

Glenrose Rehabilitation Research
Innovation & Technology (GRRIT) Hub

CO-OP STUDENT PROJECTS

September 2021

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**Glenrose Rehabilitation Research
Innovation & Technology (GRRIT) Hub**

September 2021

This report has been prepared by the Glenrose Rehabilitation Research, Innovation & Technology (GRRIT) Hub.

Contact

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Student Placements: 2019-2021

- **34 students**
From the University of Alberta, Faculty of Engineering, Departments of Biomedical Engineering, Computer Engineering, Civil Engineering, Electrical Engineering, Mechanical Engineering and Faculty of Physics (Nanotechnology)
- **17 students placed at Small and Medium-Sized Enterprises (SME's)**
i.e. KARMA Manufacturing/KARMED, Bowhead Corp, Orthotic Solutions, Okolo Health
- **10 joint student placements at the University of Alberta**
- **8 students placed directly with GRRIT Team**



Students working on scoliosis project.

Completed Projects

Scoliosis Matching Program

The impact of the Schroth treatment for moderate scoliosis was assessed. An algorithm was designed and implemented to match patients who had the Schroth intervention with those who had similar risk factors but did not receive the intervention (controls).

Scoliosis Movement Data

Radiographs were extracted from the hospital IMPAX system to assess outcomes of patients in the Pediatric Scoliosis Program.

Walker Handle

A walker attachment to support hemiplegic patients with early mobility was received from GRH Occupational Therapists.

Wheelchair Rollers

This system allows more accurate force and motion data to be captured from wheelchair users during motion assessment. The system incorporates several sensed rollers that prevent the wheelchair user from advancing while rolling, but still allowing the wheels to spin as they would in regular over-ground traversal.

Wheelchair Glove

Requested by GRH pediatric OTs; involved designing a glove to assist patients with hemiplegia to wheel a “one-arm drive” wheelchair. The project is complete; a universal product is not viable due to patient variability. Therefore, the wheelchair glove will be provided as a custom product based on patient needs.

Swim Fin

The Swim Fin is a prosthetic fin that enhances swimming ability for individuals with a single below-knee amputation. Our students designed and developed a universal model; however, it was unsuitable for use, as there was no way of securely fastening the device to the stump. The recommendation has been to continue with the use of customized solutions.



Students testing the Swim Fin.

Customizable Sippy Cup

A request from the GRH Feeding and Swallowing team led to the investigation into how a custom sippy cup lid could be produced for patients with feeding and swallowing challenges. Several prototypes were produced; however, the risk to the patients with a prototype failing was too high to continue with the project.

Pediatric Air Casting Boot

Designed to provide small incremental adjustments to the boot angle to better support progressive casting requirements following surgery. It was deployed to staff for testing and feedback. Testing has been completed. The next step is to identify a path to commercialization.



Pediatric Air Casting Boot

Ongoing Projects

Clinical Activity for Rehabilitation and Therapy (CARAT)

The CARAT supports hand and wrist therapy by engaging patients via voice commands to twist, push, and pull various custom-designed attachments. Clinician review has shown that the device build quality has been unreliable, and it is challenging to hear the device in our clinical spaces. The device will be reviewed by GRH teams and a plan to move forward with a second iteration.

Pediatric Weight Sled

The Pediatric Weight Sled was developed to allow early interventional strength training for pediatric patients. The new design was created based off University of Alberta Mechanical Engineering Capstone work. Further work has been completed by our students and we are now awaiting clinical review to proceed to manufacturing of the initial prototype.

Lite Brite

Designed to enhance fine and gross motor skills in a pediatric population through a motivating game-like product. Involves creation of a 5' x 3' height- and angle-adjustable Lite Brite board. Currently our students are working on assembling the board and determine a final material/design for the pegs before deploying it for clinical use.

Stair Lift

A request came from GRH therapists to find a way to use various wooden stairs in conjunction with some of the overhead harness systems, including the Vector gait assist system. The current iteration uses a pneumatic air pump and lift system to extend a set of wheels below the device. Unfortunately, the system has proven to not be robust enough for clinical use, and a second design, using a mechanical scissor lift, has been created and is awaiting implementation.

Early Interventional Power Mobility Trainer

Designed to create a power mobility solution to allow patients to try out power mobility without the many challenges encountered with setting up a power chair. The current prototype is undergoing testing and modification with GRH therapists.

Multi-Balance Balance Board

Designed to replace the numerous balance boards currently in use with one adjustable device in order to challenge a patient's balance in different ways and at different levels of recovery. Staff and space survey has been completed. First design iterations and testing are underway.

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"I started my co-op work term at the Glenrose Rehabilitation Hospital as a mechanical engineering student but finished with a passion for medicine. I learned a lot about myself and my career interests as I got to participate as part of interdisciplinary team of professionals in healthcare delivery to patients. The work experience at the GRH was unlike any other work experience before".

Andrew

Wheelchair Seating Frame

Designed to allow GRH therapists to more efficiently and accurately measure and assess the seating needs for manual wheelchairs. This system is currently undergoing final design changes and manufacturing in partnership with Red Deer College.

Computerized Arm Strength Analyzing Dynamometer (CASADY)

Designed to be the new gold standard in muscle testing for both static and through range of motion measurements. The system is currently undergoing design modifications to make it easier to use, more robust, and easier to manufacture.

Patient Scheduling System

This system is designed to replace current GRH white board patient schedules. The goal is to make the system easier to use and accessible for staff, patients, and families. Currently we are awaiting clearance to proceed with testing in the hospital.

Virtual Home Visit App

This system is designed to assist with home assessments. Given the geographic area that the GRH covers and the challenges that COVID has presented, we hope that this system will make it easier for clients and families alike to supply the information and images that our staff require to assess the needs for assistive technologies as well as access in clients' homes.

Continuous Projects

3D Printing Catalogue

A catalog of free, customizable, 3D-printed assistive devices has been created and maintained by Glenrose Rehabilitation Research Innovation & Technology (GRRIT) students. This catalog makes it significantly easier for GRH therapists and clients to see what is available to assist them with their daily tasks.

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“I began writing this as an unemployed recent engineering grad but am finishing it as an official full-time Bowhead employee and committed member of the Bowhead family. Through the process of this writing, I have come to realize what is probably the greatest single lesson of my co-op engineering education, that is; don't let opportunity, no matter how obscure, uncertain, or scary as it may seem pass you by because that one job, working in a basement with 2 other people, may just be your passion!”

Tatiana

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3D Printing

GRRIT students have undertaken several 3D printing tasks related to the 3D printing catalog and other needs for custom solutions from GRH therapists. These can range from screen covers to joystick gimbals to assistive devices. The students produce prototypes and parts for various devices and projects using a 3D Printing and Casting suite of tools and software.



Bowhead Corp

If you have an idea for a student project, please contact:

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