

Centre for Rehabilitation Research and Development 2012 Rehab Research News

The Ottawa Hospital Rehabilitation Centre



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I am pleased to present the second issue of Rehab Research News. Since the first issue, our name has changed from the Institute for Rehabilitation Research and Development to the Centre for Rehabilitation Research and Development (CRRD). We are now a formal part of the Clinical Epidemiology Program of the Ottawa Hospital Research Institute (OHRI), under the leadership of Dr. Dean Fergusson. I thank Dr. Fergusson for his support and continuing interest in our work.

The focus of our research and development efforts continues to be the ultimate improvement of the lives of the clients we serve at The Ottawa Hospital Rehabilitation Centre (TOHRC). Virtually all disciplines are involved in research, much of it interdisciplinary in nature, and we have a special focus on evidence-based practice and maintaining a high ethical standard for our research activities.

I would like to thank our Psychiatrist-in-Chief, Dr. Sue Dojeiji, for her strong support of all aspects of our research program. The Clinical Director of TOHRC and Academic Family Health Team, Helen Zipes, has also been a strong and dedicated advocate for research; in particular, the translation of research into practice. We also enjoy the commitment and support of our Clinical Vice-President, Cameron Love, the CEO, Dr. Jack Kitts, and the entire Senior Management Team of The Ottawa Hospital (TOH). There is a strong commitment to clinically relevant research at TOH, and this commitment clearly extends to TOHRC.

We are very fortunate to be associated with the Ottawa Hospital Research Institute (OHRI). All of our research projects are effectively and efficiently administered through OHRI and, as well, all of our projects are reviewed and monitored by The Ottawa Hospital Research Ethics Board. In particular, I would like to thank the President and CEO of OHRI, Dr. Duncan Stewart, for his support and, a special mention to Rob Hanlon, COO, and his staff who have provided invaluable support and advice throughout our development.

The Ottawa Hospital Foundation has been a consistent supporter of our activities and we look forward to working closely with the Foundation in the coming years, particularly in the effort to continue raising funds for the highly successful Rehab Virtual Reality Lab and for the emerging Post-Concussion Initiative.



I would like to thank the dedicated researchers, most of whom balance excellent research and very demanding clinical schedules. I am certain the clinical work makes for better research and conversely, that research makes for better clinical practice.

I am very fortunate to have a hard-working and dedicated team in the CRRD office to support all our activities on a daily basis. Dorothyann Curran and Carolyn Cook both do invaluable work. I would also like to acknowledge my former secretary, Tina Hutchinson, who provided first class support during her time at CRRD and to welcome Jennifer Taillon to the team.

Finally, I thank all of the patients and families at the hospital for their participation in our research efforts. We do our research to benefit them, and we are very pleased with their enthusiasm for and willingness to participate in our research projects.

Dr. Jamie MacDougall
 Director of Rehabilitation Research
 Centre for Rehabilitation Research and Development
 The Ottawa Hospital Rehabilitation Centre

THE OTTAWA HOSPITAL VISION

“To provide each patient with the world-class care, exceptional service and compassion that we would want for our loved ones”

The Centre for Rehabilitation Research and Development (CRRD) has played an integral role in assisting The Ottawa Hospital Rehabilitation Centre (TOHRC) achieve its reputation as a leader in the provision of adult rehabilitation services.

As the Champlain’s sole tertiary rehabilitation centre, the patients and families of the Champlain region have long benefitted from the close association of our clinical and research centres. Both are anchored by The Ottawa Hospital’s (TOH) core values of compassion, a commitment to quality, working together and respect for the individual.

Congratulations to Dr. James MacDougall and his group of clinicians and staff for their hard work and outstanding achievements profiled in the report. This team works hard with us to pursue new clinical knowledge and its translation into practice so that we can improve our care and thereby patient outcomes. This ensures that our staff members are actively engaged in best practice and enables us to discharge the large majority of our patients to a meaningful, high quality of life in our community.



Helen Zipes

Clinical Director, The Ottawa Hospital Rehabilitation Centre and Academic Family Health Team



Dr. Sue Dojeiji

Physiatrist-in-Chief
The Ottawa Hospital Rehabilitation Centre

RESEARCH AND DEVELOPMENT AT THE OTTAWA HOSPITAL REHABILITATION CENTRE

VISION

The pursuit of excellence in rehabilitation research and development.

MANDATE

- To conduct clinical and community research with high relevance to The Ottawa Hospital Rehabilitation Centre (TOHRC) and the broader rehabilitation community.
- To provide advice on and assistance with research methodology and data analysis/interpretation to TOHRC staff engaged in research, program evaluation and best practice review and implementation.
- To conduct research on, develop and oversee knowledge transfer within TOHRC for best practice.
- To develop, plan and oversee networking activities at the regional and national levels to enhance knowledge dissemination.
- To exchange knowledge and expertise for the benefit of the international rehabilitation community.
- To leverage the expertise, products and services of CRRD/TOHRC to generate revenue to support research and development activities and initiatives.
- To develop and research new technologies that improve the lives of persons with rehabilitation needs.

HISTORY

From the beginning, the Research Department of The Rehabilitation Centre (TRC) fostered interdisciplinary research efforts that emphasized clinical outcomes, while at the same time addressed fundamental research issues. In support of this pursuit, the first Labatt 24-Hour Relay was held in 1989. This fund was to be instrumental in launching many pilot studies and provided rehabilitation researchers the impetus for seeking external grants.

In April 1992, the Research Department at TRC officially became the Institute for Rehabilitation Research and Development (IRRD). Our mandate expanded to include the promotion of networking and partnerships at the university level, as well as with other rehabilitation centres across Canada. In addition, international development and commercialization became an important focus for IRRD. The aim was to share our clinical and research expertise worldwide and provide hands-on training opportunities to underdeveloped countries.

A Cooperation Agreement between IRRD and The University of Ottawa was signed in 1994, the objective of which was to encourage professional exchange and collaboration between academic and clinical researchers. In this same year, the Consumer-Researcher Partnership Forum was held. This forum provided an excellent opportunity to examine methods for facilitating collaborative research partnerships between consumers and researchers.

Through the late 1990's, many industrial partnerships along with national and international development projects were initiated. IRRD was incorporated in August 2000, and was later officially launched as such in December 2000 by Prime Minister Jean Chrétien and actor Christopher Reeve.

In 2005, a memorandum of understanding was signed between IRRD, Queen's University at Kingston and Kobe Gakuin University in Japan to foster cooperative education and research initiatives. In April 2005, governance of The Rehabilitation Centre was transferred from the Royal Ottawa Health Care Group to the newly amalgamated Ottawa Hospital. A year later, the incorporated IRRD was consolidated within the Clinical Epidemiology Program of the Ottawa Hospital Research Institute (OHRI).

In what is now called the Centre for Rehabilitation Research and Development (CRRD), the staff and researchers continue to strive to acquire knowledge across the spectrum of research in rehabilitation, from basic science to clinical outcome trials and population-based health outcome studies. We are committed to finding new and innovative methods of delivering knowledge to the clinician and the consumer, and to helping people with disabilities achieve full integration and participation in all aspects of life.

SPECIALIZATION WITHIN CRRD

As CRRD has evolved over the past decade, the opportunity and need for specializations have emerged. We have been fortunate that our staff have been well qualified to meet the needs of new trends in research and development.

Research Ethics

Research ethics is a growing field. Dorothyann Curran received a Master's degree in Bioethics from the University of Toronto in 2005. Prior to the merger of hospital policies and procedures, she served on the Research Ethics Board of TRC for eight years. Her growing expertise in research ethics is maintained by consultations with rehabilitation staff researchers and collaborations with the Clinical Ethicist of TOH. She is also a member of the Ottawa Hospital Research Ethics Board Executive.

Quality Reporting and Best Practice Initiatives

Carolynn Cook has a Master of Science degree in Psychology (Specialization in Neuroscience) from Carleton University. Over the past decade, she has been responsible for managing data for quality reporting and quality improvement activities related to rehabilitation within TOH. She conducts data analyses and generates reports in various formats for clinicians and clinical managers on a regular basis using both internal data, and data from the National Rehabilitation Reporting System (NRS). Through this database management, she is also an important resource for clinicians working on evidence-based research and best practice initiatives.



Post Concussion Syndrome Research-Based Clinic Initiative

Project Team Members: Jamie MacDougall, Shawn Marshall, Laura Rees and Dorothyann Curran, The Ottawa Hospital Rehabilitation Centre; Andra Smith, University of Ottawa; Santanu Chakraborty and Andrée Tellier, The Ottawa Hospital

While the majority of persons who experience a concussion will recover and resume productive lives within one to three months post injury, approximately 15% will experience persistent symptoms that affect daily living and, if left unattended, can lead to long term disability. These persistent symptoms comprise post concussion syndrome (PCS) and commonly include headaches, vision problems, dizziness, fatigue and sleep disturbances, an inability to concentrate, as well as other cognitive impairments. PCS has a pervasive impact on people's lives, affecting personal and work relationships, educational and employment potential, and involvement in recreational activities for months or even years. Only recently has PCS been acknowledged as a health-care issue unto itself, due largely to media coverage of professional athletes.

For many years, The Ottawa Hospital Rehabilitation Centre (TOHRC) and the Centre for Rehabilitation Research and Development (CRRD) have demonstrated a leadership role in the integration of rehabilitation innovation, research, and clinical practice. Given that many questions still exist regarding the functional and physiologic differences that are indicative of PCS and how to treat it, having a research based clinic that can provide both treatment and an opportunity for patients to participate in emerging research is important. However, there are no dedicated services for PCS patients within the Champlain Local Health Integrated Network (LHIN).

In 2000, TOHRC established an outpatient acquired brain injury (ABI) clinic to provide comprehensive, multidisciplinary care to those with moderate to severe ABI. Since that time, community referrals for patients with suspected PCS have risen dramatically. From 2011 to 2012, there was a 65% increase in new PCS patients seen and a 200% increase in follow-ups. The need for a dedicated PCS clinic in the Champlain LHIN is clearly rising, and a venue for the development and advancement of evidence-based clinical practice for PCS is imperative. The members of this project team are recognized leaders in their respective fields, and are involved in several initiatives for mild traumatic brain injury, both individually and collectively.

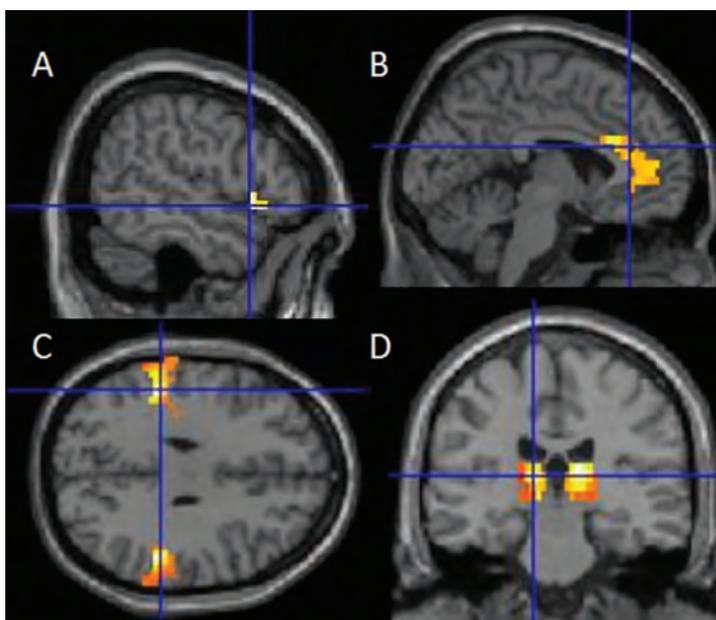
In the summer of 2012, a business case and operational plan, generously funded by the Ontario Neurotrauma Foundation (ONF), entitled 'The Time to Act', was distributed to ONF and to stakeholders

across the region. The project team gathered province-wide information regarding the impact of PCS on society and the Ontario health system, and conducted interviews with health-care providers in existing clinics. Feedback from patients and health-care providers at The Ottawa Hospital (TOH) was also obtained. The resulting document outlines the need for a post concussion research-based clinic in the Champlain LHIN, to be established at TOHRC, and provides a template for such a clinic.

The project team has also designed a unique research project that will combine imaging techniques like functional magnetic resonance imaging (fMRI), diffusion tensor imaging (DTI), and susceptibility-weighted imaging (SWI) with neuropsychological assessments, designed specifically for patients with mild traumatic brain injury (mTBI). The aim is to assemble a complete picture of the brain of a person who experiences mTBI, and to determine why some people develop persistent symptoms while others do not. The team is currently in the process of submitting a feasibility study for ethics review.

Developing a regional tertiary-level PCS outpatient rehabilitation research-based clinic will enable TOHRC to:

- Provide comprehensive multidisciplinary assessments and treatment to address the full range and complexity of PCS symptoms;
- Reduce wait times, improve access to specialty services and address existing gaps in service;
- Provide unique opportunities to study the etiology, course and treatment of PCS, and facilitate prompt clinical uptake; and
- Contribute to local, national, and international efforts to advance our knowledge and treatment of PCS for the benefit of patients everywhere.



“No head injury is too trivial to ignore.”

Hippocrates, 460-377 BC



Rehab Technology to Enhance Mobility

PRINCIPAL INVESTIGATOR: Edward Lemaire

Coinvestigators: Natalie Baddour, University of Ottawa; Jonathan Kofman, University of Waterloo; Peter Kyberd, University of New Brunswick; Laurent Frossard, Université du Québec à Montréal; Markus Besemann, Canadian Forces Health Services; Pauline Godsell, Canadian Forces Health Services; Adrian Chan, Carleton University; James Green, Carleton University; Man-Sang Wong, Hong Kong Polytechnic; Jorge A Vélez, Colombian Telemedicine Centre; Fangwei Zeng, International Society for Prosthetics and Orthotics

DYNAMIC STABILITY ASSESSMENT WITHIN REHABILITATION VIRTUAL REALITY ENVIRONMENTS *(Funded by the Canadian Forces Health Services)*

For people with mobility-related disabilities, health-care decision-making could be improved by having a better understanding of their dynamic stability. In addition to the potential link between fall risk and critical instability (i.e., the point where the person becomes so unstable that they cannot maintain balance), dynamic stability could relate to movement confidence and enhanced performance. Increasing confidence in a person's movement capacity might, therefore, reduce activity avoidance and enhance their quality of life through adoption of a more active lifestyle. The objective of this study is to develop dynamic stability measures that will generate clinically useful information for assessing mobility. With the appropriate measures and analysis, a better understanding of a person's dynamic stability can be achieved, which can translate to better clinical decision-making. The Computer-Assisted Rehabilitation Environment (CAREN) Extended virtual reality

system is an ideal tool for assessing dynamic stability within environments that are more suited to moving in the community. With this system, individuals can safely move within a progressively challenging virtual world where they work at their own mobility capacity. Individuals undergoing rehabilitation for lower extremity amputations will be evaluated using state-of-the-art virtual reality technology, real-time movement analysis, plantar pressure measurement and analysis, and assessments of movement confidence and mobility. Results obtained with this group of patients will be potentially transferrable to other populations with mobility deficits.

WEARABLE MOBILITY MONITORING USING BLACKBERRY SMARTPHONES *(Funded by the Natural Sciences and Engineering Research Council of Canada and Research In Motion)*

Monitoring the mobility of people with physical disabilities is an important part of rehabilitation medicine. A wearable mobility monitoring system (WMMS) that can monitor mobility for extended periods both in the home and the community

would be a valuable tool for clinical professionals. New smartphones provide a variable platform to create such a system. Our research uses all available BlackBerry sensors and multimedia capabilities to create a WMMS that can be easily used by the practitioner and client, without the need for external hardware. This system identifies activities and the context of the mobility state by fusing the sensor information (acceleration and global positioning system) to determine a change of state and then using the smartphone camera to record video for analysis. Custom software has been developed to assist the operator in coding the video output, and to allow secure data transfer between the Smartphone and a central server. This enables users to analyze mobility anywhere appropriate Internet access is available. Current research activities include: WMMS evaluation with able-bodied, elderly, amputee, and orthosis user populations; automated video analysis to improve activity classification and extract the context of the activities; and development of improved user-specific calibration methods to enhance sensor-based change-of-state identification.

STANCE CONTROL KNEE-ANKLE-FOOT ORTHOSES *(Funded by the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council of Canada and Ontario Centres of Excellence)*

Knee-ankle-foot orthoses (KAFOs) are prescribed for people with knee-extensor muscle weakness. To help this population achieve their mobility goals, a new hydraulic knee orthosis was developed to permit a natural gait pattern. When used in a KAFO or knee orthosis, the “Ottawalk-Speed” device allows free knee motion during swing and other non-weight-bearing activities, and resists knee flexion, while allowing knee extension during weight bearing. The Ottawalk-Speed uses a novel angular-velocity control method to activate a safety mode (i.e., resisting knee flexion when weight bearing). Since knee-flexion angular velocity during a knee-collapse event, such as a stumble or fall, is greater than that during walking, hydraulics can be engaged to resist knee flexion when an angular-velocity threshold is exceeded. The Ottawalk-Speed device does not require an

external control mechanism to switch from free motion to stance control mode. Functional and bench tests have been conducted and demonstrate that the orthotic system can handle large forces, provide free knee motion during walking, engage upon knee collapse, and support body weight while an individual recovers to a safe body position. The CAREN (Computer-Assisted Rehabilitation Environment) Extended system is currently being used to evaluate the Ottawalk-Speed device in response to a provoked stumble in people with knee extensor weakness. New research in this area will involve intelligent, variable resistant control of the hydraulic knee to further improve mobility.

WEARABLE EMG MONITORING USING ELECTRODE ARRAYS *(Funded by the Natural Sciences and Engineering Research Council of Canada and Ontario Centres of Excellence)*

Electromyography (EMG) is the analysis of electrical signals that cause muscles to contract. Typically, EMG recording occurs in a laboratory where time is taken to prepare the skin, apply electrodes to specific anatomical locations, and verify signal quality. The time involved and lab equipment required for this process limit the use of movement-based EMG analysis in a clinic setting. The purpose of this project was to create a prototype wearable system for EMG data collection at the point of patient contact (WEAR - Wearable EMG Analysis for Rehabilitation). In addition to integrating the newest technology for human signal recording and processing, this study demonstrated the capability of electrode arrays for EMG analysis (i.e., use of eight electrodes in the muscle signal area instead of two electrodes placed by an experienced technician), and the use of dry electrodes for more efficient system setup. System validation showed that appropriate muscle activity signals could be captured and analyzed by simply attaching an instrumented cuff to a person’s leg and performing a few muscle contractions for calibration. Future research will involve developing methods for automatically assessing EMG quality, new processing methods that take advantage of electrode array signals, and moving from prototype to pre-commercial versions of the WEAR system.

EFFECT OF BACKPACK LOADS ON MOVEMENT (*Funded by the Canadian Forces Health Services*)

The ability to carry a weighted backpack is an important mobility consideration for members of the Canadian Forces (CF), particularly for injured personnel. We have completed the first biomechanical study of backpack load carriage for transtibial amputation. The objective was to increase our understanding of the effects of backpack load on gait and, thereby, improve a person's ability to effectively carry heavy loads for prolonged periods. This exploratory study examined walking gait over level ground, uneven ground, ramp ascent, and ramp descent.

Three-dimensional motion analysis data was used to describe limb motion and forces, and compare between no-pack and backpack conditions. While the research demonstrated that high-functioning individuals with transtibial amputations are not limited by backpack load carriage, asymmetries and increased loading patterns were identified. Further research will examine the effect of heavier loads, fatigue, and varying movement environments by using the Computer-Assisted Rehabilitation Environment (CAREN) Extended virtual reality system.

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GRADUATE STUDENTS

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Marco Tundo
Emily Sinitski

Mechanical Engineering (MAsc)
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Human Kinetics (MSc)
Whitney Montgomery
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Population Health (PhD)
Janet Young

UNIVERSITY OF WATERLOO

Systems Design Engineering (MAsc)
Alex Spring

Systems Design Engineering (PhD)
Jennifer Irwin

CARLETON UNIVERSITY

Biomedical Engineering (MAsc)
Adam Freed

The Canadian Driving Research Initiative for Vehicular Safety in the Elderly



CO-PRINCIPAL INVESTIGATORS: Shawn Marshall and Malcolm Man-Son-Hing

Coinvestigators: Michel Bédard, Lakehead University; Paul Boase, Transport Canada; Anna Byszewski, Sylvain Gagnon and Frank Molnar, University of Ottawa; Ann Cranney, Queens University; Jude Charlton, Jim Langford and Sjaan Koppel, Monash University; David Eby and Lisa Molnar, University of Michigan; Hillel Finestone, Élisabeth Bruyère Hospital; Isabelle Gélinas, Nicole Korner-Bitensky and Barbara Mazer, McGill University; Michel J Johnson, Nipissing University; Linda Li, University of British Columbia; Janice Miller Polgar, University of Western Ontario; Jeanette Montufar, Michelle Porter, University of Manitoba; Anita Myers, University of Waterloo; Gary Naglie, Mark Rapoport, University of Toronto; Ian Stiell, The Ottawa Hospital; Holly Tuokko, University of Victoria; Brenda Vrkljan, McMaster University; George Wells, Ottawa Hospital Research Institute

The Canadian Driving Research Initiative for Vehicular Safety in the Elderly (Candrive), funded through the CIHR Team grant program (2008-2013), is a national, multidisciplinary team focused on research pertaining to older driver safety. The team has made multiple advances in researching older driver safety and positioning results to influence health care professionals and policy makers both nationally and internationally. Accomplishments of this team include successfully establishing a large prospective cohort of older drivers (928 enrolled study participants) that have been tracked for four years across seven sites in four provinces.

This cohort, the first of its kind in the world, has been positioned for the development of a clinical prediction rule/risk stratification tool that will aid clinicians and transport administrators in identifying persons who are at risk for driving due to health and medical factors. Comprehensive annual participant assessments (2670 to date), including measures to evaluate cognition, physical ability as well as driving behaviours, have been collected prospectively to determine which factors are most predictive of risk for the primary outcome of at-fault motor vehicle collisions (MVCs).

Novel trademarks of this study include its prospective design, the use of at-fault motor vehicle collision as the primary outcome measure and the precise tracking of driving patterns of older drivers with in-car recording devices equipped with global positioning system (GPS) monitoring. To date, more than 30 million kilometres of driving data has been aggregated, which represents the largest dataset of older driver data in the world. This study has and will continue to generate valuable information up until its completion in September 2013, with results from inter-related sub-projects including focus on driving patterns, simulator evaluation, psychosocial factors of driving, and older driver vehicle preferences.

The importance of this study has been recognized internationally, with subsequent collaborations with research teams in Australia and New Zealand who have secured funding to pursue the Candrive protocol (Ozcandrive), and have collectively recruited 302 participants as of May 2010. This linkage affords the opportunity to validate the derived clinical prediction rule on an independent sample, as well as provide insights into the generalizability of the clinical prediction rule.

The information gathered from the first years of this study is currently being presented at conferences across North America. In addition, considerable efforts have been put toward developing stakeholder relationships in preparation for mobilization of knowledge generated from this grant to end users, including physicians and motor transportation authorities. Later in 2013, a Special Issue of the Journal Accident and Analysis Prevention will feature eight to ten articles derived from our baseline assessment data. Some of the findings to be published include: a greater number of health reported symptoms were associated with negative views of driving by study participants, certain vehicle features were specifically associated with driving safety for older drivers, and low mileage drivers performed relatively poorly on many performance measures and reported lower comfort levels when driving in challenging situations. A knowledge translation tool, the IT-KiTT, has been developed by our study team and is ready for implementation. To date, the Candrive Research Team's knowledge translation activities include 289 presentations, 188 publications, 199 media activities, and the acquisition of thirty-four grants related to driving research.

A recent amendment to the original protocol involves directly measuring each participant's on-road driving performance. This portion of the project will be led by three Candrive researchers: Isabelle Gélinas, Barbara Mazer and Brenda Vrkljan. For those participants who agree, a naturalistic observation approach will be used to assess the on-road driving behaviours of seniors in their own familiar driving environment (e.g., navigating intersections, lane changes). The results of this study will document change in performance over time in a large representative group of elderly drivers. This will enable us to examine the association between physical, cognitive, medical and functional measures with on-road performance, as well as provide additional information on older drivers' abilities and how their use of automobile features influences safety. Results from this project will further contribute to the body of knowledge generated from research conducted by the Candrive team.

Funded by the Canadian Institutes of Health Research and Auto21 Centre of Excellence

STUDENTS/TRAINEES

Post Doctoral

Nadia Mullen, Lakehead University

The CIHR Team in Driving in Older Persons (CandriveII) Research Program: Longitudinal Study about the Process of Stopping Driving

Graduate

Maya Patel, University of Ottawa

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Evaluating the On-Road Performance of Older Drivers: Innovations to Enhance Safety

Undergraduate

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Danish Salim, University of Ottawa

Linda Tuong Van Ha, University of Ottawa

Natalie Fersht, University of Ottawa

Jaclyn Del'Unto, Ryerson University

Ozan Gurcan, University of Ottawa

The CIHR Team in Driving in Older Persons (Candrive II) Research Program: Candrive II Common Cohort

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Rehabilitation Engineering Solutions



Team Members: Louis Goudreau, Clinical Engineer; Patricia O'Neill, Research Engineer; Joao Tomas, Electronics Technologist; Tony Zandbelt, Mechanical Technologist; Debra-Lynn Poirier, Secretary

Rehabilitation Engineering collaborates with many areas of The Ottawa Hospital (TOH) to create engineering solutions for unique problems related to accessibility, client care, ergonomics and research. The following projects are highlights of our activities over the past few years.

CUSTOM EQUIPMENT TO ENHANCE DELIVERY OF REHABILITATION CARE

Fall Prevention Bed Sensors (a and b)

When there is concern that a patient may attempt to climb over the side rails of their bed, a custom monitoring system can be installed by Rehab Engineering. Broken light beams signal when the patient is starting to move a part of their body over the rails. This triggers an alert to nursing staff before there is a fall. The exact location where movement is detected can be adjusted depending on the situation. The system has recently been redesigned to accommodate newer rehabilitation beds. In addition, smaller sensors have been installed that are less intrusive for patients.



Adjustable Treadmill Handles (c)

In response to a request from respiratory physiotherapists, we designed and installed adjustable handles on three treadmills in the Physiotherapy Department. For some patients, the original handles were too high or too low, causing them to walk with a flexed posture, which further impaired their breathing. Each handle consists of two halves that mate together around the treadmill bar and four clamps in the middle section that keep the handles securely in place. They are mounted on a dual post that can adjust from five to seven inches in length. In addition, the handles rotate around the bar at 45 degree intervals, allowing the physiotherapist to change settings to accommodate patient needs.



ERGONOMIC SOLUTIONS FOR CLINICIANS

We also provide engineering services to other areas of TOH. Through Occupational Health and Safety Services we design and develop custom devices for staff recovering from repetitive strain injuries or devices to help prevent them. We created a lever for Genesis sterilization containers that allows staff to open them with much less effort. We also modified the shape of new ergonomic scalpel handles to work with the existing disposable blade removers used in the Pathology Department. Additional solutions for clinicians are described below.

Raising X-Ray Table (d)

The height of an X-ray table was modified for TOH's Forensic Unit. The height of the X-ray table needed to be increased because the height of the autopsy table, even at the lowest position, was still too high for a level transfer to the X-ray table. To increase the height, four caster extensions were made out of steel and installed. The links for the caster locks were also extended and reconnected.

Stool for CT Scan (e)

After a patient is positioned on the examination table for a CT scan, the height is adjusted. When one scan is completed the patient has to be turned over by staff without changing the table height. This often results in staff needing to work with their arms raised beyond an ideal ergonomic position. They sought a stool that was non-metallic, stable, inexpensive and could be quickly positioned and pushed out of the way when not in use. A custom, lightweight, stable stool was designed and trialed with staff, and with minor changes has been found to meet their needs.

Ergonomic Dialysis Cap Remover (f and g)

A device was made for removing caps from two different containers used by clinicians when preparing a dialysis set-up for patients. The goal was to reduce strain on the hands and decrease the likelihood of developing repetitive strain injuries. The top and bottom caps of the BiCart container (f) easily pop out with one hand. The top cap is removed by placing the lid in the groove and letting the container fall under its own weight; then the bottom cap is removed by pulling the container back toward the user. Removing the caps from the FX800 filter (g) involves sliding the caps into the top and bottom side openings and pulling the filter back in a single operation. A prototype is currently being tested.





CUSTOM DEVICES AND EQUIPMENT FOR PATIENTS

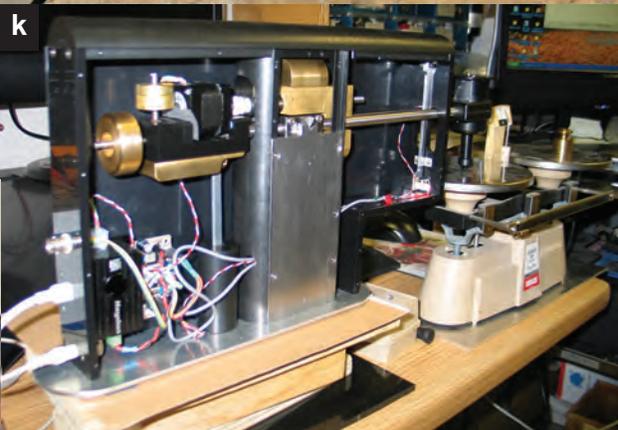
Hockey stick holder for power wheelchair (h)

A custom hockey stick holder was made for a client's power wheelchair. The pivot of the holder is fixed to the frame of the wheelchair allowing the blade to stay in contact with the floor, even when the seat is moved to different tilt positions. The hockey stick can be removed and replaced easily and the holder accommodates different stick sizes.



Communication Tray with Self-Mating Connectors (i and j)

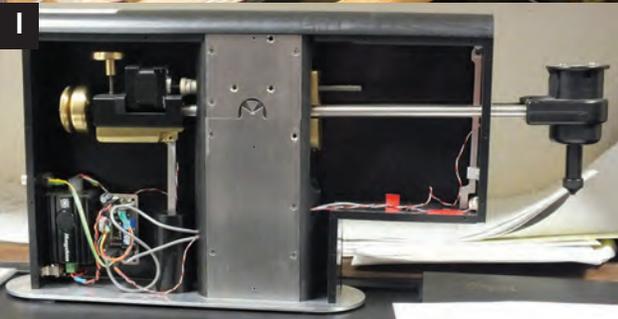
A custom solution was created for a client whose wheelchair had embedded switches in the positioning tray to control both the chair and an electronic communication device. The caregiver would frequently forget to unplug the connectors before removing the tray, leading to damage and the need for repair. The solution involved creating a custom tray with channels underneath for the cabling, and connectors that were integrated with a latch to unlock the tray. With these modifications, the connectors automatically align and mate when the tray is slid in place. Recently the client started using a different communication device and further changes were required. The embedded communication compartment was dropped deeper into the tray and a bar was added across the compartment to interface with the angle adjustment feature of the new communication system. In addition, 1) a fixed guard was installed to protect the new communication device, 2) the wiring cables were replaced, and 3) a connector was added to the tray plug-in module to accommodate the new power adaptor.



RESEARCH

Tactile Stimulator (k and l)

A tactile stimulator was designed for research conducted by Dr. François Tremblay of the School of Rehabilitation Sciences at the University of Ottawa. Dr. Tremblay uses psychophysical and biomechanical approaches to characterize sensory and motor deficits affecting hand function with age. We designed this stimulator to apply pressure to the finger tip using seven different levels of pressure in a programmed sequence. In addition, a second vertical force sensor was created to detect applied pressure from the subject. The stimulator is driven by a stepper motor controlled by a computer. The complete system includes a zero resistance damper, a stepper motor controller, a force sensor, and three different shapes of interfaces between the device and the finger tips.





Non-Invasive Airway Management in Neuromuscular Disease

PRINCIPAL INVESTIGATOR: Douglas McKim

Coinvestigators: Judy King, University of Ottawa; Carole Leblanc and Edward Lemaire, The Ottawa Hospital Rehabilitation Centre; Nadim Srour and Mark Freedman, Ottawa Hospital Research Institute; Sherri Katz and Nicholas Barrowman, Children's Hospital of Eastern Ontario; Lauralyn McIntyre, The Ottawa Hospital; Mika Nonoyama, Louise Rose, Rob Fowler, Ian Fraser, Gordon Rubinfeld, Denise Guierriere and Reshma Amin, University of Toronto; Roger Goldstein, West Park Healthcare Centre; David Leasa, London Health Sciences Centre; Marie-Eve Bédard, Université Laval; Jeremy Road, University of British Columbia; Jean Mah, University of Calgary; David Berlowitz, Austin Health (Melbourne, Australia)

Almost all of our current research involves “at-risk” and mechanically ventilated patients, most of whom have neuromuscular disease. The most interesting findings of our recent projects have to do with a particular respiratory intervention that we call lung volume recruitment (LVR), a term that our team uses instead of “breath-stacking”. We prefer this term as it gives the therapy a greater legitimacy and more directly relates to the critical care description of alveolar recruitment as a result of positive end expiratory pressure (PEEP) in acute respiratory disease syndrome (ARDS). This intervention involves providing air pressure and volume to increase lung volumes closer to normal in individuals with respiratory muscle weakness. The procedure is usually done through a hand-held resuscitation bag and mouthpiece. This process enables the individual to cough more effectively, and through this increase in thoracic range of motion, likely improves lung and chest wall compliance and prevents acute respiratory failure. This is a critical compliment to non-invasive ventilation (NIV).

We recently demonstrated for the first time that the regular twice daily performance of LVR in young men with Duchenne muscular dystrophy (DMD) results in a slower decline of lung capacity; a variable directly linked to survival. We have also reported how LVR, in rehabilitation inpatients with neuromuscular dystrophy (NMD), can facilitate the weaning and removal of invasive tracheostomies; something that had not been done to date. These techniques have also been described in the first Canadian guideline on home mechanical ventilation entitled “Home mechanical ventilation: A Canadian Thoracic Society clinical practice guideline”. In addition, we recently completed an analysis of mouthpiece ventilation (MPV), a unique life-preserving therapy, in our patients who have both DMD and amyotrophic lateral sclerosis (ALS). In both of these patient populations, the performance of regular LVR plays a fundamental role in the success of MPV therapy.

Since LVR is under-utilized world wide, we are engaging in collaborative projects to establish and reinforce its scientific and clinical merit. With local researchers at The Ottawa Hospital (TOH) and

Children's Hospital of Eastern Ontario (CHEO), as well as researchers in Vancouver and Melbourne (Australia), we are working on proposals designed to increase our understanding of the short-term and long-term physiologic effects of LVR on respiratory system compliance and lung function in DMD, multiple sclerosis and spinal cord injury. Greater utilization of this safe and inexpensive therapy will reduce hospitalization and the need for costly invasive ventilation techniques. It should also reduce mortality in individuals with respiratory compromise from neuromuscular weakness. These therapeutic strategies have been used successfully in TOH's critical care units to effectively wean "unweanable" patients from ventilators. As a result, we have a much smaller number of long-term ventilated patients in our ICUs compared to other Ontario sites. This constitutes an important reduction in costs and increases access to critical care beds for patients who need them. It also facilitates discharge home, since NIV is much less complicated than tracheostomy ventilation. Through our collaborative efforts with researchers in Toronto, London and Vancouver, we hope to achieve a much better understanding of long-term ventilation, promote the benefits of non-invasive ventilation and inform clinical management and policy makers in Canada.

Funded by The Ottawa Hospital Academic Medical Organization; the Canadian Institutes of Health Research; the Canadian Respiratory Health Professionals; the Ontario Respiratory Care Society; and the Canadian Lung Association

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ONGOING RESEARCH

- NIV and airway management (NIVAM) e-learning: Translating knowledge into practice
- Understanding long-term ventilation in Canada: A programmatic approach
- Pediatric home long-term mechanical ventilation: Health-care costs and utilization
- LVR for lung function and cough impairment in multiple sclerosis
- Effect of LVR in DMD
- Airway pressure during LVR in patients with neuromuscular disease
- MPV in amyotrophic lateral sclerosis
- Outcomes for invasively ventilated patients managed outside of the intensive care unit
- Validation of a counting device to monitor adherence with LVR exercises in individuals with NMD

Self-Perceived Burden and Suicidal Thoughts



PRINCIPAL INVESTIGATOR: Keith Wilson

COINVESTIGATORS:

Christine McPherson, University of Ottawa

Katherine Péloquin, University of Montreal

Lachlan McWilliams, University of Saskatchewan

Harvey Chochinov, University of Manitoba

John Kowal, The Ottawa Hospital Rehabilitation Centre

Peter Henderson, The Ottawa Hospital Rehabilitation Centre

A few years ago, Keith Wilson and colleagues conducted a study among patients receiving palliative care for cancer, in which they investigated the factors that might motivate such individuals to request physician-assisted suicide. One important theme that emerged in this context was related to the social and family concern around not wanting to become a burden to others. This concern is also heard frequently by clinicians who work with people who have health problems that require assistance and support from family members, so it was not a novel concept. Surprisingly, however, there was actually little formal research in the area. Along with Drs. Christine McPherson, John Kowal, and others, we began a program of research into the issue of “self-perceived burden”. This began with a systematic review of the topic, followed by more formal studies in palliative care. It led eventually to work with other populations, including stroke and chronic pain. Collectively, these studies showed that significant concerns about self-perceived burden were expressed by about 20% to 40% of patients with advanced cancer, but by over 70% of stroke survivors and people with disabling chronic pain.

While this work was ongoing, other investigators had begun discussing a related concept that they called “perceived burdensomeness”, which they reported as contributing to serious suicidal ideation and behaviour. In fact, perceived burdensomeness was a central component of a new theory, called the Interpersonal Theory of Suicide. The parallel between perceived burdensomeness and self-perceived burden was intriguing, especially considering that our initial findings had emerged with respect to suicide (albeit physician-assisted suicide in the terminally ill). Using secondary analyses of data already collected in The Ottawa Hospital Rehabilitation Centre (TOHRC) chronic pain program, we undertook a preliminary test of the theory. We found that, as predicted, self-perceived burden was strongly associated with suicidal ideation even after adjusting statistically for other risk factors, such as pain intensity and depression.

This finding opens up new avenues for both research and therapy. For example, the question of whether suicidal ideation improves with treatment for chronic pain has never been examined before, and represents an ongoing focus of study. We also hope to conduct a more thorough, prospective test of the Interpersonal Theory of Suicide in the future. Even at this early point, however, the findings are compelling: when working with individuals who are expressing suicidal thoughts, it may be critical to explore the extent to which they perceive their disabilities as having a negative impact on significant others. Believing that one has become a burden to others, who might be better off with the person gone, may be a powerful factor underlying much suicidal thinking and behaviour.

Funded by the Canadian Institutes of Health Research

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Rehabilitation Virtual Reality: Improving Clinical Outcomes and Advancing Rehabilitation Research



Team Members: Sue Balmer, Clinical Leader; Courtney Bridgewater, Operator; Louis Goudreau, Clinical Engineer; Edward Lemaire, Clinical Researcher; Patricia O'Neill, Research Engineer; Andrew Smith, Operator; Joao Tomas, Electronics Technologist; Tony Zandbelt, Mechanical Technologist; The Ottawa Hospital Rehabilitation Centre Physiotherapy Department

The Rehabilitation Virtual Reality Lab (RVR Lab) is a state-of-the-art facility for physical rehabilitation assessment, therapy and research. With the RVR Lab, people living with disabilities can use world-class rehabilitation virtual reality services to improve their mobility and balance.

The RVR Lab uses the CAREN (Computer-Assisted Rehabilitation Environment) Extended System. CAREN combines room-sized 3D graphics, a platform that moves with the person as they explore the 3D world, a dual-tread remote-controlled treadmill, and world-class motion analysis technology. Pre-programmed visual presentations allow the patient to respond to an 'environmental stimulus' by shifting weight, increasing or decreasing speed and even making specific motions. The system has a rigorous safety support system which allows the patient to experience various stimuli and physical situations in a very safe and controlled environment, which is especially important in the early stages of rehabilitation. Difficulty levels can be increased gradually as the patient progresses further in their rehabilitation treatment plans.

The CAREN Extended System was installed at The Ottawa Hospital Rehabilitation Centre (TOHRC) in 2010. Since that time, approximately 100 patients have been able to use the system as part of their rehabilitation therapy program. Patient populations that have benefitted from the use of this device include traumatic brain injury, stroke, neuromuscular, amputee and chronic pain. Therapy sessions typically last 30 to 60 minutes and are directed at achieving specific clinical goals, such as improving confidence in mobility and postural stability, reducing anxiety when multi-tasking, and learning to manage walking on sloped terrain with new prosthetic devices.

Clinical Applications

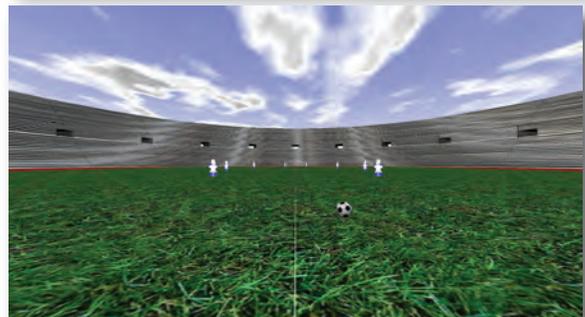
Although some pre-programmed applications were included with the CAREN system, modifications have been made to these default programs, based on specific requests from clinical staff. In addition, three novel applications have been developed by Rehabilitation Engineering staff and the Centre for Rehabilitation Research and Development (CRRD), in consultation with TOHRC clinicians.

The RVR Lab was made possible through the financial support from the Canadian Forces Health Services.

The first new application features a walking loop of variable length which allows the patient to walk through a virtual 'Park'. The terrain can be customized to simulate uphill and downhill ramps, canted roads to the left and right, rolling hills, left-right zig-zags, and rough terrain similar to that encountered when walking on rocks.

In the second application, the platform is programmed to move like a swinging rope bridge anchored between two pillars. The patient must walk downhill from one pillar, with increasing sideways tilting of the platform, until the middle of the bridge. Once past the middle of the bridge, the patient must walk uphill as the sideways tilting decreases. The program also uses motion capture to track the patient's movement. As with a real rope bridge, the patient will tilt more when he/she is on the low side of the virtual bridge. This feature allows patients to recognize how they maintain their balance while walking.

The third application features both a soccer ball kicking task and a baseball catching task. The patient must use motion capture markers, which are attached to their hands or feet, to interact with the system. This program enables patients who have difficulty with these tasks to practice and improve their skills in a safe environment. Several other applications, focusing on upper limb function and cognitive tasks have been developed, and are currently being integrated into patient care.



Research Initiatives

Three major research projects have been implemented using the CAREN system. One study was designed to evaluate the performance of knee-ankle-foot orthoses (KAFO) in response to platform perturbations causing participants to stumble. This allowed researchers to test KAFO performance to determine if it could accommodate free knee movement during gait and prevent collapse of the knee in a stumble situation. Another protocol examined dynamic stability in able bodied persons and persons with transtibial or transfemoral amputations. Using the CAREN Extended system, researchers were able to analyze motion and different forces, as well as plantar pressure, all of which are key components for learning how people remain stable during movement. A third project is underway to evaluate potential changes in posture and mobility following a mindfulness intervention for people experiencing chronic pain. In addition, collaborative research endeavors between the Canadian Forces and TOHRC are currently in preparation.

Achievements in software development and implementation at TOHRC have been presented at several different conferences. Software development activities were presented at the 3rd annual CAREN User Group Meeting hosted by Motek Medical in May 2012. In addition, a patient case study was presented at the Canadian Institute for Military and Veterans Health Research Forum in November 2012. TOHRC physiotherapists have also presented their clinical experiences at several conferences, including the University Health Network's Current Concepts in Balance, Fitness and Mobility in January 2013 and the Greater Toronto Rehabilitation Network Best Practice Day in February 2013.

Health Services, The Ottawa Hospital, The Ottawa Hospital Foundation and the community.



Clinical and Evaluative Research in Chronic Pain Rehabilitation

PRINCIPAL INVESTIGATOR: John Kowal



Coinvestigators: Keith Wilson and Peter Henderson, The Ottawa Hospital Rehabilitation Centre; Lachlan McWilliams, University of Saskatchewan; Bruce Dick, University of Alberta; Dean Fergusson, Ottawa Hospital Research Institute

Chronic pain remains a complex, costly, and prevalent health condition. Individuals with chronic pain have been treated at The Ottawa Hospital Rehabilitation Centre (TOHRC) since the early 1990s. In its current form, the Chronic Pain Management Program (CPMP) is a comprehensive, inter-professional, outpatient program designed to help patients better manage chronic pain by improving functional abilities in several domains (e.g., physical, emotional, and interpersonal).

In line with quality assurance initiatives of The Ottawa Hospital (TOH), one of the aims of the current program of research was to examine the effectiveness of the CPMP by evaluating treatment outcomes over time. Results of a program evaluation were recently presented at the annual meeting of the Canadian Psychological Association and demonstrated that following participation, significant improvements were observed on all measures, including pain intensity, functional limitations, depressive symptoms, negative pain-related thinking, self-efficacy, fear of re-injury, adaptive coping, physical abilities, and overall symptoms and distress. In addition, the overwhelming majority of patients were satisfied with the services received. Not only were these changes observed from pre- to post-treatment, they were sustained over time.

Another line of inquiry examined psychosocial aspects of chronic pain. In particular, adult attachment variables were investigated. In one study, we examined the prevalence of attachment styles among individuals with chronic pain, as well as associations among adult attachment dimensions and treatment outcomes. Over two-thirds of patients endorsed having an insecure attachment style, and attachment insecurity was associated with less improvement in pain catastrophizing, self-efficacy, and depressive symptoms. In a second study, a new measure of preferences for social support was developed and validated. We subsequently validated this measure in the CPMP as well.

A related and innovative area of research focused on self-perceived burden (SPB), that is, the perception of feeling like a burden to others. Our initial research on this topic revealed that SPB is a common experience, with high levels endorsed by over 70% of individuals with chronic pain. SPB was

also associated with numerous clinically-relevant variables, including pain ratings, functional limitations, depressive symptoms, including suicidal ideation, attachment anxiety, pain self-efficacy, and caregiver burden. These findings led us to test relationships from a new theory of suicide, namely, the Interpersonal Theory of Suicide. In this study, SPB was strongly associated with suicidal ideation after adjusting statistically for other risk factors, such as pain intensity and depression. We plan to extend this line of research in future studies.

Funded by the Canadian Institutes of Health Research, the Social Sciences and Humanities Research Council of Canada, and the Centre for Rehabilitation Research and Development

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Guidelines for the Management of Concussion/Mild Traumatic Brain Injury and Persistent Symptoms

PRINCIPAL INVESTIGATOR: Shawn Marshall

Coinvestigators: Mark Bayley, University of Toronto; Scott McCullagh, University of Toronto; Diana Velikonja, McMaster University; Lindsay Berrigan, Dalhousie University; Donna Ouchterlony, University of Toronto

The Guidelines for the Management of Mild Traumatic Brain Injury (mild TBI) and Persistent Symptoms, originally sponsored by the Ontario Neurotrauma Foundation (ONF), were created following an extensive review of the literature and a consensus conference held in Toronto in 2008. Emphasis was placed on making these guidelines useable and accessible to health care professionals who manage patients with mild TBI/concussion. These guidelines have now been freely available on the ONF website for almost two years (posted March 8, 2011).

A recent survey by ONF of centres treating mild TBI in Ontario indicated that nine of 18 centres were aware of and using the guidelines, which indicates that the guidelines have added to the management of mild TBI and persisting symptoms in Ontario. At this time, the guidelines are being updated in order to maintain their relevancy and utility for clinicians.

As part of the update process, an expert consensus conference was held again on Thursday, November 29, 2012 in Toronto, Ontario to review all new evidence and guidance on mild TBI and persistent symptoms since 2008. Presentations about feedback on the first edition, AGREE II instrument scores, results of the systematic reviews of the literature, and a summary of recommendations and levels of evidence extracted from existing guidelines were delivered.

The consensus group members broke out into four smaller groups and were given specific categories of recommendations suitable to their area of expertise to review. Specifically, the group worked to evaluate the guideline recommendations made in the first edition based on new clinical practice guidelines, research and resources available (i.e., decide whether to remove or keep the original recommendation, as well as suggest any editing if applicable).

All revisions are currently being reviewed by the project team and will be voted on by the expert group as a whole. Once cohesion and approval by the expert team is achieved, a draft of the guideline will be circulated to recognized experts in the field and stakeholders who did not participate in the development process. The external reviewers will be requested to provide input about the validity and

relevance of the guideline. This feedback will be incorporated into the final draft entitled “Guidelines for the Management of Concussion/Mild Traumatic Brain Injury and Persistent Symptoms: Second Edition”. Modifications to the original formatting and structure, along with the stronger commitment and increased input from stakeholders, will enhance the usefulness of the guidelines for healthcare clinicians and, ultimately, improve mild TBI patient care. The newly updated guidelines will be disseminated in the fall of 2013.

Expected Project Outcomes:

1. Updated guideline recommendations that will be renamed “Guidelines for the Management of Concussion/Mild Traumatic Brain Injury and Persistent Symptoms: Second Edition”
2. Improved formatting/structure of the guidelines to enhance efficient use of the guidelines for healthcare clinicians
3. Strong support for the guidelines since stakeholder groups will have been formally engaged in the update of the guidelines
4. A formal knowledge translation strategy and dissemination plan for the newly updated guidelines

Significant Impacts of the Project:

1. The creation of an updated, high quality guideline that will assist in improved mild TBI patient care
2. Gaps requiring further research will be clearly evident from a thorough review of levels of evidence for the guideline recommendations
3. A stronger commitment from stakeholders to commit to addressing mild TBI and persistent symptoms

Funded by the Ontario Neurotrauma Foundation

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STUDENTS/TRAINEES

Kelsey Scheier, Undergraduate Student, University of Waterloo
Kelly Weegar, Project Coordinator

Project: *Update of Guidelines for the Management of Concussion/ Mild Traumatic Brain Injury and Persistent Symptoms*

REHABILITATION OUTCOMES OF LOWER EXTREMITY ARTHROPLASTY PATIENTS: THE ROLE OF COGNITION AND OTHER FACTORS

Principal Investigator: Amelia Barry

Coinvestigator: Scott Wiebe, The Ottawa Hospital Rehabilitation Centre

Osteoarthritis is a prevalent medical condition in Canada. Federal government initiatives have made joint replacement surgery a priority. As a result, an increasing number of patients will be referred for post arthroplasty rehabilitation in the years to come. It is, therefore, important to determine the factors that affect rehabilitation outcomes in this population, including length of stay, function, and discharge destination. This may help with referral patterns, rehabilitation approach and discharge planning.

Demographic factors shown to affect rehabilitation outcomes include age, female gender, and social circumstances. Patients with multiple comorbidities and post-operative anemia demonstrate longer length of stay. Indications for surgery, specifically fracture and revision, also alter the length of stay and functional outcomes. Many patients undergoing joint replacement are older than 65, increasing the likelihood of cognitive impairment. In addition, post-operative cognitive impairment has been demonstrated in arthroplasty patients. While research suggests that cognition may influence length of stay, functional outcomes and discharge destination, no firm conclusions can be made due to heterogeneous populations and the lack of a discriminative tool for assessing subtle cognitive changes.

We hypothesized that impaired cognition, demonstrated by a score lower than 26 out of 30 on the Montreal Cognitive Assessment would result in longer length of stay, greater need for assistance on discharge, more frequent discharge to assisted living and a lower Functional Independence Measure (FIM) efficiency score in patients admitted for short-term rehabilitation following lower extremity arthroplasty. Data was collected retrospectively on patients over the age of 60 admitted to the Short-Term Rehabilitation Unit at The Ottawa Hospital, after elective primary or revision hip or knee joint replacement. Patients were excluded if the joint replacement resulted from fracture or neoplasm.

Rehabilitation outcomes were compared between groups of cognitively impaired versus non impaired patients. Results of our study demonstrated that length of stay was longer in patients with cognitive impairment. In addition, cognitively impaired patients had lower FIM efficiency scores and FIM discharge scores than non impaired patients. These findings indicate that patients with cognitive impairments can achieve similar gains in rehabilitation, but it takes more time to do so. Secondary outcomes are currently being explored to provide more information on discharge environment and patient services.

BELIEFS AND PRACTICES OF OTTAWA FAMILY PHYSICIANS SURROUNDING PRIMARY CARE OF SPINAL CORD INJURED PATIENTS

Principal Investigator: Dana Pecjak

Coinvestigator: Vidya Sreenivasan, The Ottawa Hospital Rehabilitation Centre

Primary care of all patients is vital to ensure optimal health. This is especially true for spinal cord injured patients, who, after discharge from acute care, have the majority of their health care concerns managed by their family physician. They visit their family physician more than any other specialist after their spinal cord injury. However, there is little training provided to primary care physicians during their residency that addresses the specific needs of this patient population. Consequently, it is vital that family physicians have access to information regarding primary care of spinal cord injured patients that is relevant to their needs.

We currently do not know in which areas of spinal cord injury primary care medicine family physicians require further training, and what would be the best method of delivery for this training. This study was conducted as a resident research project to evaluate the beliefs and practices of family physicians surrounding primary care of spinal cord injured patients. It involved a cross sectional survey of Ottawa family physicians, using self-administered questionnaires encompassing four main areas: 1) demographics, 2) caring for a spinal cord injured patient, 3) knowledge about primary care medical issues affecting spinal injured patients, and 4) methods to deliver educational tools.

Preliminary results indicate a 21% response rate. Of the family physicians who responded, 38% report having spinal cord injured patients in their family practice in Ottawa. The respondents identified five main areas in which further training would be beneficial for providing primary care to spinal cord injured patients. These issues, in descending order, include: 1) neurogenic bladder, 2) autonomic dysreflexia, 3) neurogenic bowel, 4) pressure ulcer management and 5) heterotopic ossification. In terms of dissemination, family physicians indicated that education seminars, communication with patients' physiatrists, and web-based educational modules would be the most useful methods for delivering this information.

Further analysis of the beliefs of family physicians regarding their capacity to care for spinal cord injured patients in family practice is ongoing. It is our hope that this information will ultimately be used to help guide the development of educational tools for family physicians in the primary care of spinal cord injured patients.

Funded by the Centre for Rehabilitation Research and Development

DEFINING SUCCESS AND SATISFACTION WITH FUNCTIONAL ABILITIES AFTER UPPER LIMB AMPUTATION

Principal Investigator: Jessica Trier

Coinvestigators: Erin Bidlake, University of Ottawa; Nancy Dudek, The Ottawa Hospital Rehabilitation Centre

Approximately 41,000 people in the USA live with major upper limb amputations, 90% of which are traumatic. The primary goal of upper extremity amputee (UEA) rehabilitation is to improve function. Most UEA literature has focused on prosthesis use to improve function. However, the evidence linking UEA rehabilitation success to prosthesis use is conflicting. Traditionally, prosthesis non-use or passive use has been considered unsuccessful, but anecdotally many UEAs do not use a prosthesis or use one only for specific activities, yet still consider themselves successful. Therefore, we need to better understand how an UEA defines functional success in order to better meet these patients' rehabilitation needs.

Participants were identified through a chart review from the outpatient amputee clinic at a tertiary care rehabilitation hospital in Ottawa, Canada. Adults ≥ 2 years since an acquired, unilateral, traumatic upper extremity amputation at the transradial, elbow disarticulation, or transhumeral level were invited to participate. Semi-structured interviews were conducted. Data was analyzed using a qualitative, constant comparison approach. Theme saturation was achieved.

Twelve UEAs participated. Satisfaction was not associated with prosthesis use. Prosthesis users and non-users identified themselves as successful. Acceptance of a new physical reality and a strategy for maximizing independence were both essential to achieve satisfaction with functional abilities. Acceptance and independence also influenced each other in that some participants needed to achieve

acceptance in order to become independent, and vice versa. Multiple factors contributed to the achievement of acceptance and independence. However, not all of these factors applied to every UEA.

This is the first study, to the authors' knowledge, that examines satisfaction with functional abilities without focusing solely on prosthesis use, enabling a broader understanding of rehabilitation success for UEAs. A model for the achievement of satisfaction with functional abilities is proposed that has two essential components: acceptance of the new physical reality, and a strategy for maximizing independence. For some UEAs, prosthesis use is required to achieve one or both of these components whereas for others a prosthesis plays no role. UEA rehabilitation programs need to offer services (such as psychology and occupational therapy) that address the two key components. Outcome measures that address the key components need to be developed in order to more effectively assess the success of our rehabilitation programs.

Funded by The Physicians' Services Inc. Foundation (Resident Research Grant)

A CASE-CONTROL STUDY TO DETERMINE WHETHER A SCREENING MEASURE OF EXECUTIVE DYSFUNCTION, THE QUICK EXIT, IS PREDICTIVE OF CHRONIC HOMELESSNESS

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The chronically homeless suffer high levels of substance abuse and shoulder a heavier burden on mental illness compared to other homeless individuals. Often, this subgroup makes up a smaller proportion of the homeless population, but uses a larger share of the resources. In Ottawa, temporary (< 1 month) and episodic shelter users (< 4 months) need mainly short-term assistance with finding, gaining and maintaining housing unlike chronic shelter users (6 months - 1 year) who seem to require additional supports. Researchers have proposed that an inability to plan, empathize and anticipate the consequences of one's actions (known as executive cognitive function), underlies a chronically homeless persons' failure to transition towards stability and independence. Despite its implications for the effectiveness of health and social service delivery to this vulnerable population, research to measure executive cognitive function deficits amongst chronic and former temporarily homeless persons is lacking.

This resident-led research study will screen for executive cognitive dysfunction in 30 chronically and 30 formerly, temporary, homeless adult men and women in Ottawa using two screening tests of executive dysfunction: the Quick EXIT and the Colour Trails Test. If participants who are chronically homeless demonstrate more pronounced executive dysfunction compared to formerly, temporary, homeless individuals, then supportive living environments can improve executive dysfunction. However, to better plan strategies for addressing the needs of chronically homeless individuals in the Ottawa community, service providers need practical and appropriate tools to identify persons at risk. Findings from this study could improve the ability for earlier identification of persons at risk of chronic homelessness; ideally preventing chronic homelessness.

To date, recruitment of 30 chronically homeless individuals is complete. Recruitment is underway for 30 formerly temporary homeless persons who now reside in housing, but who continue to receive support services through Ottawa Drop-In Centres.

*Funded by the Community Foundation of Ottawa (anonymous donor)
and the Centre for Rehabilitation Research and Development*

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