Spotlight on Innovation: Health to Home

Wednesday, November 7, 2018
Westin Hotel, Edmonton, Alberta

Abstract/Poster List
ACKNOWLEDGEMENTS

The remarkable research on display today would not have been possible without the continued support from Alberta Health Services, our partnership with the University of Alberta, the Glenrose Rehabilitation Hospital and the Glenrose Rehabilitation Hospital Foundation.

By bringing together Clinicians, Innovators, Investors, Patients, Academic Healthcare Administrators, Government/Policy Administrators, Clinical Researchers and Entrepreneurs, and Small and Large Industries, we are able to collect valuable information from and share ideas with, some of the most brilliant minds in research. By unleashing innovation through collecting clinical knowledge, innovative talent and business development expertise, we can focus on solving the challenges faced by people with disabilities as they transition from healthcare to home settings.

Thank you to our sponsors & supporters!
<table>
<thead>
<tr>
<th>Primary Author</th>
<th>Poster #</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHMADIAN, Niloufar</td>
<td>SOI 18-39</td>
<td>Detecting Temporal Events During Locomotion Using Body-Worn Inertial Sensors</td>
</tr>
<tr>
<td>AUSTIN, James</td>
<td>SOI 18-44</td>
<td>Improving Performance of Pattern Recognition-Based Myoelectric Control Using a Desktop Robotic Arm Training Tool</td>
</tr>
<tr>
<td>AZAD-KHANEGHAH, Peyman</td>
<td>SOI 18-12</td>
<td>Mobile Health App Rating Index: Content Validation Study</td>
</tr>
<tr>
<td>BAHARI, Hossein</td>
<td>SOI 18-30</td>
<td>Predicted Threshold Against Backward and Forward Loss of Balance During Perturbed Walking</td>
</tr>
<tr>
<td>BOULANGER, Dr. Pierre</td>
<td>SOI 18-08</td>
<td>Caring for Seniors with Complex Medical Conditions Beyond Hospital Walls Using MedROAD Virtual Clinic</td>
</tr>
<tr>
<td>BRENNEIS, Dylan</td>
<td>SOI18-19</td>
<td>Initial Investigation of a Self-Adjusting Prosthetic Wrist Control System</td>
</tr>
<tr>
<td>CASTELLANOS CRUZ, Javier L.</td>
<td>SOI 18-51</td>
<td>Preliminary Testing of a Telerobotic Haptic System and Analysis of Visual Attention During a Playful Activity</td>
</tr>
<tr>
<td>CHARLES, Dr. Lesley</td>
<td>SOI 18-01</td>
<td>Transitions in Care from Acute Care to Home</td>
</tr>
<tr>
<td>DOBSON, Melissa</td>
<td>SOI 18-53</td>
<td>Working Collaboratively, Students, Instructors and Practitioners Help Meet Rehabilitation Needs</td>
</tr>
<tr>
<td>DUROCHER, Melanie</td>
<td>SOI 18-48</td>
<td>Implementing Research Protocol for a National Site Exoskeleton Stroke Study (ExSIRA)</td>
</tr>
<tr>
<td>DZIWENKO, Gwen</td>
<td>SOI 18-03</td>
<td>Improving Pressure Redistribution Knowledge and Management for Individuals with Spinal Cord Injury Using the Xsensor Mat</td>
</tr>
<tr>
<td>EAD, Maha</td>
<td>SOI 18-43</td>
<td>Investigation of the Reassembly of Pelvic Fracture Pieces Using CAD Software</td>
</tr>
<tr>
<td>ELIASOVA, Lucie</td>
<td>SOI 18-41</td>
<td>Virtual Reality (VR) Objective Structured Clinical Examinations (OSCE) Exam Simulator – A Practice Tool Made to Ease Pre-Exam Anxiety</td>
</tr>
<tr>
<td>FONG, Jason</td>
<td>SOI 18-36</td>
<td>Kinesthetic Teaching of a Therapist’s Behaviour to a Rehabilitation Robot</td>
</tr>
<tr>
<td>FORERO, Dr. Juan</td>
<td>SOI 18-37</td>
<td>Exploring the Utility of the CAREN to Quantitatively Assess Balance</td>
</tr>
<tr>
<td>GOMEZ, Maria</td>
<td>SOI 18-52</td>
<td>Testing a Low Cost Mobile Robot to Support Play in Children with Physical Disabilities</td>
</tr>
<tr>
<td>HALLWORTH, Ben</td>
<td>SOI 18-50</td>
<td>Modular Adaptable Trans-Humeral Prosthetic Socket for Evaluating Myoelectric Control</td>
</tr>
<tr>
<td>JEE, Calvin</td>
<td>SOI 18-04</td>
<td>Design and Analysis of an Experimental Set-up to Simulate Loading of a Hemipelvis</td>
</tr>
<tr>
<td>JOHNSON, John</td>
<td>SOI 18-38</td>
<td>Paving the Path for Novel Applications of Accessible Technology to Reduce Overexertion in Manual Wheelchair Users</td>
</tr>
<tr>
<td>JOLY, Vanessa</td>
<td>SOI 18-45</td>
<td>Impact of a Self-Regulation Intervention on the Health Habits of Adolescents with FASD</td>
</tr>
<tr>
<td>Primary Author</td>
<td>Poster #</td>
<td>Title</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>JONES, Chelsea</td>
<td>SOI 18-10</td>
<td>Brain Bootcamp: An Integrated Behavioural Health Intervention For Military Members With Reduced Executive Cognitive Functioning</td>
</tr>
<tr>
<td>KEEN, Christopher</td>
<td>SOI 18-33</td>
<td>Applying Maglev Technology to Knee and Hip Implants to Limit Contact Wear</td>
</tr>
<tr>
<td>KHODAEI, Mahdieh</td>
<td>SOI 18-17</td>
<td>A Pilot Study to Validate a Novel Method to Predict Progressive Cases on AIS</td>
</tr>
<tr>
<td>KRYSKA, Kathryn</td>
<td>SOI 18-34</td>
<td>Examination of Mathematics and Executive Function Among Children with Perinatal Stroke</td>
</tr>
<tr>
<td>KWOK, Alyson</td>
<td>SOI 18-15</td>
<td>Patient Pathways: Creating A patient and Family-Centred Culture Around Quality Improvement</td>
</tr>
<tr>
<td>LEO, Dr. Jennifer</td>
<td>SOI 18-26</td>
<td>Community Based Exercise Maintenance Program for People with Chronic Lung Conditions – A Model for Community Transition</td>
</tr>
<tr>
<td>LIURAOERJIJIN, Yilina</td>
<td>SOI 18-32</td>
<td>The Impact of a Bariatric Simulation Suit on Functional Mobility in Adults Without Obesity</td>
</tr>
<tr>
<td>LOU, Dr. Edmond</td>
<td>SOI 18-24</td>
<td>Pilot Case Report Of 3D Printed Braces For The Treatment Of Adolescent Idiopathic Scoliosis</td>
</tr>
<tr>
<td>MACKLIN, Marissa</td>
<td>SOI 18-29</td>
<td>Glenrose Rehabilitation Research, Innovation and Technology Internship Opportunities</td>
</tr>
<tr>
<td>MAEDA, Dr. Nathaniel</td>
<td>SOI 18-40</td>
<td>Virtual Reality Dental Local Anesthesia Simulator – A Stepping Stone in Dentistry Curriculum</td>
</tr>
<tr>
<td>MARTIN, Laura</td>
<td>SOI 18-47</td>
<td>Health to Home: Using Skype for Business for Clinical Visits</td>
</tr>
<tr>
<td>MCNEIL-INYANI, Keri</td>
<td>SOI 18-46</td>
<td>Development and Verification of a Low-Cost Prosthetic Knee Motion Sensor</td>
</tr>
<tr>
<td>MIGUEL CRUZ, Dr. Antonio</td>
<td>SOI 18-20</td>
<td>Computer Games for Older Adults – Engagement as an Outcome</td>
</tr>
<tr>
<td>NAZARAHARI, Milad</td>
<td>SOI 18-25</td>
<td>An Instrumented Functional Test For Outcome Evaluation Of Shoulder Motion Following Brachial Plexus Injury</td>
</tr>
<tr>
<td>NEUBAUER, Noelannah</td>
<td>SOI 18-05</td>
<td>Development of a Strategy Adoption Model for Persons with Dementia at Risk of Getting Lost</td>
</tr>
<tr>
<td>NG, Kenwick</td>
<td>SOI 18-22</td>
<td>Evaluation Of Manufacturing Process For Building 3D Printed Spinal Brace For Adolescent Idiopathic Scoliosis (AIS)</td>
</tr>
<tr>
<td>NG, Kenwick</td>
<td>SOI 18-23</td>
<td>Association Of In-Brace Cobb Angle With Axial Vertebral Rotation And Torsion On Children With AIS</td>
</tr>
<tr>
<td>NOAMANI, Alireza</td>
<td>SOI 18-27</td>
<td>Validity of Using Wearable Inertial Sensors for Assessing the Dynamics of Standing Balance</td>
</tr>
<tr>
<td>NOAMANI, Alireza</td>
<td>SOI 18-28</td>
<td>Long-Term Gait Variability of Individuals with Spinal Cord Injury As Measured With Wearable Inertial Sensors</td>
</tr>
<tr>
<td>Primary Author</td>
<td>Poster #</td>
<td>Title.tp</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>OCAMPO, Renz</td>
<td>SOI 18-18</td>
<td>Improving User Performance in Rehabilitation Exercises Through Visual-Motor Colocation Via a 3D Augmented-Reality Display</td>
</tr>
<tr>
<td>PARHIZI, Behdad</td>
<td>SOI 18-16</td>
<td>Arm and Leg Cycling to Improve Walking After Spinal Cord Injury</td>
</tr>
<tr>
<td>PARROTT, Yolan</td>
<td>SOI 18-11</td>
<td>implementing Quality Improvements in Geriatric Lower Extremity Edema Management in Occupational Therapy</td>
</tr>
<tr>
<td>PLETSCH, Sarah</td>
<td>SOI 18-14</td>
<td>FES Cycle Implementation</td>
</tr>
<tr>
<td>PURDON, Mareika</td>
<td>SOI 18-06</td>
<td>Partnering with Patients, Families and Staff to Optimize Access to Inpatient Rehabilitation at the Glenrose</td>
</tr>
<tr>
<td>RAMADI, Dr. Ailar</td>
<td>SOI 18-13</td>
<td>Breaks in Sedentary Time in Cardiac Rehabilitation Participants</td>
</tr>
<tr>
<td>RAZA, Sara</td>
<td>SOI 18-09</td>
<td>A Novel Behavioral-Physiological Approach To Characterize Emotion In Infants At Risk For Autism Spectrum Disorder</td>
</tr>
<tr>
<td>RIOS RINCON, Dr. Adriana</td>
<td>SOI 18-21</td>
<td>Serious Games for Cognitive Engagement in Older Adults: Qualitative Findings</td>
</tr>
<tr>
<td>ROSZKO, David</td>
<td>SOI 18-31</td>
<td>Electrode Design Parameters for Safe Stimulation of the Human Spinal Cord</td>
</tr>
<tr>
<td>ROY, Michelle</td>
<td>SOI 18-02</td>
<td>The “3 Questions” Project in Pediatric Rheumatology – A Self-Management Initiative for Youth with Rheumatic Diseases</td>
</tr>
<tr>
<td>TORABBI, Ali</td>
<td>SOI 18-35</td>
<td>Application of a Redundant Haptic Interface in Robotic Rehabilitation for Enhanced User Safety</td>
</tr>
<tr>
<td>WAYNE, Christopher</td>
<td>SOI 18-07</td>
<td>The Effect of Body Mass Index on Gait Mechanics Before and After Total Knee Arthroplasty</td>
</tr>
<tr>
<td>WELLS, Eric</td>
<td>SOI 18-49</td>
<td>Myoelectric Training: Improving Prosthesis Performance Using a Robotic Platform</td>
</tr>
<tr>
<td>WILLIAMS, Heather</td>
<td>SOI 18-42</td>
<td>Assessing the Inter-Rater Reliability of Two Functional Upper Limb Tasks</td>
</tr>
<tr>
<td>Primary Author</td>
<td>Poster #</td>
<td>Title</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>CHARLES, Dr. Lesley</td>
<td>SOI 18-01</td>
<td>Transitions in Care from Acute Care to Home</td>
</tr>
<tr>
<td>ROY, Michelle</td>
<td>SOI 18-02</td>
<td>The “3 Questions” Project in Pediatric Rheumatology – A Self-Management Initiative for Youth with Rheumatic Diseases</td>
</tr>
<tr>
<td>DZIWENKO, Gwen</td>
<td>SOI 18-03</td>
<td>Improving Pressure Redistribution Knowledge and Management for Individuals with Spinal Cord Injury Using the Xsensor Mat</td>
</tr>
<tr>
<td>JEE, Calvin</td>
<td>SOI 18-04</td>
<td>Design and Analysis of an Experimental Set-up to Simulate Loading of a Hemipelvis</td>
</tr>
<tr>
<td>NEUBAUER, Noelannah</td>
<td>SOI 18-05</td>
<td>Development of a Strategy Adoption Model for Persons with Dementia at Risk of Getting Lost</td>
</tr>
<tr>
<td>PURDON, Mareika</td>
<td>SOI 18-06</td>
<td>Partnering with Patients, Families and Staff to Optimize Access to Inpatient Rehabilitation at the Glenrose</td>
</tr>
<tr>
<td>WAYNE, Christopher</td>
<td>SOI 18-07</td>
<td>The Effect of Body Mass Index on Gait Mechanics Before and After Total Knee Arthroplasty</td>
</tr>
<tr>
<td>BOULANGER, Dr. Pierre</td>
<td>SOI 18-08</td>
<td>Caring for Seniors with Complex Medical Conditions Beyond Hospital Walls Using MedROAD Virtual Clinic</td>
</tr>
<tr>
<td>RAZA, Sara</td>
<td>SOI 18-09</td>
<td>A Novel Behavioral-Physiological Approach To Characterize Emotion In Infants At Risk For Autism Spectrum Disorder</td>
</tr>
<tr>
<td>JONES, Chelsea</td>
<td>SOI 18-10</td>
<td>Brain Bootcamp: An Integrated Behavioural Health Intervention For Military Members With Reduced Executive Cognitive Functioning</td>
</tr>
<tr>
<td>PARROTT, Yolan</td>
<td>SOI 18-11</td>
<td>implementing Quality Improvements in Geriatric Lower Extremity Edema Management in Occupational Therapy</td>
</tr>
<tr>
<td>AZAD-KHANEGHAH, Peyman</td>
<td>SOI 18-12</td>
<td>Mobile Health App Rating Index: Content Validation Study</td>
</tr>
<tr>
<td>RAMADI, Dr. Ailar</td>
<td>SOI 18-13</td>
<td>Breaks in Sedentary Time in Cardiac Rehabilitation Participants</td>
</tr>
<tr>
<td>PLETSCH, Sarah</td>
<td>SOI 18-14</td>
<td>FES Cycle Implementation</td>
</tr>
<tr>
<td>KWOK, Alyson</td>
<td>SOI 18-15</td>
<td>Patient Pathways: Creating A patient and Family-Centred Culture Around Quality Improvement</td>
</tr>
<tr>
<td>PARHIZI, Behdad</td>
<td>SOI 18-16</td>
<td>Arm and Leg Cycling to Improve Walking After Spinal Cord Injury</td>
</tr>
<tr>
<td>KHODAEI, Mahdieh</td>
<td>SOI 18-17</td>
<td>A Pilot Study to Validate a Novel Method to Predict Progressive Cases on AIS</td>
</tr>
<tr>
<td>OCAMPO, Renz</td>
<td>SOI 18-18</td>
<td>Improving User Performance in Rehabilitation Exercises Through Visual-Motor Colocation Via a 3D Augmented-Reality Display</td>
</tr>
<tr>
<td>BRENNEIS, Dylan</td>
<td>SOI18-19</td>
<td>Initial Investigation of a Self-Adjusting Prosthetic Wrist Control System</td>
</tr>
<tr>
<td>MIGUEL CRUZ, Dr. Antonio</td>
<td>SOI 18-20</td>
<td>Computer Games for Older Adults – Engagement as an Outcome</td>
</tr>
<tr>
<td>RIOS RINCON, Dr. Adriana</td>
<td>SOI 18-21</td>
<td>Serious Games for Cognitive Engagement in Older Adults: Qualitative Findings</td>
</tr>
<tr>
<td>Primary Author</td>
<td>Poster #</td>
<td>Title</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------</td>
<td>-----------------------------------------------------------------------</td>
</tr>
<tr>
<td>NG, Kenwick</td>
<td>SOI 18-22</td>
<td>Evaluation Of Manufacturing Process For Building 3D Printed Spinal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brace For Adolescent Idiopathic Scoliosis (AIS)</td>
</tr>
<tr>
<td>NG, Kenwick</td>
<td>SOI 18-23</td>
<td>Association Of In-Brace Cobb Angle With Axial Vertebral Rotation And</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Torsion On Children With AIS</td>
</tr>
<tr>
<td>LOU, Dr. Edmond</td>
<td>SOI 18-24</td>
<td>Pilot Case Report Of 3D Printed Braces For The Treatment Of Adolescent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Idiopathic Scoliosis</td>
</tr>
<tr>
<td>NAZARAHARI, Milad</td>
<td>SOI 18-25</td>
<td>An Instrumented Functional Test For Outcome Evaluation Of Shoulder</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motion Following Brachial Plexus Injury</td>
</tr>
<tr>
<td>LEO, Dr. Jennifer</td>
<td>SOI 18-26</td>
<td>Community Based Exercise Maintenance Program for People with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chronic Lung Conditions – A Model for Community Transition</td>
</tr>
<tr>
<td>NOAMANI, Alireza</td>
<td>SOI 18-27</td>
<td>Validity of Using Wearable Inertial Sensors for Assessing the Dynamics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Of Standing Balance</td>
</tr>
<tr>
<td>NOAMANI, Alireza</td>
<td>SOI 18-28</td>
<td>Long-Term Gait Variability of Individuals with Spinal Cord Injury As</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measured With Wearable Inertial Sensors</td>
</tr>
<tr>
<td>MACKLIN, Marissa</td>
<td>SOI 18-29</td>
<td>Glenrose Rehabilitation Research, Innovation and Technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Internship Opportunities</td>
</tr>
<tr>
<td>BAHARI, Hossein</td>
<td>SOI 18-30</td>
<td>Predicted Threshold Against Backward and Forward Loss of Balance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>During Perturbed Walking</td>
</tr>
<tr>
<td>ROSZKO, David</td>
<td>SOI 18-31</td>
<td>Electrode Design Parameters for Safe Stimulation of the Human Spinal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cord</td>
</tr>
<tr>
<td>LIURAOERJIJIN, Yilina</td>
<td>SOI 18-32</td>
<td>The Impact of a Bariatric Simulation Suit on Functional Mobility in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adults Without Obesity</td>
</tr>
<tr>
<td>KEEN, Christopher</td>
<td>SOI 18-33</td>
<td>Applying Maglev Technology to Knee and Hip Implants to Limit Contact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wear</td>
</tr>
<tr>
<td>KRYSKA, Kathryn</td>
<td>SOI 18-34</td>
<td>Examination of Mathematics and Executive Function Among Children</td>
</tr>
<tr>
<td></td>
<td></td>
<td>with Perinatal Stroke</td>
</tr>
<tr>
<td>TORABI, Ali</td>
<td>SOI 18-35</td>
<td>Application of a Redundant Haptic Interface in Robotic Rehabilitation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for Enhanced User Safety</td>
</tr>
<tr>
<td>FONG, Jason</td>
<td>SOI 18-36</td>
<td>Kinesthetic Teaching of a Therapist’s Behaviour to a Rehabilitation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Robot</td>
</tr>
<tr>
<td>FORERO, Dr. Juan</td>
<td>SOI 18-37</td>
<td>Exploring the Utility of the CAREN to Quantitatively Assess Balance</td>
</tr>
<tr>
<td>JOHNSON, John</td>
<td>SOI 18-38</td>
<td>Paving the Path for Novel Applications of Accessible Technology to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduce Overexertion in Manual Wheelchair Users</td>
</tr>
<tr>
<td>AHMADIAN, Niloufar</td>
<td>SOI 18-39</td>
<td>Detecting Temporal Events During Locomotion Using Body-Worn Inertial</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensors</td>
</tr>
<tr>
<td>MAEDA, Dr. Nathaniel</td>
<td>SOI 18-40</td>
<td>Virtual Reality Dental Local Anesthesia Simulator – A Stepping Stone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>in Dentistry Curriculum</td>
</tr>
</tbody>
</table>

#HealthToHome
<table>
<thead>
<tr>
<th>Primary Author</th>
<th>Poster #</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELIASOVA, Lucie</td>
<td>SOI 18-41</td>
<td>Virtual Reality (VR) Objective Structured Clinical Examinations (OSCE) Exam Simulator – A Practice Tool Made to Ease Pre-Exam Anxiety</td>
</tr>
<tr>
<td>WILLIAMS, Heather</td>
<td>SOI 18-42</td>
<td>Assessing the Inter-Rater Reliability of Two Functional Upper Limb Tasks</td>
</tr>
<tr>
<td>EAD, Maha</td>
<td>SOI 18-43</td>
<td>Investigation of the Reassembly of Pelvic Fracture Pieces Using CAD Software</td>
</tr>
<tr>
<td>AUSTIN, James</td>
<td>SOI 18-44</td>
<td>Improving Performance of Pattern Recognition-Based Myoelectric Control Using a Desktop Robotic Arm Training Tool</td>
</tr>
<tr>
<td>JOLY, Vanessa</td>
<td>SOI 18-45</td>
<td>Impact of a Self-Regulation Intervention on the Health Habits of Adolescents with FASD</td>
</tr>
<tr>
<td>MCNEIL-INYANI, Keri</td>
<td>SOI 18-46</td>
<td>Development and Verification of a Low-Cost Prosthetic Knee Motion Sensor</td>
</tr>
<tr>
<td>MARTIN, Laura</td>
<td>SOI 18-47</td>
<td>Health to Home: Using Skype for Business for Clinical Visits</td>
</tr>
<tr>
<td>DUROCHER, Melanie</td>
<td>SOI 18-48</td>
<td>Implementing Research Protocol for a National Site Exoskeleton Stroke Study (ExStRA)</td>
</tr>
<tr>
<td>WELLS, Eric</td>
<td>SOI 18-49</td>
<td>Myoelectric Training: Improving Prosthesis Performance Using a Robotic Platform</td>
</tr>
<tr>
<td>HALLWORTH, Ben</td>
<td>SOI 18-50</td>
<td>Modular Adaptable Trans-Humeral Prosthetic Socket for Evaluating Myoelectric Control</td>
</tr>
<tr>
<td>CASTELLANOS CRUZ, Javier L.</td>
<td>SOI 18-51</td>
<td>Preliminary Testing of a Telerobotic Haptic System and Analysis of Visual Attention During a Playful Activity</td>
</tr>
<tr>
<td>GOMEZ, Maria</td>
<td>SOI 18-52</td>
<td>Testing a Low Cost Mobile Robot to Support Play in Children with Physical Disabilities</td>
</tr>
<tr>
<td>DOBSON, Melissa</td>
<td>SOI 18-53</td>
<td>Working Collaboratively, Students, Instructors and Practitioners Help Meet Rehabilitation Needs</td>
</tr>
</tbody>
</table>

Full poster abstracts and posters can be viewed at: [https://www.albertahealthservices.ca/grh/Page14576.aspx](https://www.albertahealthservices.ca/grh/Page14576.aspx)
POSTER ABSTRACTS

On behalf of the Spotlight on Innovation organizing committee, we would like to thank everyone who submitted poster abstracts to this event. Without your support, this poster symposium would not have been possible!
SOI 18-01 (Clinical Innovation)

TRANSITIONS IN CARE FROM ACUTE CARE TO HOME

Dr. Lesley Charles, MbChB, CCFP(COE), Program Director, Division of Care of the Elderly, Department of Family Medicine, Faculty of Medicine & Dentistry, University of Alberta; GRH Research Affiliate
Lisa Jensen, RD, MBA, Integrated Access, Covenant Health
Claire Johnson, RN, BScN, Integrated Access, Covenant Health

Background: Much research has been done on how to smooth the transition home from hospital by identifying patients at high risk for readmission and coordinating discharge.

Objective: To facilitate smoother discharge of high risk patients at the Grey Nuns Community Hospital.

Method: Design: Quality improvement project. Setting: Grey Nuns Community Hospital, Edmonton. Participants: Patients admitted to medicine units. Intervention: Phase 1 utilized expert consensus to design a risk assessment tool, a telephone call script, and a comprehensive evaluation framework. Phase 2 included risk assessment of the patients and follow-up telephone calls 48 hours after the patient’s discharge. Through these phone calls, the Research Coordinator provided support in medication management, equipment access, homecare referrals, and physician appointments.

Result: 27% of patients discharged home (n=1621) were classified as high-risk from LACE scores. 79% of patients/caregivers were contacted within 3 days of discharge of which 99% found the call helpful. 93% of patients had a good understanding of their discharge instructions. 83% had picked up their prescriptions and 51% their equipment. 78% of patients had an appointment booked with their PCP. Among patients with high LACE scores, those who received the intervention, as compared to those who had not, had lower lengths of stay (12.7 days vs. 16.6 days), lower 7-day ED revisits (10.6% vs. 10.8%), lower 30-day ED revisits (30.5% vs. 33.3%), higher 7-day inpatient readmissions (7.6% vs. 5.2%), and higher 30-day inpatient readmissions (22.7% vs. 20.8%).

Conclusion: Support across the continuum is required for seamless transition planning.

SOI 18-02 (Clinical Innovation)

THE ‘3 QUESTIONS’ PROJECT IN PEDIATRIC RHEUMATOLOGY: A SELF-MANAGEMENT INITIATIVE FOR YOUTH WITH RHEUMATIC DISEASES

Michelle Roy, BScPT, Clinical Practice Lead, Pediatric Physical Therapy, Glenrose Rehabilitation Hospital
Janet Elsworth, MD, Pediatric Rheumatologist, Stollery Children’s Hospital
Cara Kaup, BScPT, Coordinator, Pediatric Rheumatology Clinic, Glenrose Rehabilitation Hospital

Background: Studies show that from early adolescence, youth with chronic diseases report wanting greater engagement with their health care providers. Currently, the focus on chronic disease self-management in pediatric rehabilitation at our centre is to involve the youth in decision-making about their health, but has not yet evolved into empowering the youth to take the lead in these conversations.

Objective: “3 Questions” is an exciting self-management support initiative at the Glenrose Rehabilitation Hospital. This initiative focuses on giving youth with chronic illnesses (in this case, rheumatic diseases) a formalized opportunity to address their specific concerns, not their parents’, during appointments. This initiative also aims to teach and reassure parents that they can continue to maintain their naturally protective role while supporting their child’s emerging ability to independently manage their health.

Method: Beginning at age 7, youth are offered a list of age-appropriate “frequently asked questions”, and asked to choose up to 3 questions they would like answered during each visit. The questions are answered by different members of the multidisciplinary team, depending on the question(s) selected. Two different versions of this tool were created, for
The questions in both versions differ based on age and reading level. The two versions were piloted on patients in clinic.

**Result and Conclusion:** Program staff track which questions are asked. If needed, modifications to the questions will occur during improvement cycles every 6 months. Our vision is to spread this initiative to other programs at our pediatric rehabilitation centre.

---

**SOI 18-03 (Applied Research)**

**IMPROVING PRESSURE REDISTRIBUTION KNOWLEDGE AND MANAGEMENT FOR INDIVIDUALS WITH SPINAL CORD INJURY USING THE XSENSOR MAT**

Gwen Dziwenko, BScOT, Rehabilitation Technology Leader, Glenrose Rehabilitation Hospital  
Ashley Lloyd, LPN, Spinal Cord Injury Unit, Glenrose Rehabilitation Hospital

**Background:** People with a spinal cord injury (SCI) are at a high risk of developing a pressure injury (PI). SCI patients in the rehabilitation setting receive individual and group education sessions focusing on the principles of pressure reduction. There is little information regarding the transition from hospital to home in terms of PI prevention.

**Objective:** The objective was to explore if using a pressure mapping technology (XSensor ForeSite Patient Turn System) to provide personalized education could improve patient confidence in PI prevention and impact their pressure management strategies following discharge from hospital.

**Method:** Personalized education sessions were conducted in the hospital and home setting. Semi-structured face-to-face and telephone interviews (n=12) with SCI patients were conducted after the hospital and home education sessions and one month after discharge. Narratives were analyzed using framework analysis to explore key themes and issues. Data were also collected on skin-bed interface pressure readings on hospital and home sleep surfaces. Pressure mapping systems may provide a means of providing personalized assessment and education sessions for people with SCI. Further research is needed to explore variations between sleep surfaces and the potential for higher pressure readings in clinical compared to home sleep surfaces.

**Result:** Participants reported increased confidence in their knowledge of pressure injury management, feeling increased control and confidence, and more responsibility for their pressure management care. Skin-bed interface pressure readings suggested that home sleep surface may provide similar or better pressure redistribution than the hospital sleep surface especially for sacral areas.

---

**SOI 18-04 (Applied Research)**

**DESIGN AND ANALYSIS OF AN EXPERIMENTAL SETUP TO SIMULATE LOADING OF A HEMIPELVIS**

Calvin Jee, BSc Mechanical Engineering Student Co-op, University of Alberta Health Services  
Dr. Kajsa Duke, BSc, MSc, PhD, Department of Mechanical Engineering, Faculty of Engineering, University of Alberta; Glenrose Research Affiliate

**Background:** As the impact of osteoarthritis is increasing, the relevance of pelvic fracture is more pressing. Depending on the severity of the injury, approaches include open reduction, closed reduction, or non-operative treatment. There are general classifications of pelvic injury that suggest when each approach should be used. However, every fracture differently affects the mechanical loading profile of the pelvis. Approaches that insufficiently address the altered mechanics may predispose the pelvis to osteoarthritis.

**Objective:** This study investigates the accuracy of experimental simulations of pelvic loading. Repeatable experimentation can increase the understanding of this complex mechanical problem and its appropriate approaches.

**Method:** A testing apparatus has been designed to apply the boundary and loading conditions of a pelvis during the heel strike of gait. For part accessibility and measurement repeatability, a composite hemipelvis model (Sawbones, #3045) is
the test specimen. A measurement technique called digital image correlation (DIC) is used. It involves the use of cameras to measure the strains across the entire specimen surface in view.

**Result:** Numerical simulations have been conducted, predicting comparable results to literature. The corroboration of the experiment results to the numerical simulations and existing literature will demonstrate the feasibility of this approach.

**Conclusion:** Through experimentation, a greater understanding of pelvic loading can be ascertained. Approaches to pelvic fracture can be assessed from a biomechanically emphasized perspective.

---

**SOI 18-05 (Applied Research)**

**DEVELOPMENT OF A STRATEGY ADOPTION MODEL FOR PERSONS WITH DEMENTIA AT RISK OF GETTING LOST**

Noelannah Neubauer, MSc, BHK, Faculty of Rehabilitation Medicine, University of Alberta  
Dr. Lili Liu, PhD, MSc, BSc, Professor & Chair, Department of Occupational Therapy, Faculty of Rehabilitation Medicine, University of Alberta; Glenrose Research Affiliate

**Background:** Three in five Canadians with dementia will wander and become lost raising concern as to how it can be managed effectively. In recent years hundreds of interventions, such as GPS devices have been developed to manage this issue, however no guideline exists to allow for the successful adoption of these strategies.

**Objective:** To develop a conceptual model that will help stakeholders choose strategies to manage challenging behaviours associated with dementia-related wandering.

**Method:** Semi-structured individual phone interviews containing 12 questions were conducted with family and formal caregivers, persons with mild dementia, clinicians, police, social workers, industry and staff from community organizations whom were concerned with dementia-related wandering. The purpose of the interviews was to determine what factors influenced strategy adoption of wander-management strategies and to identify if any differences existed. Responses from these interviews were used to develop a conceptual model for strategy adoption of wander-management strategies.

**Result:** Thirty-five participants from across four Canadian provinces were recruited. Responses from the interviews highlighted 3 contextual factors that influence the successful adoption of wander-management strategies: (1) Risk associated with wandering; (2) Culture; (3) Geography. Perceived risk was conveyed as the most influential factor of strategy adoption across all stakeholder groups. The relationships of these 3 factors were further reflected in the conceptual model.

**Conclusion:** This is the first study to describe what factors influence strategy adoption for dementia related wandering. This model will be used by caregivers, health and community service providers to identify strategies to mitigate the risks associated with wandering.

---

**SOI 18-06 (Clinical Innovation)**

**PARTNERING WITH PATIENTS, FAMILIES AND STAFF TO OPTIMIZE ACCESS TO INPATIENT REHABILITATION AT THE GLENROSE**

Mareika Purdon, Manager, Patient Transitions & Respiratory Therapy, Glenrose Rehabilitation Hospital  
Christine Foisy, Manager, Physical Therapy, Glenrose Rehabilitation Hospital

**Background:** Patients have experienced long waits for access to Glenrose specialty rehabilitation. This negatively impacts patients who then miss out on their optimal therapeutic window. Inefficient processes such as 20+ forms, 20+ fax numbers, inconsistent intake criteria, processes and discharge planning further compound the problem.

**Objective:** To create a cohesive process and procedure to improve patient access to the Glenrose in a way that is transparent and targets issues important to patients, families and staff.

**Method:** Baseline criteria for admission and discharge – specific to a rehab setting, have been developed; thus providing
an objective and transparent framework. The creation of regular meeting forums with patient advisors, managers and frontline staff to examine case studies, including support from the Glenrose Ethics Committee.

**Result:** The Glenrose now has one referral form and process for admission, and supporting materials co-designed with patients, families and staff. New “Rehab Navigator” roles supported by site-wide interdisciplinary partners, and linkages with Home Care have been instrumental in reducing the Glenrose waitlist from an average of 50 patients to 15. The number of patients waiting at the Glenrose for alternative level of care (ALC) has been reduced by 82%, freeing up more opportunities for new patients to benefit from the Glenrose Rehabilitation Programs, Research and Technology.

**Conclusion:** The Glenrose recognizes and celebrates the importance of initial and ongoing patient and staff partnerships to support each patient’s Rehabilitation Journey. These critical partnerships are embedded in the work we do every day at the Glenrose.

---

**SOI 18-07 (Applied Research)**

**THE EFFECT OF BODY MASS INDEX ON GAIT MECHANICS BEFORE AND AFTER TOTAL KNEE ARTHROPLASTY**

Christopher Wayne, BSc Kin, University of Alberta  
Dr. Lauren Beaufre, PT, PhD, Faculties of Rehabilitation Medicine & Medicine & Dentistry, University of Alberta; Glenrose Research Affiliate  
Dr. Albert Vette, PhD, PEng, Faculty of Engineering, University of Alberta; Glenrose Research Affiliate  
Dr. Allyson Jones, PT, PhD, Faculty of Rehabilitation Medicine & School of Public Health, University of Alberta  
Justin Lewicke, BSc Kin, MBA, Research & Technology Development, Glenrose Rehabilitation Hospital

**Background:** Osteoarthritis (OA) is prevalent with the knee commonly affected. Individuals with obesity are at an increased risk of developing knee OA, partly due to biomechanical mechanisms. Little research exists on the effect of obesity on knee biomechanics following total knee arthroplasty (TKA), particularly in patients living with Class II obesity.

**Objective:** To compare differences, relative to pre-TKA status, in knee joint mechanics during walking in individuals living with Class II obesity and normal/overweight individuals after TKA.

**Method:** Twenty participants between 50-70 years of age received 3D analysis within 1-month before and 3-months after TKA. Participants were grouped into i) normal/overweight (N/OW; n=10) and ii) Class II obesity (OBl n=10). Gait spatial temporal, angular kinematics and kinetics were compared between groups.

**Result:** From pre- to post-TKA, the OB group slightly decreased in velocity, cadence and stride length whereas the N/OW group slightly increased. The OB group, when compared to the N/OW group, had on average:

1. slightly greater knee flexion during loading response and less knee extension in terminal stance and all of swing;
2. slightly greater knee varus throughout stance and swing phase;
3. slightly less knee extension moment during terminal stance and
4. slightly less knee adduction moment in loading response, but slightly greater knee adduction moment in terminal stance.

**Conclusion:** Adults living with Class II obesity appear to have more variability in knee biomechanics and gait post-TKA than adults who are normal/overweight. Further research will determine if gait differences are amenable to rehabilitation.

---

**SOI 18-08 (Applied Research)**

**CARING FOR SENIORS WITH COMPLEX MEDICAL CONDITIONS BEYOND THE HOSPITAL WALLS USING MedROAD VIRTUAL CLINIC**

Pierre Boulanger, PhD, PEng, Faculty of Science, Department of Computing Science, University of Alberta  
William Mott, BSc, Faculty of Science, Department of Computing Science, University of Alberta
**Background:** In Alberta, seniors who often have chronic and medically complex conditions with increasing care needs, are beginning to outnumber younger generations (often their caregivers); one in five Albertans are expected to be over age 65 by the year 2031, hence the need for resident care tele-monitoring.

**Objective:** MedROAD Virtual Clinics (VC) developed at the University of Alberta can provide a medical-grade complete multimedia enabled end-to-end virtual monitoring solution. The primary goal of this study was to understand the feasibility of implementing MedROAD VC into resident care and highlight potential challenges.

**Method:** A first version of MedROAD VC was tested in collaboration with AHS with 30 seniors in an assisted living facility in Calgary (Whitehorn). We used wireless devices to monitor blood pressure, oxygen saturation, weight, and hydration. This 1-year pilot study included: a readiness assessment, procuring sensing devices, developing an alert software, training staff, and weekly monitoring for several months.

**Result:** Throughout the study, we experienced significant challenges with sensing technology limitations and the recruitment of senior participants. It took longer than anticipated to find suitable sensing devices, fix software issues, and recruit residents, thus limiting data collection. We also experienced firsthand the benefits of strong staff engagement.

**Conclusion:** Staff feedback helped us fine-tune sensing devices selection, develop training materials, and measurement process. Following their suggestions MedROAD VC was redesigned to be better optimized for homecare tele-monitoring and is now being redeployed for a larger pilot project in collaboration with Rockyview General Hospital’s Complex Care Hub team.

**SOI 18-09 (Applied Research)**

**A NOVEL BEHAVIORAL-PHYSIOLOGICAL APPROACH TO CHARACTERIZE EMOTION IN INFANTS AT RISK FOR AUTISM SPECTRUM DISORDER**

**Sara Raza, BSc, MSc,** Faculty of Medicine & Dentistry, Department of Pediatrics, University of Alberta  
**Lori-Ann Sacrey, BSc, MSc, PhD,** Faculty of Medicine & Dentistry, Department of Pediatrics, University of Alberta; Glenrose Research Affiliate  
**Vickie Armstrong, BSc, MSc, PhD,** IWK Health Centre, Dalhousie University, Halifax, NS  
**Lonnie Zwaigenbaum, MSc, MD, FRCP(C),** Faculty of Medicine & Dentistry, Department of Pediatrics, University of Alberta; Co-Director, Autism Research Centre, Glenrose Rehabilitation Hospital

**Background:** Autism Spectrum Disorder (ASD) has associated impairments in emotional regulation (ER). Prospective studies of high-risk (HR) infants (i.e., have an older sibling with ASD) have shown atypical ER during infancy. The early impairments in ER may derail the development of social-communicative abilities and affect the onset of ASD.

**Objective:** To determine if infants’ affect and/or heart-rate predicts ASD symptoms during an ER paradigm in a HR population using a novel behavior-physiological approach.

**Method:** HR infants were assessed at 12 months (n=35) on an ER paradigm comprised of activities designed to elicit positive (bubbles, toy play) or negative (toy removal, masks, grooming) emotions. Average affect and heart-rate were calculated for each activity. Early ASD signs were assessed using the Autism Observation Scale for Infants (AOSI). Data analysis included correlations between affect and heart-rate and between affect, heart-rate, and AOSI score.

**Result:** Correlations between heart-rate and affect were found for only toy play (r=0.34, p=0.05) and grooming (r=0.49, p=0.003). Affect was correlated with AOSI score for bubbles (r=-0.71, p<0.001), masks (r=-0.45, p<0.007), toy play (r=-0.35, p=0.04), and grooming (r=-0.57, p<0.001). No relationship was found between heart-rate and AOSI score.

**Conclusion:** Preliminary results suggest small-to-modest relationship between internal (heart-rate) and external (affect) signs of ER, where affect, rather than heart-rate, predicted ASD symptom expression in 12-month-old HR infants. Using this novel approach, we may be able to discern behavioral and physiological differences between infants who are diagnosed with...
SOI 18-10 (Applied Research)

**BRAIN BOOTCAMP: AN INTEGRATED BEHAVIOURAL HEALTH INTERVENTION FOR MILITARY MEMBERS WITH REDUCED EXECUTIVE COGNITIVE FUNCTIONING**

Chelsea Jones, MScOT, PhD Student, Heroes in Mind and Research Consortium (HiMARC), Faculty of Rehabilitation Medicine, University of Alberta
Suzette Bremault-Phillips, PhD, MA, BMR, BSc, Associate Professor/Directory of HiMARC, Faculty of Rehabilitation Medicine, University of Alberta; Glenrose Research Affiliate
Ashley Pike, PhD, Post-Doctorate Fellow, Faculty of Rehabilitation Medicine, University of Alberta

**Background:** Canadian Armed Forces (CAF) Service Members (SMs) experience higher rates of mild traumatic brain injuries (mTBIs) and psychosocial risk factors such as mental health diagnoses, sleep disturbances, alcohol consumption, and post-concussion symptoms than Canadian civilians. Associated challenges with executive cognitive functioning (ECF) can significantly impede their performance, engagement, and deployability. To address challenges with ECF, an Occupational Therapist providing rehabilitation services to CAF-SMs created and delivered Brain Bootcamp — an integrated behavioral health intervention for CAF-SMs who sustained mTBI or more serious traumatic brain injuries (TBI) and had reduced ECF. While anecdotal post-intervention feedback is favourable, Brain Bootcamp’s impact on ECF in individuals with mTBI/TBI and/or mental health diagnoses is yet to be determined.

**Objective:** This study is aimed to determine if Brain Bootcamp improves cognitive performance, reduces mTBI/TBI-related symptoms, and increases external aid utilization among CAF-SMs with reduced ECF.

**Method:** A quasi-experimental study was conducted of clinical outcomes collected from 65 participants who participated in Brain Bootcamp. Measures used to determine changes in client ECF prior to and following the intervention included the Montreal Cognitive Assessment (MoCA), Rivermead Post-Concussion Symptom Questionnaire (RPQ), and External Aids Utilization Survey (EAUS).

**Result:** Statistically significant changes pre/post-intervention were observed, including improved cognitive performance, reduced self-reported mTBI/TBI symptoms, and increased external aid utilization.

**Conclusion:** Brain Bootcamp appears to have a positive effect on ECF. Such improvements can enable CAF-SMs to be operationally ready for military service and have greater overall well-being. Brain Bootcamp appears to be a promising ECF-enhancing intervention.

SOI 18-11 (Applied Research)

**IMPLEMENTING QUALITY IMPROVEMENTS IN GERIATRIC LOWER EXTREMITY EDEMA MANAGEMENT IN OCCUPATIONAL THERAPY**

Yolan Parrott, MScOT, Clinical Practice Lead, Occupational Therapy, Glenrose Rehabilitation Hospital
Su-Li Dang, BScOT, LEAT Clinical Lead, Glenrose Rehabilitation Hospital

**Background:** Lower extremity (LE) edema affects approximately 30% of patients on inpatient geriatric units at the Glenrose Rehabilitation Hospital (GRH). LE edema often causes pain and discomfort, reduces mobility and may negatively impact self-esteem. Chronic LE edema increases the risk for wounds, reduces function, decreases quality of life and increases length of hospital stays.

**Objective:** The implementation of best-practices in LE edema assessment and treatment to ensure comprehensive management of LE edema on inpatient geriatric rehabilitation units at the GRH.
Method: Nineteen best practice statements were selected by an multi-disciplinary advisory committee. Standardized assessments and treatment protocols were developed based on these best practice statements. National Implementation Research Network (NIRN) Implementation Science guided implementation, which included completion of practice profiles, drivers analysis and development of formal training along with coaching/mentorship initiatives.

Result: Based on confidential staff surveys, there was increased confidence in the administration and interpretation of LE edema assessment tools and application and monitoring of treatment modalities. On-going mentorship has supported the integration of training into practice.

Conclusion: Increased staff confidence and adherence to new protocols supports evidence based comprehensive LE edema management and ultimately increases patient care. A sustainability plan has been developed to ensure staff retain high levels of confidence and adherence to protocols.

SOI 18-12 (Applied Research)

MOBILE HEALTH APP RATING INDEX: CONTENT VALIDATION STUDY

Peyman Azad-Khaneghah, MSc, Rehabilitation Science, OT (Reg), PhD Candidate, Faculty of Rehabilitation Medicine, Department of Occupational Therapy, University of Alberta
Mary Roduta Roberts, PhD, OT (Reg), Assistant Professor, Faculty of Rehabilitation Medicine, Department of Occupational Therapy, University of Alberta
Eleni Stroulia, PhD, Professor and iCORE Research Industrial Research Chair on “Service Systems Management”, Department of Computing Science, University of Alberta
Lili Liu, PhD, OT (Reg), Chair, Faculty of Rehabilitation Medicine, Department of Occupational Therapy, University of Alberta; Glenrose Research Affiliate

Background: Over 300,000 mobile health (m-Health) apps are available online through app stores. However, the majority of these apps are not classified as medical devices and hence are not subjected to legislation and guidelines. With no regulation, low quality apps may exist on the app markets. It is challenging for patients, clinicians, and other end users to identify good quality apps that meet their needs. We have generated an item pool to develop a rating index based on 10 quality criteria from technology acceptance models, mobile app evaluation frameworks, and app users’ opinion.

Objective: To evaluate the content validity of the generated item pool.

Method: An online survey was developed based on generated items and relevant quality criteria. The link of the survey was e-mailed to a panel of m-health app end users. Panel members rated the relevance of each item to the given quality criterion on a 3-point scale: 1- Not relevant, 2- Relevant and 3- Unable to assess relevance.

Result: All 10 quality criteria were rated as relevant. From 74 total items, 47 were rated as relevant by at least 80% of the participants (CVI ≥ 0.8).

Conclusion: 10 quality criteria capture items that describe the quality of health apps: privacy, security, trustworthiness, ease of use, user engagement, aesthetics, customizability, functionality, affordability and usefulness. Participants reduced the item pool from 74 to 47 items that were considered “relevant” to keep. These results will inform the creation of an index for rating the quality of health apps.

SOI 18-13 (Applied Research)

BREAKS IN SEDENTARY TIME IN CARDIAC REHABILITATION PARTICIPANTS

Ailar Ramadi, PhD, Faculty of Rehabilitation Medicine, University of Alberta
Background: There is a deleterious association between sedentary behavior and mortality risk factors. Interrupting sedentary time with activity breaks has shown to be beneficial in improving these risk factors.

Objective: To examine the changes in sedentary behavior, breaks in sedentary time, and physical activity (PA) in cardiac rehabilitation (CR) participants.

Method: Fifty-eight participants (61±9 years, 79.3% male) attended 8-12 weeks of CR. Sedentary behavior and PA were assessed using accelerometer at baseline, 12 weeks, and 6 months after CR entry. Time spent sedentary (≤1.5 METs), in light PA (1.6-2.9 METs) and MVPA (≥3 METs) were calculated as percentage of waking time. Any interruption in sedentary time was considered a break. Repeated measures analysis of variance, Friedman’s analysis of variance, and Pearson correlations were used for analyses.

Result: At 12 weeks, participants spent more time in MVPA (p<0.05) and tended to be less sedentary (p=0.106). However, changes were lost by the 6 month follow-up (baseline vs. 6 months: MVPA, p=0.813; Sedentary, p=1.000). Although the majority of participants (~70%) met the recommended MVPA (30 min/day), our participants demonstrated elevated sedentary time. Further, we found strong correlations between number of breaks/day and light PA (baseline: r=0.75; 12 weeks: r=0.70; 6 months: r=0.73; p=0.000); neither of which showed any changes over the course of the study (break#/day, p=0.799; Light PA, p=0.280).

Conclusion: By promoting MVPA as their main target, current CR programs may have little impact on changing the elevated sedentary behavior of their participants. Further, interrupting sedentary time with light PA could be an achievable strategy to reduce sedentary behavior in CR participants.

SOI 18-14 (Clinical Innovation)

FES CYCLE IMPLEMENTATION

Sarah Pletsch, MPT, Physiotherapy, Glenrose Rehabilitation Hospital
Alyson Kwok, BScPT, Healthcare Improvement Specialist, Glenrose Rehabilitation Hospital
Gwen Dziwenko, Rehabilitation Technology Leader, Occupational Therapy, Glenrose Rehabilitation Hospital
Deb Bontus, Recreation Therapy, Glenrose Rehabilitation Hospital

Background: Functional Electrical Stimulation (FES) cycling has been shown to help improve overall fitness in persons with spinal cord injury (SCI). Despite this evidence and the growing number of facilities offering FES cycle in the community, patients often find it difficult to access this mode of fitness after leaving the Glenrose Rehabilitation Hospital (GRH).

Objective: To use implementation science systematically improve best practices around FES cycle at the GRH, building on work already started at the Foothills Medical Centre (FMC) and the Steadward Centre.

Method: A working group, consisting Glenrose Hospital, as well as representatives from the FMC and the Steadward Centre, systematically applied frameworks created by the National Implementation Research Network (NIRN) to move research into practice.

Result: Implementation began the summer of 2018, with therapists at the GRH screening and assessing SCI inpatients. Appropriate and interested patients were then assessed on the FES cycle and transitioned to the community after discharge. Although in early stages, screening and use of the FES cycle has already increased.

Conclusion: A systematic approach to implementation can facilitate consistently applied evidence-informed protocols that will ultimately benefit patients.
SOI 18-15 (Clinical Innovation)

**PATIENT PATHWAYS: CREATING A PATIENT AND FAMILY-CENTRED CULTURE AROUND QUALITY IMPROVEMENT**

Alyson Kwok, BScPT, Healthcare Improvement Specialist, Glenrose Rehabilitation Hospital  
Mareika Purdon, BScN, Manager, Transition Services and Respiratory Therapy, Glenrose Rehabilitation Hospital  
Dave Fraser, Patient Advisor, Glenrose Rehabilitation Hospital  
Manon Fraser, Family Advisor, Glenrose Rehabilitation Hospital

**Background:** The Glenrose Rehabilitation Hospital (GRH) places high value on patient-centred care. However, opportunities for patients and families to guide quality improvement have been limited. Patient Pathways provided an opportunity to apply the core concepts of patient- and family-centred care to a quality improvement project.

**Objective:** To engage patient and family advisors at the earliest stages of a quality improvement project, enabling and empowering them to guide the methods and goal of the project.

**Method:** A patient and family advisor were each recruited to be a part of the steering committee for Patient Pathways. The advisors helped develop guiding documents, as well as data collection methods such as focus groups. While proceeding with the project, the steering committee adapted and applied a nine-step process to enable the patient and family advisors.

**Result:** The result of the project was a process for patient and family advisors that can be applied to future projects at the GRH. The Patient Pathways project also had the benefit of balanced and robust qualitative data, thanks to the input from the patient and family advisors.

**Conclusion:** By engaging patients and families throughout the process, Patient Pathways has helped to shift culture at the GRH from systems-centred thinking to patient-centred care.

SOI 18-16 (APPLIED RESEARCH)

**ARM AND LEG CYCLING TO IMPROVE WALKING AFTER SPINAL CORD INJURY**

Behdad Parhizi, PhD Student, University of Alberta  
Vivian Mushahwar, Professor, Faculty of Medicine & Dentistry, Department of Medicine, Division of Physical Medicine & Rehabilitation, University of Alberta; GRH Research Affiliate

**Background:** Spinal Cord Injury (SCI) results in disruptions to motor, sensory and autonomic functions. Restoration of walking is a priority for people with incomplete SCI (iSCI). Current rehabilitation interventions for restoring walking promote locomotor activation of the legs, but neglect to engage the arms which play an important role in walking.

**Objective:** The goal of this project was to assess the potential benefits of actively engaging the arms rhythmically with the legs in a rehabilitation paradigm for improving walking after neurotrauma.

**Method:** We used recumbent arm and leg (A&L) cycling training as a potential therapy for improving walking. Study volunteers with chronic iSCI were enrolled in one of two electrical stimulation-cycling training paradigms: (i) legs-only cycling, or (ii) simultaneous A&L cycling. Training sessions consisted of 1 hour/day, 5 times/week for 12 weeks. Walking speed and distance, biomechanics of walking of walking and changes in descending and spinal activity were assessed.

**Result:** Both groups had significant improvements in walking speed and distance after training; however, the improvements were significantly larger in the A&L cycling group compared to the legs-only cycling group. Spatiotemporal parameters of walking for both dominant and weaker legs significantly improved in the A&L group. Moreover, intra- and inter-leg
regulation of muscle activity were improved in the A&L group. The results suggest that active engagement of the arms underlies twice the improvements in walking metrics relative to leg training only.

**Conclusion:** Our study revealed, for the first time, that simultaneous A&L cycling training outperforms other studies of locomotor training such as over-ground walking with stimulation. The cervico-lumbar networks are critical for improvement of walking.

**SOI 18-17 (CLINICAL INNOVATION)**

**A PILOT STUDY TO VALIDATE A NOVEL METHOD TO PREDICT PROGRESSIVE CASES ON AIS**

**Mahdieh Khodaei**, BSc, PhD Student, University of Alberta  
**Edmond Lou**, PhD, Faculty of Engineering, Faculty of Medicine & Dentistry, University of Alberta; GRH Research Affiliate  
**Rui Zheng**, PhD, Faculty of Engineering, University of Alberta; GRH Research Affiliate  
**Lawrence Le**, PhD, Faculty of Medicine & Dentistry, Department of Radiology & Diagnostic Imaging, University of Alberta; GRH Research Affiliate

**Background:** Adolescent Idiopathic Scoliosis (AIS) is a 3D spinal deformity. All AIS patients need to take radiographs for diagnosis and monitoring even though non-progressive cases. Expose patients to ionizing radiation increase cancer risk. We developed a new method to measure bone quality in the spine area to predict curve progression and eventually reduce number of radiographs on non-progressive cases. A pilot study, 86 participants, showed a specific ultrasound (US) parameter called frequency amplitude index (FAI) which was lower than a threshold value 101.2 dB and the major curvature ≥25°, their progression rate was 89%.

**Objective:** This study was to validate our preliminary hypothesis that the FAI and Cobb angle values were highly correlated to curve progression on children with AIS.

**Method:** Five-hundred female children with AIS were aimed to scan and recruit for this validation study. Currently, only 29 participants were recruited and met our inclusion criteria: need 2 consecutive clinical visits with US scan, were analyzed. All subjects were scanned in standing position by using US and had their radiographs taken on the same day. The frequency amplitude index (FAI) which reports the bone quality was extracted from the US data. The difference of the Cobb angle ≥6° between the two consecutive visits is considered curve progression.

**Result:** The age of all subjects was 14.7±1.5 years old. Their major curve angles at the 1st and 2nd visits were 25.1°±8.1°, and 26.0°±10.0°, respectively. The Mean±SD of the FAI for the first visit was 100.7±1.1dB. Among the 29 subjects, 9 participants met our hypothesis, but only 3 subjects showed progression. To compare with our pilot study, the rate of progressive case was lower. However, some subjects who were under treatment had not been removed from the analysis.

**Conclusion:** This study showed the FAI and the severity of curvature showed 33% accuracy to predict the curve progression. More subjects are required prior to make a conclusive statement.

**SOI 18-18 (APPLIED RESEARCH)**

**IMPROVING USER PERFORMANCE IN REHABILITATION EXERCISES THROUGH VISUAL-MOTOR CO-LOCATION VIA A 3D AUGMENTED REALITY DISPLAY**

**Renz Ocampo**, Master’s Student, University of Alberta

**Background:** Serious games are recently becoming a common sight in rehabilitation settings to provide motivation for patients undergoing therapy to regain upper limb function after disability. These are often presented using a 2D monitor to
the patient who uses a robotic device (haptic user interface) as the game controller.

**Objective:** To lighten the mental load on the patient and improve task success rates by bridging the spatial disparity between the screen and arm coordinate frames using AR.

**Method:** We developed a 3D spatial Augmented Reality (AR) display to colocate visual and haptic feedback to the user in three rehabilitative games. The same set of games are also displayed using 2D non-immersive Virtual Reality (VR) and are compared with their AR counterpart in terms of user task performance to evaluate the benefit of the 3D AR system. To simulate a rehabilitation scenario, able-bodied participants are put under cognitive load (CL) for simulating disability-induced cognitive deficiencies when performing the tasks. A within-subjects analysis of 10 participants was carried out for the rehabilitative games.

**Result:** The results show that AR leads to the best user performance with or without cognitive loading. This result is most evident in dynamic exercises where the participants are required to have quick reaction times and fast movement.

**Conclusion:** Visual-Motor colocation, done through AR, showed a significant difference over non-immersive VR. One of the tasks showed that performance in AR between non-CL and CL cases were similar, thereby showing how AR can alleviate the negative effects of CL.

---

SOI 18-19 (APPLIED RESEARCH)

**INITIAL INVESTIGATION OF A SELF-ADJUSTING PROSTHETIC WRIST CONTROL SYSTEM**

**Dylan Brenneis, BSc, Mech Eng, EIT, MSc Student, Faculty of Mechanical Engineering, University of Alberta**

**Background:** Commercially available myoelectric wrist prostheses offer limited degrees of freedom, and limited control thereof. This results in compensatory movements of the shoulder, elbow, and back when performing motions such as placing an object on a shelf. We have proposed that a wrist control system that keeps the terminal device orientation constant relative to the ground may alleviate some compensatory movements.

**Objective:** To determine the most intuitive way of interfacing with a self-adjusting wrist control system. This preliminary objective will help to ensure that a future study investigating the effects of the self-adjusting wrist on compensatory movements is not confounded by a confusing control interface.

**Method:** Six able-bodied participants operated a desktop-mounted robotic arm with one degree of freedom at the wrist (flexion/extension), using a joystick-and-button controller. Each participant performed ten trails of a specific task with each of the six possible control schemes. The task was designed to include levelling of the hand (so as to not spill a cup of beads), and re-orientation of the wrist (to pour beads into a sink). Quantitative data concerning performance and quantitative data concerning participants’ perceptions of the control modes were collected.

**Result:** The data suggests that using a momentary button switch (analogous to co-contraction of EMG control) to change between self-adjusting and direct control of the wrist may be appropriate for future studies.

**Conclusion:** This study shows that a self-adjusting wrist control system may be more performant than conventional control schemes, and provides an intuitive control interface for future studies which are currently underway.

---

SOI 18-20 (APPLIED RESEARCH)

**COMPUTER GAMES FOR OLDER ADULTS – ENGAGEMENT AS AN OUTCOME**

**Antonio Miguel Cruz, PhD, Assistant Lecturer/Program Evaluator, Faculty of Mechanical Engineering, University of Alberta; GRH Research Affiliate**

**Lili Liu, PhD, OTR, Chair and Professor, Faculty of Rehabilitation Medicine, Department of Occupational Therapy, University of Alberta**

Antonio Miguel Cruz, PhD, Assistant Lecturer/Program Evaluator, Faculty of Mechanical Engineering, University of Alberta; GRH Research Affiliate

Lili Liu, PhD, OTR, Chair and Professor, Faculty of Rehabilitation Medicine, Department of Occupational Therapy, University of Alberta
Background: Engagement while playing computer games can improve cognitive skills in older adults, especially those living with dementia. Methods for measuring engagement during computer game-play include self-report questionnaires and observation (e.g., by caregivers). No measures have been developed specifically for use by older adults with dementia. The use of existing engagement measures with older adults living with dementia would require adaptations to the measures.

Objective: The objective of this project was to create suitable measures for engagement among older adults with dementia during computer game-play.

Method: Two measures were developed based on a literature review: a self-report measure of engagement, and a structured observation of engagement (including challenge, concentration, control, enjoyment and, motivation). These were tested with four older adults, three healthy and one with dementia. We determined interrater reliability and internal consistency of the measures.

Result: All participants were able to respond to the self-report measure of engagement. However, the participant with dementia needed to be reminded how to complete the measure during its administration. The engagement self-report scale showed good internal consistency (Cronbach Alpha = 0.88). The structured observation engagement scale showed low internal consistency (Cronbach Alpha = 0.45) and a moderate Interrater reliability (Kappa =0.53). Correlation between the two measures was weak (r = -0.07, p=0.58).

Conclusion: Older adults were able to respond the self-report measure. The observational measure seemed suitable to be used with these population. We identified features of the measures that need to be adapted in order to ease their use.

SOI 18-21 (APPLIED RESEARCH)
for 30 minutes twice a week for three weeks. An interview guide was administered to elicit participants’ perspectives about the usability of these games. Interviews were transcribed and analyzed through interpretive description.

**Result:** Three major themes emerged in the study regarding the usability of the three games: game motivators, environment, and technology. Motivators: participants (mean age 77.75 years, SD=1.80) found the games fun and challenging despite playing them 6 times each. The game that was least familiar and more challenging to learn was of greatest interest, and all participants (including the participant with dementia) reported a sense of gratification in gaining mastery over the game. Environment: environmental conditions such as lighting, brightness of the screen or positioning of the tablet improved gameplay. Technology: some adaptations were identified to improve the game experience.

**Conclusion:** Usability of serious games is critical. Balance between challenge and skill, environmental conditions, accessibility of game components, accessibility of the instructions, and removing technical challenges were important for enhancing usability.

---

**SOI 18-22 (CLINICAL INNOVATION)**

**EVALUATION OF MANUFACTURING PROCESS FOR BUILDING 3D PRINTED SPINAL BRACE FOR ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS)**

Kenwick Ng, BSc, Graduate Research Assistant, University of Alberta  
Edmond Lou, PhD, Associate Professor, Faculty of Engineering and Faculty of Medicine & Dentistry, University of Alberta; GRH Research Affiliate  
Kajsa Duke, PhD, Associate Professor, Faculty of Engineering, University of Alberta; GRH Research Affiliate

**Background:** AIS is a three-dimensional spinal deformity. Bracing is a proven non-surgical treatment. Traditional brace is bulky, lack ventilation and requires cumbersome manufacturing process. This motivates current study to develop a new manufacturing process to produce a lightweight and breathable brace with advanced 3D printing and scanning technologies.

**Objective:** To evaluate the accuracy in using 3D scanning to construct a 3D printed brace.

**Method:** A custom brace design frame was developed to apply corrective pressure on torso. A 3D Spectra Scanner was used to capture the body contour in frame for 3D printing. Experiments were performed on a body model. Thirty reflective markers were placed on 15 levels. Two scans without and 1 with pad cover were conducted to evaluate the scan accuracy and body contour regeneration accuracy, respectively. Parameters: (a) width and (b) thickness of the model were measured for evaluating scan reliability. The 3D body mold image was also reconstructed at 4 pad covered regions and its contour regeneration accuracies were evaluated.

**Result:** The mean absolute difference (MAD) and deviation range for the parameters a), b) and the 4 contour regeneration accuracies were less than 3.4±3.2mm and 0.6 mm-10.3 mm, respectively. This demonstrated adequate scan and reconstruction accuracy within clinician accepted range (about 1 cm).

**Conclusion:** This study demonstrated that the new streamline process using a 3D scanner can generate accurate body image within about 1 cm deviation.

---

**SOI 18-23 (APPLIED RESEARCH)**

**ASSOCIATION OF IN-BRACE COBB ANGLE WITH AXIAL VERTEBRAL ROTATION AND TORSION ON CHILDREN WITH AIS**

Kenwick Ng, BSc, Graduate Research Assistant, University of Alberta  
Edmond Lou, PhD, Associate Professor, Faculty of Engineering and Faculty of Medicine & Dentistry, University of Alberta; GRH
Background: Bracing is a proven non-surgical treatment for adolescent idiopathic scoliosis (AIS). Currently, in-brace Cobb angle (CA) is used to predict treatment outcomes. However, the association of the in-brace CA correction with in-brace apical axial vertebral rotation (AVR) or torsion corrections is unknown. Understanding the associations may help orthotists to design a better brace.

Objective: To investigate if in-brace CA correction was associated with in-brace apical AVR or torsion correction at the first follow-up clinic.

Method: 26 children with AIS (21 F, 5 M) were retrospectively extracted from our clinical records with ethics approval. The inclusion criteria were a) 10-16 years, b) Risser < 3, c) maximum CA 20°-40°, and d) prescription of full time TLSO with no prior bracing. Pre-brace and in-brace CA, AVR, and torsion of the treated curve were measured and used to calculate the correction in percentage. Pearson correlation was used to determine the association between in-brace corrections of (a) CA vs. AVR, (b) CA vs. torsion, and (c) AVR vs. torsion.

Result: The average in-brace CA, AVR and torsion correction were 46±23%, 14±91% and 7±87%, respectively. The Pearson correlation for (a), (b) and (c) analyses were R² = 0.05, 0.03 and 0.96, respectively. No correlation was found between in-brace correction of CA with AVR or torsion. However, AVR and torsion correction had a strong correlation.

Conclusion: There was no strong association between in-brace CA correction with in-brace AVR or torsion correction. Orthotists should still focus on in-brace CA correction while designing TLSO.

SOI 18-24 (APPLIED RESEARCH & CLINICAL INNOVATION)

PILOT CASE REPORT OF 3D PRINTED BRACES FOR THE TREATMENT OF ADOLESCENT IDIOPATHIC SCOLIOSIS

Edmond Lou, PhD, Associate Professor, Faculty of Engineering and Faculty of Medicine & Dentistry, University of Alberta; GRH Research Affiliate
Kenwick Ng, BSc, Graduate Research Assistant, University of Alberta
Kajsa Duke, PhD, Associate Professor, Faculty of Engineering, University of Alberta; GRH Research Affiliate
Andreas Donauer, CPO, Orthotist, Glenrose Rehabilitation Hospital
Melissa Tilburn, CO, Orthotist, Glenrose Rehabilitation Hospital
Doug Hill, BSc, MBA, PEng, Senior Consultant, Research & Technology Development, Glenrose Rehabilitation Hospital

Background: Adolescent Idiopathic Scoliosis (AIS) is a three-dimensional deformity of the spine. Bracing is the only proven non-invasive treatment. Traditional spinal braces are made of polypropylene. Researchers are promoting 3D printed braces. Our method is unique with the 3D printed brace design validated during the casting process.

Objective: To report the preliminary results of two 3D printed spinal braces for the treatment of AIS.

Method: Two females with AIS prescribed a full time brace were recruited. These participants (S1 and S2), both had right thoracic and left lumbar curves (S1: 29°, 30°; S2: 27°, 28°). A custom standing frame which provides the ability to impose 3D forces to simulate the impact of the brace was built to assist pad placement. The brace pads’ pressures and locations were confirmed using real-time US images. A handheld scanner was used to acquire the body shape while the optimal simulated in-brace configuration was obtained. Nylon12 material was used to print the braces.

Result: The in-brace spinal curvatures (S1: 13°, 13°; S2: 17°, 10°) achieved the target of >50% curve correction. The 3D printed brace thickness, weight and labor manufacturing time were 2 mm thinner, 30% lighter and 3 hours faster than the traditional brace, respectively.
Conclusion: The 3D printed brace has great potential to soon replace the traditional polypropylene brace.

SOI 18-25 (APPLIED RESEARCH)

AN INSTRUMENTED FUNCTIONAL TEST FOR OUTCOME EVALUATION OF SHOULDER MOTION FOLLOWING BRACHIAL PLEXUS INJURY

Milad Nazarahari, MSc, Research Assistant, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta/Glenrose Rehabilitation Hospital
Ming Chan, MD, FRCP(C), Professor, Faculty of Medicine & Dentistry, Department of Medicine, Division of Physical Medicine & Rehabilitation, University of Alberta; GRH Research Affiliate
Albert Vette, PhD, Assistant Professor, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; GRH Research Affiliate
Hossein Rouhani, PhD, Assistant Professor, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; GRH Research Affiliate

Background: Brachial plexus injury can have drastic consequences on shoulder function and the ability to return to work of affected individuals. Functional deficits of the shoulder muscles are among the most difficult to evaluate as the shoulder joints are capable of multi-directional movements. Therefore, nerve dysfunction around the shoulder can be easily disguised by “trick movements” of the trunk.

Objective: The objective of this study was to develop and test a novel wearable technology for objective outcome evaluation of brachial plexus injury and to quantify subtle trick movements of the trunk, which may be used to compensate for shoulder dysfunction.

Method: Ten individuals with unilateral brachial plexus injury and ten able-bodied controls participated in this study. Three inertial measurement units were placed on the upper arms and sternum. Participants performed the Simple Shoulder Test (SST) that includes seven functional shoulder movements. Finally, a symmetry index was calculated based on the relative difference of the range of angular velocity and acceleration between the affected and unaffected shoulders.

Result: Significantly higher symmetry was observed in controls during SST compared to affected individuals (p<0.05). Additionally, comparing the range of angular velocity and acceleration of the trunk during the movement of both shoulders of affected individuals revealed significantly larger trunk motion when performing the SST with the affected shoulder (p<0.05).

Conclusion: The proposed novel wearable technology was not only able to quantify shoulder dysfunction in patients with brachial plexus injury, but also able to quantify subtle trick movements of the trunk.

SOI 18-26 (APPLIED RESEARCH)

COMMUNITY-BASED EXERCISE MAINTENANCE PROGRAM FOR PEOPLE WITH CHRONIC LUNG CONDITIONS – A MODEL FOR COMMUNITY TRANSITION

Jennifer Leo, PhD, Director, The Steadward Centre for Personal and Physical Achievement, University of Alberta
Tara Joy Knibbe, MA, Manager Research & Program Evaluation, Abilities Centre, Ontario
Jessica Cohan, BSc, CSEP-CPT, Supervisor, Post-Rehabilitation Programs, Abilities Centre, Ontario
Jody Hamilton, MSW, Manager, Patient Engagement & Community Programs, The Lung Association, Ontario

Background: Chronic respiratory diseases such as COPD involve progressively worsening symptoms which can negatively effect exercise capacity and quality of life. Evidence suggests community-based programs can promote long-term exercise adherence in individuals with chronic lung conditions (CLC). The Lung Association – Ontario in partnership with community-
based fitness centres (e.g., Abilities Centre), developed, implemented and evaluated an evidence-based model for exercise maintenance among individuals with CLC.

**Objective:** Purpose of this pilot study was to examine the impact of this program on quality of life and well-being of participants with CLC.

**Method:** Adults with CLC attended supervised exercise sessions twice weekly for six weeks. Pre- and post-testing measured fitness, perceived COPD symptoms, participant satisfaction, and general well-being. Assessment tools included the COPD Assessment Test (CAT), the 6-Minute Walk Test (6-MWT), and a participant satisfaction survey.

**Result:** Twelve participants (50% female) between the ages of 36 to 80+ participated at the Abilities Centre, an inclusive community hub in southcentral Ontario. Results indicate overall satisfaction with the program. 100% of respondents reported that their health was maintained. All participants indicated they will continue attending future exercise sessions and will be physically active. The 6-MWT and CAT did not produce significant results, despite remarkable maintenance success and individual improvements.

**Conclusion:** In this population, health maintenance is an incredibly important indicator of program success. Participants demonstrated marked improvements in their COPD management, thereby improving quality of life. The program is low cost, sustainable over time, easily transferable from community to community, and a “win win” for participants post-rehabilitation and community fitness centres.

---

**SOI 18-27 (APPLIED RESEARCH)**

**VALIDITY OF USING WEARABLE INERTIAL SENSORS FOR ASSESSING THE DYNAMICS OF STANDING BALANCE**

**Alireza Noamani, MSc, PhD Student, University of Alberta**

**Albert Vette, PhD, Assistant Professor, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; GRH Research Affiliate**

**Justin Lewicke, MBA, BSc Kinesiology, Motion Analyst, Glenrose Rehabilitation Hospital**

**Hossein Rouhani, PhD, Assistant Professor, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; GRH Research Affiliate**

**Background:** Neuromuscular conditions can cause reduced balance control and, thus, an increased fall risk. Evaluating balance during standing has been used to assess the fall risk for affected individuals and the effectiveness of preventive or rehabilitative strategies. Current methods are either subjective or require expensive in-lab motion capture system (MCS). In this light, an objective balance assessment methodology can stimulate the development of novel preventive and rehabilitative strategies and improve the evaluation of treatment efficiency.

**Objective:** The objective of this study was to develop and validate a wearable technology for reliable assessment of standing balance that could be easily integrated into clinical functional tests.

**Method:** Nine non-disabled individuals (27 ± 12 years) participated in a two-minute standing test at the Glenrose Rehabilitation Hospital. The body was modelled as three rigid segments. We attached inertial measurement units (IMUs) on the tibia, sacrum, and sternum representing the leg, pelvis, and head-arms-trunk segments. Retro-reflective markers were placed on anatomical landmarks. Kinematic parameters were measured from the synchronous recording of MCS and IMUs. To validate their accuracy, we compared the joint angles and moments calculated using IMUs to those obtained via MCS.

**Result:** Small root means square errors as well as high correlation coefficients were found between the joint angles and moments calculated using IMUs to those obtained via MCS.

**Conclusion:** Wearable IMUs offer a reliable alternative to MCS for quantifying balance control. These IMUs have the advantage of being of lower cost and easier integration into current functional tests.
LONG TERM GAIT VARIABILITY OF INDIVIDUALS WITH SPINAL CORD INJURY AS MEASURED WITH WEARABLE INERTIAL SENSORS

Alireza Noamani, MSc, PhD Student, University of Alberta
Jean-François Lemay, PhD, Professor of Clinic, Université de Montréal, Montreal, QC
Kristin Musselman, PhD, PT, Toronto Rehabilitation Institute, University Health Network/University of Toronto, ON
Hossein Rouhani, PhD, Assistant Professor, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; GRH Research Affiliate

Background: Detrended fluctuation analysis has been used to identify fractal property of gait parameters. Previous studies showed the fractal property of gait parameters as an indicator of long-term dynamics of the locomotor system. Although impaired gait stability after spinal cord injury (SCI) has been studied, clinical assessment of gait parameters in long-term walking for individuals with SCI has yet to be studied.

Objective: This study aims to compare the mean, variability, and fractal property of gait parameters between individuals with SCI and able-bodied (AB) peers during six-minutes of over-ground walking using wearable inertial sensors.

Method: Sixteen individuals with SCI (ASIA D) (59.9±20.5 years) and seven AB individuals (35.0±21.8 years) participated in this study. Participants walked at a self-selected speed in a hospital hallway. Five wearable sensors were attached to the feet, shanks, and sacrum of each participant, and recorded lower limb motion. The feet trajectory were determined via customized gait analysis software. Spatio-temporal gait parameters were calculated, and the mean, variability, and fractal property (characterized using the scaling exponent) of these parameters were compared between groups.

Result: No significant differences were observed between AB and SCI groups for the mean values. Significantly larger variability was observed for the foot clearance, stride length, and stride speed of AB participants. Significantly larger scaling exponent was observed for gait cycle time of individuals with SCI compared to AB participants.

Conclusion: Fractal property and variability of the gait parameters may distinguish the gait stability of the individuals with SCI from able-bodied individuals.

GLENROSE REHABILITATION RESEARCH, INNOVATION AND TECHNOLOGY INTERNSHIP OPPORTUNITIES

Marissa Macklin, Undergrad Cooperative Student, University of Alberta; Research, Innovation & Technology Development, Glenrose Rehabilitation Hospital
Jim Raso, MASc, Senior Consultant, Research, Innovation & Technology Development, Glenrose Rehabilitation Hospital
Hosein Bahari, BSc, Graduate Student, University of Alberta; Technology Development Intern, Research, Innovation & Technology Development, Glenrose Rehabilitation Hospital

Background: The Glenrose Rehabilitation Research, Innovation and Technology (GRRIT) working group works to solve clinical challenges encountered by front-line clinicians such as nurse, occupational therapists, physical therapists and speech-language pathologists. These solutions may take the form of modifying a commercially available device or designing a totally new device.

Objective: University students can assist in solving these clinical challenges through internship opportunities or cooperative placements. GRRIT provides students with working experience as well as opportunities to interact with clinicians, machinists and engineers.

Method: GRRIT hosts reverse trade shows and brainstorming sessions with academia, small businesses, entrepreneurs,
government agencies, clinicians, and hospital staff to generate ideas of potential challenges encountered. Once analyzed, some of these ideas are presented to student interns to solve.

**Result:** Examples of various student projects include: mattress pressure evaluation, use of the Microsoft HoloLens in rehabilitation, stair lifting device, adjustable sippy cup lids, angle adjustable air cast, adjustable Bop-It! Speeds, smart wheelchair and various 3D print projects.

**Conclusion:** The Glenrose Rehabilitation Research, Innovation and Technology working group provides university students with various internship opportunities. These internship opportunities involve solving clinical challenges encountered by frontline clinicians. Solutions can take a variety of forms, from mechanical design to 3D printing.

---

**SOI 18-30 (APPLIED RESEARCH)**

**PREDICTED THRESHOLD AGAINST BACKWARD AND FORWARD LOSS OF BALANCE DURING PERTURBED WALKING**

**Hosein Bahari,** BSc, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; Graduate Research Assistant, Research & Technology Development, Glenrose Rehabilitation Hospital  
**Juan Forero,** PhD, Postdoctoral Fellow, Faculty of Rehabilitation Medicine, BLINC Lab, University of Alberta  
**Albert Vette,** PhD, PEng, Assistant Professor, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; GRH Research Affiliate  
**Jacqueline Hebert,** MD, Associate Professor, Faculty of Medicine & Dentistry, Department of Medicine, Division of Physical Medicine & Rehabilitation, University of Alberta; Glenrose Rehabilitation Hospital  
**Hossein Rouhani,** PhD, PEng, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; GRH Research Affiliate

**Background:** Loss of balance during gait, including falling, accounts for a significant portion of traumatic injuries in older adults. Understanding the biomechanical mechanisms behind loss of balance and fall initiation can help to prevent these injuries.

**Objective:** The objective of this study was to: (1) develop a bipedal model of walking in the sagittal plane that can account for perturbed and unperturbed walking conditions; and (2) find the feasible stability region (FSR), which is a range of feasible position and velocity values for the body’s center of mass during perturbed walking.

**Method:** A seven-segment forward-dynamics model of the human body was developed. A genetic algorithm optimization routine was used to obtain the body motion during swing phase of gait. The maximum and minimum feasible initial velocities for a set of initial positions of the center of mass that enabled stable walking were obtained. These limits formed the FSR. Then, motion data gathered from 15 able-bodied individuals and 3 individuals with walking disorders in the CAREN system at the Glenrose Rehabilitation Hospital were used to validate the simulation results.

**Result:** Results included the FSR for multiple modalities of platform perturbation. The FSR limits were presented in terms of the perturbation frequency and amplitude.

**Conclusion:** The FSR limits for forward and backward loss of balance provided in this study can be used to develop rehabilitation programs in virtual reality environments, such as the CAREN, and to provide training guidelines for individuals with walking disorders.

---

**SOI 18-31 (APPLIED RESEARCH)**

**ELECTRODE DESIGN PARAMETERS FOR SAFE STIMULATION OF THE HUMAN SPINAL CORD**

**David Roszko,** BSc, MSc Student, Neuroscience and Mental Health Institute, Faculty of Medicine & Dentistry, University of Alberta
Amirali Toossi, MSc, PhD Candidate, Neuroscience and Mental Health Institute, Faculty of Medicine & Dentistry, University of Alberta
Vivian Mushahwar, PhD, Professor, Faculty of Medicine & Dentistry, Department of Medicine, Division of Physical Medicine & Rehabilitation, University of Alberta; GRH Research Affiliate

**Background:** Spinal cord injury (SCI) is a debilitating neurological condition which can cause complete or partial loss of mobility and sensation below the level of injury. There are an estimated 86,000 Canadians living with SCI, which present an estimated financial burden of $2.7 billion per year on the healthcare system. Intraspinal microstimulation (ISMS) is one method which aims to counteract the effects of SCI by achieving functional standing and walking in injured people. Preclinical testing has shown that ISMS can generate functional leg movements by implanting microelectrodes into the spinal cord and injecting minute electrical currents to targeted motor networks. In translating this technique to humans, optimal and safe microelectrode designs must first be identified.

**Objective:** Characterize the electrochemical safety and functionality of various microelectrode designs to guide future chronic ISMS studies in humans.

**Method:** Microelectrodes of various tip exposure lengths were fabricated from 50-75 μm diameter platinum-iridium microwire using a nanosecond laser and microelectrode beveller. Electrochemical properties such as charge injection capacity, frequency response and polarization at the electrode-tissue interface were determined using cyclic voltammetry, electrical impedance spectroscopy and voltage transient measurements. These values were then compared against known electrical stimulation safety limits for biological tissue.

**Result:** These manufacturing techniques allowed for the precise fabrication of microelectrodes within ±15 μm of the desired length. The electrochemical properties of each microelectrode model were identified in a bench environment for direct comparison.

**Conclusion:** This research will provide technical design specifications for ISMS microelectrodes that can be tested chronically in humans.

---

SOI 18-32 (APPLIED RESEARCH)

**THE IMPACT OF A BARIATRIC SIMULATION SUIT ON FUNCTIONAL MOBILITY IN ADULTS WITHOUT OBESITY**

Ilina Liubaoerjijin, BSc, MSc Rehabilitation Science Student, Faculty of Rehabilitation Medicine, University of Alberta
John Johnson, BSc, MSc Biomedical Engineering Student, Rehabilitation Robotics Lab, University of Alberta
Normand Boulé, PhD, Professor and Associate Dean (Graduate), Faculty of Kinesiology, Sport and Recreation, University of Alberta
Mary Forhan, PhD, MHSc, BSc, Assistant Professor, Faculty of Rehabilitation Medicine, Department of Occupational Therapy, University of Alberta; GRH Research Affiliate

**Background:** With excessive adipose tissue accumulation, some individuals with obesity have a shifted center of mass, restricted range of motion, limited relative muscle force, restricted field of vision, and altered kinesthetic feedback that can lead to poor balance. As a result, these alterations significantly increase the difficulties to perform functional tasks. To date, there is no research into the use of a non-weight matched bariatric simulation suit for people without obesity to gain a better understanding of functional mobility of individuals with obesity.

**Objective:** This study will explore the impact of a non-weight matched bariatric simulation suit on functional mobility in adults without obesity.

**Method:** Ten students in health care professional training programs, age 18-40 years old with BMIs≤25kg/m2 will be recruited for the intervention group. Ten participants, age 18-40 years old with a BMI≥30kg/m2 will be recruited for the comparison group.
Procedure: The study includes four functional tasks and a semi-structured interview to reflect on the perceived difficulties of the tasks. Three-dimensional kinematic data will be collected. The intervention group will complete the tasks twice, with and without a bariatric simulation suit, in random order.

Significance: This study will be the first to determine the extent to which, if any, a commercially available bariatric simulation suit can replicate functional mobility in persons without obesity. It will also evaluate whether the simulation suit can contribute to a better understanding of mobility performance in persons with obesity among students in healthcare training programs who do not have obesity.

SOI 18-33 (CLINICAL INNOVATION)

APPLYING MAGLEV TECHNOLOGY TO KNEE AND HIP IMPLANTS TO LIMIT CONTACT WEAR

Christopher Keen, Undergraduate Student, University of Alberta
Matthew Menon, MD, Associate Professor, University of Alberta
Lindsey Westover, PHD, PEng, Associate Professor, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; GRH Research Affiliate

Background: One of the main issues facing knee and hip implants is the effect of contact wear and the associated health complications. The breakdown of plastic and metal implant materials releases particles into the joint space causing adverse effects such as autoimmune response and osteolysis, which results in more difficult implant upkeep, potential revision surgery, and a greater effect on the patient’s livelihood post-operation.

Objective: The purpose of this study is to determine the feasibility of applying magnetic levitation (Maglev) technology to knee and hip implants with the intent to reduce or eliminate wear effects.

Method: To determine the feasibility of this technology, a literature review was conducted focusing on joint mechanics and technologies that utilize magnetic levitation. A list of design considerations was developed for implementing Maglev technology in the design of knee and hip implants and a preliminary design concept was formulated.

Result: Through an ongoing literature review, the following design considerations for potential Maglev implants have been formulated: biocompatibility of materials, power requirements, interaction with surroundings, ease of upkeep, and associated costs. Based on these considerations, a preliminary design for a hip implant has been made based on magnetic bearing and spherical rotor technologies.

Conclusion: It is feasible to use Maglev technology in a knee or hip implant in a manner in which it is not active all the time. The integration of this technology could improve implant upkeep and post-operation livelihoods of patients. Further study should go into power requirements and resulting heat generation to support average and peak loading.

SOI 18-34 (APPLIED RESEARCH)

EXAMINATION OF MATHEMATICS AND EXECUTIVE FUNCTION AMONG CHILDREN WITH PERINATAL STROKE

Kathryn Kryska, BA, Research Assistant, University of Alberta
Carmen Rasmussen, PhD, Associate Professor, Faculty of Medicine & Dentistry, Department of Pediatrics, University of Alberta; GRH Research Affiliate
John Andersen, PhD, Associate Professor, Faculty of Medicine & Dentistry, Department of Pediatrics, University of Alberta
Adam Kirton, MD, FRCP(C), MSc, PhD, Professor, Department of Pediatrics, Radiology and Clinical Neuroscience, University of Calgary
Brian Brooks, PhD, Adjunct and Associate Professor, Department of Pediatrics/Department of Psychology, Alberta Children’s Hospital, Calgary
Dr. Jacqueline Pei, PhD, Associate Professor, Faculty of Education, University of Alberta; GRH Research Affiliate

#HealthToHome
Background: Considerable evidence suggests that executive function (EF) is important for mathematics development in young children. Increasingly researchers report that children with cerebral palsy (CP) have difficulty with EF, however few have focused explicitly on EF and math among children with perinatal stroke, which commonly causes hemiparetic CP.

Objective: To examine the profile and association of mathematics and EF among children with perinatal stroke.

Method: Children (M age = 9.5) with perinatal stroke (n = 15) were recruited through the Alberta Perinatal Stroke Project (APSP) as part of a larger study investigating the neurobehavioural outcomes of children with perinatal stroke. Standardized assessments include: NEPSY – II to measure EF (initiation, cognitive flexibility, self-monitoring, attention, visuospatial, comprehension, and inhibition) and KeyMath 2.

Result: Mathematics performance including tests of calculation (M = 82.9, SD = 14.3), fluency (M = 79.2, SD = 13.2), and applied problems (M = 86, SD = 11.8), all fell below the normative mean of 100, ps < .01. Math scores were highly correlated EF skills, inhibition (r = .75, p = .003) and approached significance in a second skill area, attention (r = .57, P = .065). On measures of EF, the children performed at expected level on attention (M = 8, SD = 2.86), visuospatial perception (M = 8.50, SD = 3.40), and comprehension (M = 9.90, SD = 4.43), however had difficulty with inhibition r (M = 5.07, SD = 2.50), initiation, cognitive flexibility and self-monitoring (M = 6, SD = 3.02).

Conclusion: Children with perinatal stroke had difficulty in all areas of math performance, and both areas of strength and weakness in their EF. Possible interventions are discussed.

Background: The number of stroke survivors in Canada is expected to grow by 80% over the next two decades. The growing demand for rehabilitation services has motivated the development of robotics technologies for assisting therapy following impairment. Robots can provide highly reproducible, quantitative and controlled therapy. The rehabilitation process can be moved to the home and remote areas using robots for increased access to and reduced cost of healthcare.

Objective: Safety of patient-robot interaction is important especially when high forces and large workspace are needed as part of prescribed therapy for a patient. Ensuring patient safety in the presence of large forces and large workspace is even more critical for the in home-based rehabilitation as the patient can be alone. Maximizing the allowable effectiveness of robotic therapy while guaranteeing patient safety is desirable in this research.

Method: In this research, a kinematically redundant haptic interface (RHI), which has more degrees of freedom than what is minimally required to perform a task, is proposed to ensure user safety while providing large forces and large workspace. We propose to use the kinematic redundancy to keep the RHI linkages away from undesired regions of the joint space and of the task space, e.g., where there are undesirable contacts with the user or obstacles in the environment, without sacrificing the main rehabilitation task.

Result: In the presence of redundancy, both the (intentional) RHI end-effector/user interaction stability and (unwanted) RHI/user collision safety is attained by utilizing the self-motion of the RHI. Active compliance strategies are developed for the
case of accidental and unintentional user/RHI collision while preserving as much as possible the execution of the end effector task.

**Conclusion:** In this research, it was shown that by using a redundant haptic interface, we can enhance user safety, improve the quality of haptic interaction, enhance the user’s control over force/velocity commands, reduce the user’s effort, and improve the user’s comfort, culminating in enhanced task performance outcomes.

---

**SOI 18-36 (APPLIED RESEARCH)**

**KINESTHETIC TEACHING OF A THERAPIST’S BEHAVIOUR TO A REHABILITATION ROBOT**

Jason Fong, BSc, MSc Student, University of Alberta  
Mahdi Tavakoli, PhD, Professor, Faculty of Engineering, Department of Electrical and Computer Engineering, University of Alberta

**Background:** The integration of robotic assistance in rehabilitation medicine has grown more attractive in recent years. Robots can provide highly repetitive hands-on therapy for patients. These benefits are applicable to post-stroke rehabilitation, where repeated activation of muscle motor groups expedites repair of damaged neural structures.

**Objective:** Robots have traditionally been preprogrammed for simple, predefined movement therapies. However, Activities of Daily Living (ADLs) are more complex and cannot be preprogrammed easily. Despite this, healthy humans can perform ADLs robustly. We propose a new approach to programming rehabilitation robots to enable quick redefinition of ADL tasks and therapeutic behaviors. This is done not through computer coding, but by having therapists physically move the robot in order to teach it.

**Method:** Using a control scheme for Physical Human-Robot Interaction (PHRI), the robot records force and position data during demonstrations in which a spring (simulating a patient) opens a drawer with and without assistance from a human participant (representing a therapist). A machine learning algorithm called Gaussian Mixture Modelling is used to learn the therapist’s assistance. Later, the same task is attempted again, this time with the robot assisting in place of the human participant.

**Result:** The system is able to provide interactions similar to the therapist’s demonstrated behavior (mean absolute error of 1.88N for assistive force) for the given task. The PHRI control scheme is satisfactory, but could be too stiff for some patients.

**Conclusion:** The system properly enables kinesthetic teaching of rehabilitation robots. Future work will focus on incorporating improved learning algorithms and Assistance-as-Needed frameworks.

---

**SOI 18-37 (CLINICAL INNOVATION)**

**EXPLORING THE UTILITY OF THE CAREN TO QUANTITATIVELY ASSESS BALANCE**

Juan Forero, PhD, Postdoctoral Fellow, Faculty of Rehabilitation Medicine, BLINC Lab, University of Alberta  
Albert Vette, PhD, PEng, Assistant Professor, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; GRH Research Affiliate  
Jacqueline Hebert, MD, Associate Professor, Faculty of Medicine & Dentistry, Department of Medicine, Division of Physical Medicine & Rehabilitation, University of Alberta; Glenrose Rehabilitation Hospital

**Background:** The CAREN system represents an ideal environment for training balance and mobility. We have developed a Performance Assessment Tool (PAT) to expand its use by providing a tool to identify and quantify balance and mobility impairments.

**Objective:** The PAT consists of a series of modules aimed at testing different features of balance and mobility. The
objective of the present study was to: 1) develop measures of balance for one of the modules; 2) define norms using data from able-bodied participants; and 3) test the performance of the tool using data from impaired participants.

**Method:** For a given task, we selected different measures associated with changes in the body’s center of pressure. We calculated, for each participant and task, the score associated with each measure and defined normative values using the data from the able-bodied cohort. We then compared the scores from each participant in the impaired cohort to the normative values and evaluated the quality of the chosen tasks and measures.

**Result:** Data from 34 able-bodied individuals and 4 individuals with lower-limb amputation were included in the analysis. Based on the data collected, we found the measures were consistent across the able-bodied cohort. Moreover, we found these measures allowed to confidently identify participants with impaired balance.

**Conclusion:** The results show the PAT is an appropriate tool to quantify balance and identify balance impairments. We are confident that the PAT will provide therapists with an additional tool to assess patients and to better define the rehabilitation program each patient needs in order to improve their balance.

---

**SOI 18-38 (APPLIED RESEARCH)**

**PAVING THE PATH FOR NOVEL APPLICATIONS OF ACCESSIBLE TECHNOLOGY TO REDUCE OVER-EXERTION IN MANUAL WHEELCHAIR USERS**

John Johnson, MSc Student, BSc (Hon.), Research Assistant, Rehabilitation Robotics Laboratory, University of Alberta  
Sydney Hampshire, MSc Student, BSc, CertILS, Cert Sust, Research Assistant, Rehaillitation Robotics Laboratory, University of Alberta  
Lucie Eliasova, Dipl GD and Dipl 3DAnimMod, Graphic Artist, Rehabilitation Robotics Laboratory, University of Alberta  
Nathanial Maeda, PhD, EIT, BSc, Post-Doctoral Fellow, Rehabilitation Robotics Laboratory, University of Alberta  
Martin Ferguson-Pell, PhD, C Phys, FRSA, Principal Investigator, Rehabilitation Robotics Laboratory, University of Alberta; GRH Research Affiliate  
Musi Ala, MSc, Research Assistant, Rehabilitation Robotics Laboratory, University of Alberta  
Kenton Hamaliuk, MSc, BSc, EIT, Research Technician, Rehabilitation Robotics Laboratory, University of Alberta (Former)

**Background:** Up to 78% of manual wheelchair users (MWUs) report arm, hand, and shoulder pain during their lifetime. This pain can be caused by the overuse of these body parts during wheelchair propulsion. Since MWUs depend on their upper limbs for mobility, pain and shoulder degradation can leave them stranded and unable to interact with their communities.

**Objective:** Wearable technologies that track the movement of and are tailored to MWUs will provide useful information to users and researchers. Data gained from these wearables can be used to create maps of public spaces in terms of how difficult they are to navigate in a wheelchair. We call them exertion maps. Our team hopes to prevent overexertion of the upper extremities by producing exertion maps for public spaces such as conference centres, museums, and national park trails.

**Method:** Exertion mapping is a way to assess how hard it is to push on different terrains based on the MWU’s strength. **Click&Push** works by coupling a mobile application to a Bluetooth-enabled, low-cost, and real-time wheelchair activity monitor called Redliner, which can be mounted onto almost any wheeled device.

**Result:** Thus far Click&Push has been used to map high use areas at the Edmonton FRINGE Festival; this data is accessible **online**.

**Conclusion:** The University of Alberta - North Campus is the next proposed site to be mapped. In doing so, MWUs will have the ability to select routes to class based on distance, resistance, and obstacles. However, these maps will be useful to all individuals who visit the university.
SOI 18-39 (APPLIED RESEARCH)

DETECTING TEMPORAL EVENTS DURING LOCOMOTION USING BODY-WORN INERTIAL SENSORS

Niloufar Ahmadian, BSc, Graduate Student, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; Glenrose Rehabilitation Hospital
Sanjot Sunner, Student Researcher, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; Glenrose Rehabilitation Hospital
Milad Nazarahari, MSc, Graduate Research Assistant, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta
Jackie Whittaker, PhD, PT, Assistant Professor, Faculty of Rehabilitation Medicine, Department of Physical Therapy, University of Alberta
Hossein Rouhani, PhD, PEng, Assistant Professor, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; GRH Research Affiliate

Background: Identification of the stance phase of gait, marked by initial and terminal foot contacts with the ground is important for the evaluation of clinical conditions. Wearable inertial sensors present an ideal solution for in-field detection of these temporal events.

Objective: Objectives included: (1) Assessing the accuracy and robustness of novel features of foot and shank kinematic signals in detecting temporal events of gait using inertial sensors and (2) validating the event detection algorithm against an in-lab motion-capture system.

Method: Three able-bodied participants performed U-turn walking trials with two inertial sensors fixed unilaterally to their shank and foot. Reflective markers were attached on the first metatarsal and calcaneus, and tracked with motion-capture cameras to obtain reference temporal events instances of gait. Ten features were defined over each gait cycle based on pre-determined thresholds and peaks of Euclidean norm and time derivatives of foot and shank 3D angular velocity, pitch angular velocity, and 3D acceleration; and their relationship with reference temporal events of gait was investigated.

Result: Foot and shank features detected temporal events of walking with average accuracies and precisions of less than 50 milliseconds, and 70 milliseconds, respectively. While foot-based features provided higher accuracy, shank-based features showed higher precision, particularly in more dynamic movements.

Conclusion: Kinematic features of foot and shank obtained from signals of inertial sensors, can be used for accurate and robust detection of the stance phase during the gait and complex dynamic activities.

SOI 18-40 (APPLIED RESEARCH)

VIRTUAL REALITY DENTAL LOCAL ANESTHESIA SIMULATOR: A STEPPING STONE IN DENTISTRY CURRICULUM

Nathaniel Maeda, PhD, EIT, BSc, Postdoctoral Fellow, Rehabilitation Robotics Laboratory, University of Alberta
Lucie Eliasova, Dip IGD and DIPL 3D AnimMod, Graphic Artist, Rehabilitation Robotics Laboratory, University of Alberta
Kenton Hamaliuk, MSc, BSc, EIT, Research Technician, Rehabilitation Robotics Laboratory, University of Alberta (Former)
Martin Ferguson-Pell, PhD, CPhys, FRSA, Principal Investigator, Rehabilitation Robotics Laboratory, University of Alberta; GRH Research Affiliate

Background: University of Alberta’s Faculty of Medicine and Dentistry was looking for a way to make students more comfortable performing local dental anesthesia injections before having students perform the procedure on each other, as many were refusing to participate as first test subjects for their peers.

Objective: To improve the training of local dental anesthesia injections, we developed a virtual reality local anesthesia simulator as a stepping stone towards performing on human subjects.
Method: A virtual 3D environment closely representing a dental office was created to give students a feel of a proper setting. Patient charts and short quizzes were implemented to test knowledge. A 3D model of a patient was customized in order to be able to manipulate the patient’s head, jaw and lips by the user. Controller vibrations were programmed for physical feedback.

Result: The student is placed in a virtual dental office reception room where they are presented with a patient chart. The student is given a short quiz based on the chart materials, and upon successful completion of the quiz is granted entry to an operating room with a patient. The student can interact with the patient; opening their mouth and repositioning their head. The student must then choose the correct needle to perform the desired injection with, locate relevant landmarks and perform the injection. After a successful injection, the anaesthetized region is displayed and the student is given a score.

Conclusion: Initial results of the pilot test group revealed considerable interest for implementation into the curriculum along with further development of more injection sites.
Background: When an upper body prosthesis user controls the arm and hand to move and manipulate an object, the resulting motion requires compensatory trunk and limb adjustments, along with increased visual fixation on their device. An understanding of these adjustments is needed to design prostheses that facilitate natural upper body movements.

Two functional tasks, along with motion capture and eye tracking techniques, have been established by the University of Alberta’s Bionic Limbs for Improved Natural Control (BLINC) Lab, with the goal of quantitatively assessing upper limb function.

Objective: The objective of this study is to determine whether these methods provide reliable outcome measures that can be used to appraise prosthetic device designs.

Method: Previously, BLINC Lab researchers collected motion capture and eye tracking data when twenty study participants executed the two functional tasks. In the present study, data for twenty additional participants have been collected by another experimenter, at a different site with different equipment. Currently, the obtained results are being analyzed to assess the inter-rater reliability of the experimental protocol and outcome measures.

Result: Thus far, inter-rater reliability results show that most kinematic and eye measures are similar to those previously obtained by BLINC Lab researchers. Some discrepancies between the two datasets, however, exist, including: (1) how long it takes for participants to execute the trials and (2) the number of movement units.

Conclusion: The inter-rater results are promising. Nevertheless, more work is needed to further evaluate the measures’ reliability through statistical analysis.

SOI 18-43 (CLINICAL INNOVATION)

Investigation of the Reassembly of Pelvic Fracture Pieces Using CAD Software

Maha Ead, BSc, Student, University of Alberta
Lindsey Westover, PhD, PEng, Assistant Professor, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; GRH Research Affiliate
Kajsa Duke, PhD, PEng, Associate Professor, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; GRH Research Affiliate

Background: Fractures in the pelvic bone are often quite complex, as the bone may be split into several tiny pieces. Treatments involve fitting plates, but in severe cases, where the bone may be shattered, custom plates need to be designed. Creating patient-specific 3D models of pelvises by reconnecting the fractured pieces would assist in the development of these plates. Currently, there is no technique developed for modeling the pelvis in such severe cases.

Objective: Evaluate geometrical differences between both sides of the pelvis to determine the possibility of using the opposite side for designing custom plates in case one side is fractured. Develop a method to model and reassemble fractured pelvic pieces using CAD software.

Method: CT scans of intact pelvises will be converted into 3D models using Mimics software. A 3D deviation analysis will compare symmetry of the left and right sides of these pelvises. Geomagic software will be used to reflect the left side of the pelvis and align it with the right side so geometrical differences may be determined. In case asymmetry is found or both sides are fractured, the model would be unviable. Therefore, this work will attempt to reconstruct fractured pelvises by...
reassembling the pieces on SolidWorks software and mating them.

**Result:** Previous studies tested the symmetry of the talus bone in both ankles, concluding that they are symmetric and so we anticipate to see similar results with the pelvis.

**Conclusion:** The success of this work will provide a better treatment for patients with severe pelvic fractures by easing the design process of custom plates.

---

**IMPROVING PERFORMANCE OF PATTERN RECOGNITION-BASED MYOELECTRIC CONTROL USING A DESKTOP ROBOTIC ARM TRAINING TOOL**

James Austin, BEng, Graduate Student Research Assistant, Faculty of Engineering, Department of Mechanical Engineering, BLINC Lab, University of Alberta
Ahmed Shehata, PhD, Postdoctoral Fellow, Faculty of Engineering, Department of Mechanical Engineering, BLINC Lab, University of Alberta
Michael Dawson, MSc, Research Engineer, Faculty of Engineering, Department of Mechanical Engineering, BLINC Lab, University of Alberta
Jason Carey, PhD, Professor, Faculty of Engineering, Department of Mechanical Engineering, BLINC Lab, University of Alberta; GRH Research Affiliate
Jacqueline Hebert, MD, Associate Professor, Faculty of Medicine & Dentistry, Department of Medicine, Division of Physical Medicine & Rehabilitation, University of Alberta; Glenrose Rehabilitation Hospital

**Background:** Performance using myoelectric prostheses, especially considering recent developments in pattern recognition-based control, is significantly impacted by user training with the selected control strategy. However, minimal research has been done into the effect of functional user training with different myoelectric control strategies, as doing so typically requires training and evaluating prosthesis users with differing device configurations and customized socket fittings. Intermediate platforms such as desktop-mounted robotic arms present an opportunity for consistent training of participants both able-bodied and with amputations.

**Objective:** To develop and assess a training environment and protocol for improving myoelectric prosthetic control with a desktop-mounted robotic arm with pattern recognition as the control method.

**Method:** A training protocol using a desktop-mounted robotic arm was developed, and 10 able-bodied participants were recruited to complete it using pattern recognition-based control. Pre-training and post-training performance was evaluated using a previously established test of pattern recognition-based control in virtual space, the Target Achievement Control test, for 1, 2 and 3 degrees of freedom.

**Result:** Results showed significant differences in performance before and after 1 hour of desktop training; a significant improvement in completion time was found for all degrees of freedom, and the other performance metrics, completion rate and path efficiency, trended towards improvement.

**Conclusion:** These results support the hypothesis that a desktop training protocol may improve performance with pattern recognition-based control.

---

**IMPACT OF A SELF-REGULATION INTERVENTION ON THE HEALTH HABITS OF ADOLESCENTS WITH FASD**

Vannesa Joly, B.A., Research Assistant, University of Alberta
Kathryn Kryska, B.A., Research Assistant, University of Alberta
Jacqueline Pei, PhD, Associate Professor, Faculty of Education, University of Alberta; GRH Research Affiliate
Carmen Rasmussen, PhD, Professor, Faculty of Medicine & Dentistry, Department of Pediatrics, University of Alberta; GRH Research Affiliate

Background: Fetal Alcohol Spectrum Disorder (FASD) is a diagnosis describing individuals who have been exposed to alcohol prenatally and consequently present with impairments in many areas, including the ability to regulate one’s behaviours. Health Habits are those behaviours that promote a balanced lifestyle, and can include physical, self-care, and social activities. The Alert program® is an evidence based self-regulation intervention for children; its impact on the health habits of adolescents with FASD is unstudied.

Objective: To determine the impact of an adapted Alert Program® on the health habits of adolescents with FASD.

Method: Adolescents (n = 27) between 11 and 18 years of age with FASD participated in the Alert program® using a waitlist study design. The Health Habits (HH) questionnaire was used to measure total number of physical activities, time spent physically active, and time spent asleep pre and post intervention between and within groups.

Result: Paired-sample t-tests indicated no significant differences between pre- and post-intervention HH total physical activity scores (t (22) =0.699, P>0.05), total time spent physically active (t(20)=-0.462, P>0.05), or hours slept (t(21)=-1.614, P>0.05). Preliminary frequency analysis showed 76.2% of participants maintained or increased their total number of physical activities, 69.5% maintained or increased the number of hours in which they participated in physical activity, and 33% took less time to fall asleep post-intervention. Additional analysis will further explore these results.

Conclusion: A self-regulation intervention targeting adolescents with FASD may impact their time spent in physical activity, number of physical activities in which they participate, and time spent asleep.

SOI 18-46 (APPLIED RESEARCH)

DEVELOPMENT AND VERIFICATION OF A LOW-COST PROSTHETIC KNEE MOTION SENSOR

Keri McNeil-Inyani, BSc, MSc Student, Faculty of Engineering, Department of Mechanical Engineering, BLINC Lab, University of Alberta
Ahmed Shehata, PhD, Postdoctoral Fellow, Faculty of Engineering, Department of Electrical and Computer, Engineering, BLINC Lab, University of Alberta
Quinn Boser, BSc, MSc Student, Faculty of Engineering, Department of Biomedical Engineering, BLINC Lab, University of Alberta
Albert Vette, PhD, PEng, Assistant Professor, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; GRH Research Affiliate
Jacqueline Hebert, MD, Associate Professor, Faculty of Medicine & Dentistry, Department of Medicine, Division of Physical Medicine & Rehabilitation, University of Alberta; Glenrose Rehabilitation Hospital

Background: Limb amputation affects many individuals across the world, with most amputations occurring in the lower limb. In addition to losing structure and motor function, the body loses important sensory organs and information that optimizes performance (i.e., ambulation). Tactile and kinesthetic sensory feedback techniques are being investigated for upper limb prosthetic users and may soon translate to lower limb users. A barrier to implementing these techniques is the lack of adequate instrumentation of lower limb prostheses.

Objective: The objective of this research was to design and develop a low-cost wireless movement sensor, which can detect the single axis movement of a prosthetic knee. This sensor could be used to link the movement of a prosthesis to a sensory feedback mechanism in a functional and intuitive manner.

Method: The movement sensor is comprised of a microcontroller, Bluetooth radio, inertial measurement unit, and battery with corresponding circuitry. A custom software was developed to process and visualize movement data. Computing the joint angle of a prosthetic knee was achieved using two movement sensors. This joint angle computation was validated through comparison with a commercial inertial measurement system and motion capture technology.
Result: Our results suggest that the developed sensor may be able to provide robust movement detection during walking or jogging, but not during running or sprinting.

Conclusion: The developed sensor is successful in detecting the onset and termination of single axis movement of a prosthetic knee. Future work includes using the developed sensor to drive actuators that close the sensory feedback loop for lower-limb prosthesis users.

**SOI 18-47 (CLINICAL INNOVATION)**

**HEALTH TO HOME: USING SKYPE FOR BUSINESS FOR CLINICAL VISITS**

Laura Martin, BScOT, Clinical Facilitator, Alberta Health Services  
Cynthia Pon, BScOT, Coordinator, I CAN Centre for Assistive Technology, Glenrose Rehabilitation Hospital  
Kim Beckers, Med, BScOT(C), ACETS Coordinator, Occupational Therapy, Alberta Health Services, Calgary  
Jennifer Fryk, BN, RN, Clinical Facilitator, Alberta Health Services

Background: The I CAN Centre for Assistive Technology and the Augmentative Communication and Educational Technology Service offers rehabilitation services using assistive technologies to clients who experience severe communication difficulties. Recently they reached out to AHS Virtual Health to explore simpler, more flexible applications to connect to clients within their communities.

Objective: This project explored the feasibility and effectiveness of using Skype for Business as an alternative to provide services, access and support to individuals who are too medically fragile to travel, live a great distance from the clinic or require home environment assessment.

Method: The I CAN Centre and ACETS program have been using in-person visits, traditional videoconferencing and phone follow-ups to provide services. Virtual SFB visits were trialed to connect with clients in their home and school environments.

Result: Benefits included reduced travel for clients, families and clinicians, home environment assessment, capacity building of community clinicians, more time in actual treatment and potentially shorter wait times. Clinicians reported that they felt that using SFB during consultations was as good as an in person visit, was appropriate for their clinic and met their clinical needs. They were satisfied with the session outcomes and noted that they would be comfortable using SFB in similar clinical situations.

Conclusion: Using SFB to support clients in community settings with rehabilitation follow-up focused on assistive technologies was feasible for clients and acceptable for clinicians. Next steps may include, troubleshooting via remote access, further connections to long term care and school settings and potentially trialing a different camera.

**SOI 18-48 (APPLIED RESEARCH)**

**IMPLEMENTING RESEARCH PROTOCOL FOR A NATIONAL MULTI-SITE EXOSKELETON STROKE STUDY (ExSRA)**

Melanie Durocher, BSc, Site Study Coordinator  
Dennis Riley Louie, Primary Study Coordinator, Vancouver, BC  
Janice Eng, PhD, BSc (PT/OT), Principal Investigator, University of British Columbia; GRH Research Affiliate

Background: In 2014, the Glenrose Rehabilitation Hospital Foundation purchased a robotic exoskeleton (EKSO GT, Ekso Bionics) to give patients with neurological conditions the opportunity to experience safe and efficient walking practice. The Glenrose EKSO team was approached by Dr. Janice Eng and Riley Louie from the University of British Columbia and GF Strong Rehab Centre in 2017 to be a secondary site for a Canadian multi-site research study in stroke using the exoskeleton.
Objective: The Glenrose Rehabilitation Hospital objective in participating was to give frontline staff the opportunity to be part of innovating research, as well as to build national partnerships with other rehabilitation centres. The main objective of the ExStRA study is to compare walking recovery in stroke patients resulting from exoskeleton-based therapy versus standard physical therapy (PT) practice.

Method: This is a single-blind randomized controlled study. It involves screening for appropriateness, assessment, randomization, treatment, a discharge assessment, and a 6-month follow-up assessment. The control group receives a standard rehabilitation program, involving 5-6 days of PT per week. For those in the exoskeleton group, they receive the same rehabilitation program, except three of their PT sessions are replaced with supported walking practice in the EKSO.

Result: Currently, at 10 months into recruitment, our site is currently completing the treatment and discharge assessment of its sixth participant, with its second participant reaching the six-month mark.

Conclusion: The results of this research study will be used to guide future evidence-based practice integrating robotic exoskeletons.

SOI 18-49 (APPLIED RESEARCH)

MYOELECTRIC TRAINING: IMPROVING PROSTHESIS PERFORMANCE USING A ROBOTIC PLATFORM

Eric Wells, MSc Candidate, BLINC Lab, University of Alberta
Ahmed Shehata, PhD, Post-Doctoral Research Fellow, BLINC Lab, University of Alberta
Jason Carey, PhD, Associate Dean, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta; GRH Research Affiliate
Jacqueline Hebert, MD, Associate Professor, Faculty of Medicine & Dentistry, Department of Medicine, Division of Physical Medicine & Rehabilitation, University of Alberta; Glenrose Rehabilitation Hospital

Background: Upper limb amputation can negatively impact an individuals’ economic, psychological, and social well-being. Prosthetics technology research attempts to mitigate these effects by restoring functionality to the lost limb. Recent advancements utilize powered actuators controlled by muscular activation signals from the surface of the residual limb. Even with these recent advancements, 57% of users abandon their device within the first month of obtaining it. This early abandonment is often due to inadequate training before receiving the prosthesis resulting in poor control compounded by a lack of sensory feedback.

Objective: It has been shown that training able-bodied subjects to use myoelectric control with auditory feedback improves short-term performance for 1-DOF virtual target acquisition tasks. While this method is promising, it has been tested only using virtual systems which do not resemble real-world applications.

Method: We extend this work to better reflect practical use by training individuals with limb amputation, completing 3-DOF tasks, and controlling a desktop mounted robotic arm. This robotic arm can be attached as a wearable prosthesis, making it ideal for testing the validity of transferring training improvements to a wearable prosthesis in the future.

Result: We hypothesize that employing the established control with auditory feedback method on an intuitive 3-DOF physical platform will result in an increased learning rate and enhanced performance than previously seen in 1-DOF virtual tasks.

Conclusion: This study will establish an effective myoelectric training method that can be completed before prosthesis fitting, allowing the user to develop the necessary skills to improve myoelectric prosthesis use in the real world.
**MODULAR ADAPTABLE TRANS-HUMERAL PROSTHETIC SOCKET FOR EVALUATING MYOELECTRIC CONTROL**

Ben W. Hallworth, BSc, Research Assistant, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta

James A. Hallworth, MSc, Graduate Student, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta

Heather E. Williams, MSc, Graduate Student, Faculty of Engineering, Department of Mechanical Engineering, University of Alberta

Mayank Rehani, MSc, Research Associate, Faculty of Medicine & Dentistry, Division of Physical Medicine & Rehabilitation, University of Alberta

Ahmed W. Shehata, PhD, Post-Doctoral Researcher, Faculty of Medicine & Dentistry, Division of Physical Medicine & Rehabilitation, University of Alberta

Jacqueline Hebert, MD, Associate Professor, Faculty of Medicine & Dentistry, Department of Medicine, Division of Physical Medicine & Rehabilitation, University of Alberta; Glenrose Rehabilitation Hospital

**Background:** The development and integration of novel human-machine interfaces to improve myoelectric prosthetic control requires systematic evaluation of their efficacy. This evaluation often consists of experiments in which the user performs various functional tasks with a prosthesis, which are similar to those performed on an everyday basis. However, to accommodate novel prosthetic devices, these experiments often require extensive, permanent modifications to an existing prosthetic socket, or the manufacturing of custom-fitted sockets for each participant. The requirement for these Prosthetist-Fitted Participant-Specific Sockets (PSS) increases cost and preparation time for experiments, reduces consistency among participants' prosthetic devices, and hinders functional testing with socket-mounted wearable prosthetic devices.

**Objective:** In this work, we address these challenges by developing a modular prosthetic socket, which is manufactured using 3D printers and off-the-shelf components.

**Method:** This socket was then compared to a conventional suction socket in a case study which evaluated performance based on different mechanical assessments, user experience, and outcome metrics from activity of daily living tasks.

**Conclusion:** Few differences in user experience or functional performance were observed, suggesting the new socket design has the potential to replace more expensive PSS systems in future control validation studies.

---

**PRELIMINARY TESTING OF A TELEROBOTIC HAPTIC SYSTEM AND ANALYSIS OF VISUAL ATTENTION DURING A PLAYFUL ACTIVITY**

Javier Castellanos Cruz, MSc Student, Faculty of Rehabilitation Medicine, University of Alberta

Maria Gomez Medina, MSc Student, Faculty of Rehabilitation Medicine, University of Alberta

Mahdi Tavakoli, PhD, Professor, Faculty of Engineering, Department of Electrical and Computer Engineering, University of Alberta; GRH Research Affiliate

Patrick Pilarski, PhD, Adjunct Professor, Faculty of Medicine & Dentistry, Division of Physical Medicine & Rehabilitation, University of Alberta; GRH Research Affiliate

Kim Adams, PhD, Assistant Professor, Faculty of Medicine & Dentistry, University of Alberta; GRH Research Affiliate

**Background:** Children with physical impairments face challenges to play because of their limitations. Children with physical impairments can improve their independence, cognitive, and social skills by playing using robots.

**Objective:** The goal of this study was to do preliminary tests of the methods used for haptic guidance and prediction of the toys a user wants to reach. Another goal was to explore and analyze the visual attention of the participants during the
activity when eye-hand discoordination was induced.

**Method:** A telerobotic haptic system was developed with two haptic robots, one that is for a child and the other to interact with the environment. Five adults without disabilities played a whack-a-mole game using the robotic system. The robots were programmed to induce eye-hand discoordination, so that haptic guidance would be required. A multi-layer perceptron neural network was implemented to predict the target moles that the participants had to reach.

**Result:** Guidance did not improve the performance of the task. On average, the accuracy of the target prediction by the neural network was 70.7%.

**Conclusion:** Analysis of participant’s eye gaze led to the hypothesis that the less control a person has over the teleoperation system, the less they will look at the target. The predicting of targets will allow the robot to assist children during movement of the robot towards the target toy, without needing the children to explicitly point out with their gaze which toy they want to reach. This will potentially lead to a more intuitive and faster human-robot interaction.

---

**SOI 18-52 (APPLIED RESEARCH)**

**TESTING A LOW COST MOBILE ROBOT TO SUPPORT PLAY IN CHILDREN WITH PHYSICAL DISABILITIES**

Maria Gomez Medina, MSc Student, Faculty of Rehabilitation Medicine, University of Alberta  
Javier Castellanos Cruz, MSc Student, Faculty of Rehabilitation Medicine, University of Alberta  
Adriana Rios Rincon, PhD, OT, Faculty of Rehabilitation Medicine, Department of Occupational Therapy, University of Alberta; GRH Research Affiliate  
Antonio Miguel Cruz, PhD, Assistant Lecturer/Program Evaluator, Faculty of Mechanical Engineering, University of Alberta; GRH Research Affiliate  
Daniel Quiroga, Auxiliar Professor, Universidad del Rosario, Bogota, Columbia  
William Rodriguez, Associate Professor, Universidad del Rosario, Bogota, Columbia  
Kim Adams, PhD, Assistant Professor, Faculty of Medicine & Dentistry, University of Alberta; GRH Research Affiliate

**Background:** Children with physical disabilities may have difficulties when playing, resulting in developmental delays across different areas, including sensory, motor, cognition, and communication and social development. Assistive technology robots can help children with physical impairments to have control over the environment and objects. However, the control interfaces and commercial availability of robots to support play in children with disabilities is lacking. A robot that can be controlled with different interfaces may be a way of meeting the demands of children with different disabilities. Additionally, commercial availability and affordability of robots are needed, so they could be used at home or for therapy sessions.

**Objective:** To test a low cost robot that can be controlled using three interfaces: the head inclination, a smartphone inclination and switches.

**Method:** Four typically developing children and one adult with physical disabilities used the robot to perform a matching task, where they delivered 5 colored blocks to 5 colored houses. They used the three interfaces to control the robot.

**Result:** Participants could successfully complete the task using all the interfaces. However, children had issues turning in the correct direction using the head inclination due to the cognitive demands this interfaces has. The adult also had some difficulties turning because of her head range of motion was not recognized for the interface.

**Conclusion:** The three interfaces could allow children with physical disabilities to control a robot using a reliable anatomical site such as the head. Future work will be implementing algorithms for automatic calibration for the interfaces.

---

**SOI 18-53**

**WORKING COLLABORATIVELY, STUDENTS, INSTRUCTORS AND PRACTITIONERS HELP MEET REHABILITATION NEEDS**

Melissa Dobson, PhD, Chair, Research Ethics Board (REB), NAIT  
Joseph Varughese, Chair, Bachelor of Technology in Technology Management, NAIT
Background: In the last ten years, student teams from the Bachelor of Technology in Technology Management (BTech-TM) have worked on many projects to improve healthcare. They have designed prototypes, developed software, and guided solutions tailored to meet the needs of the Glenrose Rehabilitation Hospital.

Objective: In groups of three to four students, each group has designed and built functional prototypes, improved existing prototypes, or solved real-world problems. Many have involved input directly from therapists, rehabilitation experts, information technology departments, and Mike Cimolini (project facilitator at the GRH).

Method: Students are required to complete assignments and meet with a guidance team (of three instructors). The students must also meet with their sponsoring group, assess the current situation and determine the needs of the sponsor.

Result: Several successful projects include therapy stairs, a therapy device to increase wrist mobility, a therapy bicycle to encourage young patients to complete their exercises, software solutions for scheduling, maintenance and administrative processes and various other health solutions.

Conclusion: These projects are meaningful to the students and provide the added benefit of being functional and purposeful when finally delivered. The BTech-TM team, students and faculty are continuously looking to enhance our project offerings and encourage continued project collaboration.