research Initiation Grant.

A 24

SPINAL COLUMN AND SPINAL CORD INJURIES IN MOUNTAIN BIKERS: A THIRTEEN YEAR REVIEW

Emily R Dodwell, MD[1], Brian K Kwon, MD, PhD[1], Barbara Hughes, MD, MHSc[2], David Koo, MD[2], Andrea Townson, MD[2], Allan Aludino, BSc[1], Richard K Simons, MB, BChir[3], Charles G Fisher, MD, MHSc[1], Marcel F Dvorak, MD[1], Vanessa K Noonan, PhD[1]

[1]Division of Spine, Department of Orthopaedics, [2]Division of Physical Medicine and Rehabilitation, [3]Department of Surgery, University of British Columbia, Vancouver, BC, Canada

Background: Multiple studies have described in general the injuries associated with mountain biking, and detailed accounts of spine injuries sustained in hockey, gymnastics, skiing, snowboarding, rugby and paragliding have previously been published. However, no large scale detailed assessment of mountain biking associated spinal fractures and spinal cord injuries (SCI) has previously been published. *Purpose:* To describe the patient demographics, injuries, mechanisms, treatments, outcomes and resource requirements associated with spine injuries sustained while mountain biking. *Methods:* Patients who were injured while mountain biking, and presented to our provincial spine referral centre between 1995 and 2007 inclusive, with SCI and/or spine fracture were included. A chart review was performed to obtain demographic data, and details of the injury, treatment, outcome and resource requirements. *Results:* 102 men and 5 women were identified for inclusion. The mean age at injury was 32.7 years 95% CI [30.6,35.0]. Seventy-nine patients (73.8%) sustained cervical injuries, while the remainder sustained thoracic or lumbar injuries. Forty-three patients (40.2%) sustained a SCI. Of those with cord injuries, 18 (41.9%) were ASIA A, 5 (11.6%) were ASIA B, 10 (23.3%) ASIA C, and 10 (23.3%) ASIA D. Sixty-seven patients (62.6%) required surgical treatment. The mean length of stay in an acute hospital bed was 16.9 days 95% CI [13.1,30.0]. Thirty-three patients (30.8%) required ICU care, and 31 patients (29.0%) required inpatient rehabilitation. Of the 43 patients (39.6%) who presented with SCI, 14 (32.5%) improved by one ASIA category, and one (2.0%) improved by two ASIA categories. Two patients remained ventilator-dependent at discharge. *Conclusions:* Spine fractures and SCI due to mountain biking accidents typically affect young, male, recreational riders. The medical, personal, and societal costs of these injuries are high. Injury prevention should remain a primary goal, and further research is necessary to explore the utility of educational programs, and the impact of helmets and other protective gear on spine injuries sustained while mountain biking.

A 25

IMPACT OF THE STROKE REHABILITATION EVIDENCE-BASED REVIEW (SREBR)

Robert Teasell, MD[1,2], Norine Foley, MSc[1], Katherine Salter, BA[1], Matthew Meyer, MSc(c)[1], Andrew McClure, BA[1], Ross Graham, MSc(c)[1]

[1]Aging, Rehabilitation & Geriatric Care Program, Lawson Health Research Institute, [2]The Department of Physical Medicine & Rehabilitation, Schulich School of Medicine & Dentistry, University of Western Ontario, London, Ontario, Canada

The SREBR is the most comprehensive review of the research literature examining both therapy-based and pharmacological interventions associated with stroke rehabilitation. Since its original publication in April 2002, the SREBR has undergone

11 major revisions. The SREBR includes an extensive literature search, data extraction and analysis, study quality assessment using the PEDro scale and development of levels of evidence, with the focus on randomized controlled trials (RCTs). The 12th edition of the SREBR was released in September 2009 which includes reviews of well over 3,400 articles including 956 RCTs and over 400 levels of evidence as well as 7 new Educational Modules. The SREBR is freely available online at: www.ebrsr.com. *Knowledge Dissemination:* The SREBR has had over 24,000 Internet visits over the past year from 114 countries and 93 publications including 68 peer-reviewed articles. Large sections of the SREBR have been translated into Japanese. The SREBR or its publications have been cited over 600 times in Medline journals with approximately 1300 citations in Google Scholar. The SREBR has recently been the recipient of 8 recognition awards. There have been 15 studentship and graduate student awards provided. The SREBR has become a training center for the next generation of stroke rehabilitation researchers and clinicians. *Knowledge Uptake:* The SREBR has served as a platform for development of national research priorities, provincial stroke strategy recommendations, numerous educational programs, lay bilingual stroke rehabilitation education tools such as StrokEngine and SCORE guidelines, a national multi-centered trial examining the application of best evidence in a clinical setting. More recently we have been examining the economic cost-benefits of implementing key best evidence based on key principles of stroke rehabilitation. SREBR is providing a unique and vital infrastructure for stroke rehabilitation in Canada and internationally. *Support:* Funding for the SREBR from Canadian Stroke Network.

A 26

OSTEOARTHRITIS OF THE KNEE WITH AND WITHOUT CONTRACTURE: DEMOGRAPHICS AND ASSOCIATED FACTORS

Mark Campbell, Hans K Uhthoff, Guy Trudel
University of Ottawa, Ottawa, Ontario

Objective: To compare demographics and associated factors of patients with and without knee flexion contracture secondary to knee osteoarthritis (OA) selected for total knee arthroplasty (TKA). *Methods:* Patients undergoing TKA for OA were assigned to either the contracture or the no contracture group based on their ability to extend the knee beyond 5° of flexion. Exclusions included inflammatory arthritis or prior knee surgery. Age, gender, height, weight, body mass index (BMI), range of motion of surgical and contralateral knees, and duration of OA were compared using Mann-Whitney *U*-tests. *Results:* We recruited 14 patients (67%) with contracture and 7 (33%) with no contracture; with mean extension limitation of $10.3 \pm 4.3°$ and $1.1 \pm 1.1°$, respectively. Contracture of the OA knee joint was associated with a lack of extension in the contralateral knee (3.5 ± 3.7 vs $0.6 \pm 1.0°$; $p < 0.05$), and duration of OA (15.5 ± 12.3 vs 4.6 ± 3.2 years; $p < 0.05$). There was a trend towards larger mean BMI in the contracture group (29.9 ± 4.1 vs 26.4 ± 3.1 kg/m^2; $p = 0.052$). *Conclusions:* Patients with OA and knee flexion contractures face worse surgical outcomes post-arthroplasty. Lack of contralateral knee extension may compensate for leg length difference, balance, and pain. Alternatively, it points to a genetic predisposition: expression of genes contributing to contractures would limit extension of both knees, not only the OA knee. Pain from load-bearing through degenerated knee cartilage in OA may impose a flexed position. Keeping this position for long durations or increasing loads through the knee due to obesity may lead to structural changes in capsule, muscle, tendon and ligaments, causing the joint contracture. In obesity, cytokines and TNF-α can mediate these structural changes. Contralateral knee range of motion and time since diagnosis may guide surgical referral. Interventions targeted at ranging the knees through their full motion and weight control in OA may prevent flexion contracture, delay arthroplasty or improve its success.

A 27

NOVEL ASSESSMENT OF THE EFFECTS OF SCI IN PATIENTS BY MEANS OF SPINAL FMRI

PW Stroman[1,2], RL Beazer[1], C Kidd[1], R Bosma[1], Karen Smith[3,4], Ronald Pokrupa[5,6], O Islam[2,7], N Mngoma[4], D Cadotte[8,9], D Mikulis[8,10], MG Fehlings[8,9]
[1]Centre for Neuroscience Studies, [2]Diagnostic Radiology, Queen's University, Kingston, [3]Physical Medicine and Rehabilitation, Queen's University, Kingston, [4]Providence Care, St Mary's of the Lake, Kingston, [5]Neurosurgery, Kingston General Hospital, Kingston, [6]Neurosurgery, Queen's University, Kingston, [7]Radiology, Kingston General Hospital, Kingston, [8]Neurosurgery, University of Toronto, Toronto, [9]Surgery, Toronto Western Hospital, Toronto, [10]Medical Imaging, Toronto Western Hospital, Toronto, Ontario, Canada

Introduction: Assessment of the condition of the spinal cord in patients after spinal cord trauma is essential, both for treatment planning and for monitoring outcomes. Here, we present a novel method of stimulating 4 sensory dermatomes simultaneously, during spinal fMRI, in order to map function on both the right and left sides of the cord, as well as at two segmental levels; above and below the injury site. Thermal stimuli are used because they are passive, and involve spinal cord pathways involved with sensation, pain responses, and a component of motor responses. Data are presented from cases of spinal cord injured patients to demonstrate the clinical value, and practicality of this technique in fMRI. *Methods:* Functional MRI studies of the injured spinal cord were carried out with a 3 T Siemens Magnetom Trio using a phased-array spine receiver coil with subjects lying supine. Signal intensity changes observed in the image data upon a change in neuronal activity level were the result of signal enhancement by extravascular water protons (SEEP), as described previously. The peripheral pulse was recorded continuously during each study for use in subsequent data analysis. Thermal stimulation of 4 different sensory dermatomes was applied by means of a custom-made device that is entirely automated, requiring only the press of a button to initiate the stimulation sequence. This device controls heating and passive cooling of four thermodes to a preset stimulation temperature of 44°C during stimulation, in four linearly-independent block-design paradigms to enable the distinct response to each stimulus to be determined. The four thermodes were placed symmetrically on the right and left sides, on sensory dermatomes corresponding to approximately 2 spinal cord segments above, and below, the injury level. Spinal fMRI analysis was carried out using custom software written in MatLab as described previously, with modifications to be almost entirely automated when used with the four pre-set stimulation paradigms. The data were reformatted to permit smoothing along the long axis of the cord, and were normalized to a consistent coordinate space for all studies to facilitate group comparisons of results. *Results and Conclusions:* Results obtained to date demonstrate little to no image distortion or signal loss in the spinal cord near fixation devices. Activity is seen both above and below the level of injury on the right and left sides, corresponding to the placement of the thermodes. Comparisons with data from healthy volunteers demonstrate changes in function as a result of the spinal cord injury, in agreement with clinical tests. In addition, preserved sensory functions and evidence of descending modulation of activity have been detected, providing clear evidence of preserved pathways through the level of injury. The results to date demonstrate that the method we have developed is a sensitive and practical means of assessing spinal cord function. This method can be applied in any modern clinical MRI system, with no modifications, and minimal extra training of clinical personnel needed either for data collection or analysis. Further corelation with clinical assessments is the focus of current research. Aspects of this work was presented in poster form at the International Society of Magnetic Resonance in Medicine, Sweden, May 2010. Research supported by SCI Solutions Network.

A 28

SPINAL ACCESSORY NERVE PALSY FOLLOWING MVA, AND THE DISABILITY OF SCAPULAR WINGING

S Macaluso, MD, Thomas A Miller, MD, FRCPC, Douglas C Ross, MD, MEd, FRCSC
University of Western Ontario, Schulich School of Medicine and Dentistry, St Josephs Health Care, London, Ontario

We present three cases of isolated injury to the spinal accessory nerve (SAN), following a MVA. All three were difficult to diagnose and had been missed by previous multiple specialists consultations. The importance of the middle and inferior portions of the trapezius muscle highlight the functional deficits of spinal accessory nerve palsy and their lack of function contribute to the ongoing disability. Case 1: A 23 year-old-female was involved in an MVA. She suffered a TBI, fractured femur requiring ORIF and a weak and painful shoulder Radiologic and EMG findings confirmed an isolated injury to the spinal accessory nerve. Her lack of scapular stability and ongoing pain contributed to her disability. Cases 2 and 3 consisted of a 44-year-old female and an 82-year-old male, both patients presented 2 years after their

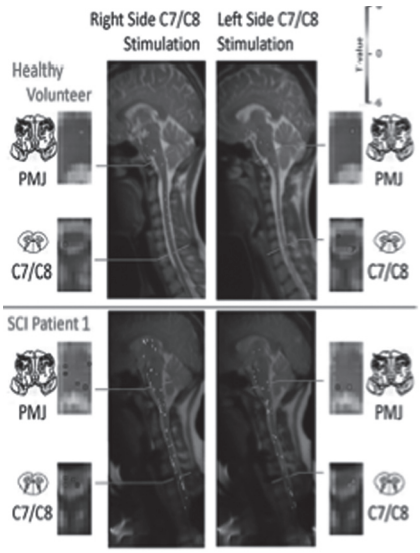

Fig. 1. Example of spinal fMRI results from a healthy control volunteer (top), and an age-matched volunteer with C4 sensory C5 motor ASIA B traumatic SCI (bottom). Maps of activity are shown in two selected sagittal slices and selected transverse slices (at the C7/C8 spinal cord segments and pontomedullary junction), to demonstrate the responses detected with right- and left-hand stimulation at 44°C. The areas of activity are indicated in colour (representing the significance, T value, of the response), overlaid onto the functional imaging data.

MVA's with complaints of pain and shoulder dysfunction, that had been attributed to whiplash. Similarly, EMG and imaging confirmed isolated injury to the spinal accessory nerve. The accessory nerve is a pure "motor" nerve and consists of spinal and cranial parts. In SAN palsy in contrast to the long thoracic nerve palsy results in winging of the scapular with shoulder abduction as opposed to shoulder flexion or protraction. The most common etiology is iatrogenic injury following surgical procedures in the posterior triangle of the neck. These cases serve to highlight the importance of traction or stretch injury and outline the functional deficits as a result of SAN palsy. A thorough physical examination, electrodiagnostic evaluation, and suspicion can enable an early correct diagnosis and proper management including surgical neurotization procedures, in minimizing the risk of disability, and highlight the proper rehabilitation management.

A 29

INJURY PATTERNS AND PROJECTED REHABILITATION NEEDS AS A RESULT OF THE JANUARY 12, 2010 EARTHQUAKE IN HAITI

Colleen O'Connell, MD, FRCPC, Aleema Shivji, BSc, PT, Thomas Calvot, MKDE
Handicap International, Haiti and France

Objectives: Rapid assessment of injury patterns and incidence following the 7.3 magnitude earthquake in Haiti, to identify urgent and emergent rehabilitation needs, and guide planning for longer term interventions. *Methods:* Data collection on injuries was conducted by a rehabilitation assessment team from field and permanent hospitals in greater Port au Prince area following the earthquake. Targeted conditions were those with high risk for development of permanent disability; fractures, polytrauma, spinal cord injury (SCI), traumatic brain injury (TBI), amputations and burns. Patients with injuries of targeted pathologies were directly assessed at both hospital and community levels. Physicians, surgical teams, administrative staff, paramedical and physical rehabilitation response teams were interviewed. Cross-reference for comparative purposes with previous earthquake disasters were made. *Results:* Data from 17 hospitals was obtained in the first 14 days following the earthquake, and 600 patients were examined in hospitals and community centres. 80–90% of all presentations to hospitals in the first week were orthopaedic injuries. Data for 282 patients in hospital-only setting were analyzed to identify the distribution and pattern of the more severely injured survivors. Sixty-five percent were in the working age group of 18–59, with equal injury rates between genders. Fractures represented half of all presentations, consistent with previously observed earthquake events. Amputation accounted for 35% of the severely injured, a finding not observed in previous earthquakes where rates were 2.5–5%. Persons with SCI and TBI represented 6% and 3% of this population, respectively. Data extrapolation from population studies, previous earthquakes and the hospital surveys, gives an estimated 2000–4000 persons with amputations, and 100 persons surviving with SCI. *Conclusion:* Immediate postoperative and rehabilitation care needs were identified to initiate distribution of mobility aids and deployment of rehabilitation workers and local training of community based workers. Rehabilitation professional have an important role in emergency disaster response, to aid in identifying and implementing urgent, emergent, and long term interventions.

A 30

THE EFFECTIVENESS OF LIDOCAINE IN THE TREATMENT OF VARIOUS CHRONIC PAIN CONDITIONS: A SYSTEMATIC REVIEW AND META-ANALYSIS

V Gnanakumar[1], Norine Foley[2], Robert Teasell[1,2]
[1]The Department of Physical Medicine & Rehabilitation, Schulich School of Medicine & Dentistry, University of Western Ontario, London, [2]Aging, Rehabilitation & Geriatric Care Program, Lawson Health Research Institute, London, Ontario

Objective: To estimate the treatment effect associated with the use of lidocaine for chronic pain conditions. *Methods:* A systematic review of seven databases was conducted to identify trials published between 1945 and Dec 1, 2009 that examined the use of lidocaine in the systemic treatment of chronic pain due to any condition. A standardized mean difference (SMD) ± standard error and 95% confidence interval (CI) for pain reduction was calculated for each study and the results pooled using a random effects model. *Results:* Twenty-four

studies were included, of which 15 were (saline) placebo-controlled randomized controlled trials (RCT) and 9 were uncontrolled whereby pain was assessed before and after treatment with lidocaine. No trials included a non-treatment placebo condition. Routes of infusion included intravenous ($n=23$) and subcutaneous ($n=1$). No studies examined intramuscular or intranasal routes of administration. Fibromyalgia was the most commonly studied condition. The majority of trials assessed pain using a visual analog scale immediately before and after infusion. A small number of trials assessed pain hours, days or weeks following treatment. Data representing 442 subjects were included in the pooled analysis. Lidocaine use was associated with a significant treatment effect (SMD = 0.627 ± 0.102, 95% CI: 0.427 to 0.827, $p<0.0001$). The treatment effect was larger for RCTs compared with uncontrolled trials (0.499, 95% CI: 0.286 to 0.712) vs. 1.581, 95% CI: 1.000 to 2.162). *Conclusions:* There is evidence of benefit of lidocaine in the treatment of various pain conditions. None of the studies included natural history (no treatment) arms, which may be a valuable direction for future research.

Author index