UNIVERSITY OF WATERLOO

Office of Innovation & Research
Grand River Hospital

2022: A YEAR IN REVIEW

We continue to see active engagement between the Grand River Hospital community and the University of Waterloo. As a key partner in advancing the hospitals strategic directions for 2021-2025, the following report outlines the ongoing collaborative relationship between Grand River Hospital and the University of Waterloo. The Office of Innovation & Research remains committed to actively nurturing partnerships and engagement that advance the hospitals strategic directions of being a partner to create a world class health system and innovating to transform healthcare delivery.

Grand River Hospital will be an engaged partner working with our partners, patients and their families to co-develop a truly world class system to advance the health and health outcomes of people in our community. To that end, staff and clinicians at Grand River Hospital have partnered with numerous researchers from the University of Waterloo to conduct research studies and clinical trials to enhance patient health outcomes.

For this reporting year, three new studies are in the planning phases, with an additional twelve ongoing studies active from previous years, and five studies coming to conclusion. To support future research efforts, ten letters of support to accompany funding grant applications were provided to various researchers. In addition, the engagement for student learning opportunities continues to be successful.

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PARTNERING TO CREATE A WORLD CLASS HEALTH SYSTEM

STRATEGIC PRIORITY: Grand River Hospital will be an engaged partner working with our partners, patients and their families to co-develop a truly world class system to advance the health and health outcomes of people in our community. To that end, staff and clinicians at GRH have partnered with numerous researchers from the University of Waterloo to conduct research studies and clinical trials to enhance patient health outcomes.

RESEARCH PLANNING

As we reflect on the past year, much work has gone into planning for collaborative research. In 2022, twelve studies, approved in previous years, are still in the active stages of patient recruitment, data collection, analysis or reporting. In addition, collaborative teams have been actively engaged this past year to design and prepare for future studies. Here is a look at three areas that are new partnerships for Grand River Hospital:

AI for identifying and addressing inequities in the health system to improve patient outcome

An exciting new collaboration for Grand River Hospital and the use of artificial intelligence. Dr. Payal Agarwal, Chief Medical Information & Innovation Officer, and Alex Wong, Canada Research Chair in AI & Medical Imaging, will collaborate to see the application of machine learning models applied to real-world health data. The goal will be to identify systemic biases and determine data reliability as foundational work in order to move forward with AI powered models to improve quality of care.

Functional outcomes following total hip arthroplasty with and without computer assisted surgical navigation

GRH is currently conducting a clinical trial evaluating the self-reported patient outcomes related to the use of computer assisted surgical navigation. In a new partnership, Dr. Matthew Snider, orthopedic surgeon, and Andrew Laing, Associate Professor Kinesiology and Health Sciences, will expand the study to incorporate measured functional outcomes.

Quantitative Modelling of Spasticity

The rehabilitation program, in partnership with Arash Arami, Assistant Professor Mechanical and Mechatronics Engineering, are planning forward a study to evaluate whether a quantitative measure of spasticity can produce similar or improved results than the commonly used Modified Ashworth Scale.

GRANT APPLICATIONS

The Office of Innovation & Research was pleased to facilitate a number of collaborative discussions regarding potential future research partnerships. On behalf of the study teams, 'Letters of Support' were generated to accompany grant application processes. We Look forward to hearing about application success and initiation of project work.

Grant Applications submitted in 2022 included:

University of Waterloo

- Transformative Health Technologies Initiative, Canada First Research Excellence Fund March 2022 and July 2022

Mahla Poudineh, Electrical and Computer Engineering

- Diabetes-Tracker: A continuous monitoring technology for resolving insulin and glucagon dynamic, Diabetes Canada July 2022
- A new transdermal patch to continuously and without pain track and treat diabetes, Graham Seed Fund September 2022

Parsin Reza, Systems Design Engineering

- Next generation of surgical microscopes for rapid virtual histopathology, Canadian Institutes of Health Research Competition February and September 2022
- Advancing fresh bulk tissue microscope with state-of-the-art virtual histology staining for rapid intraoperative breast cancer margin assessment, INOVAIT Pilot Fund December 2022

Andrew Laing, Kinesiology and Health Sciences

- Functional outcomes following total hip arthroplasty with and without computer assisted surgical navigation, Graham Seed Fund December 2022

Alex Wong, System Design Engineering

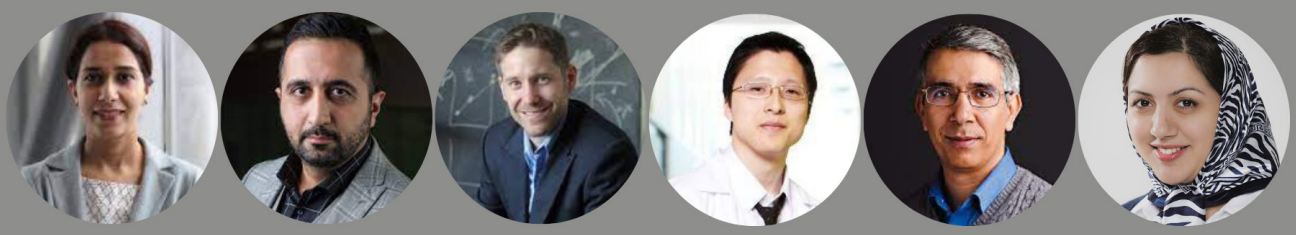
- AI for identifying and addressing inequities in the health system to improve patient outcomes, Graham Seed Fund December 2022

Mohammad Kohandel, Applied Mathematics

- Applying machine learning techniques to patient anatomy and planned doimetric data to predict delivered dosimetric data and toxicity, Graham Seed Fund December 2022

Houra Mahmoudzadeh, Management Science

- Automated radiation therapy treatment planning optimization, Graham Seed Fund December 2022

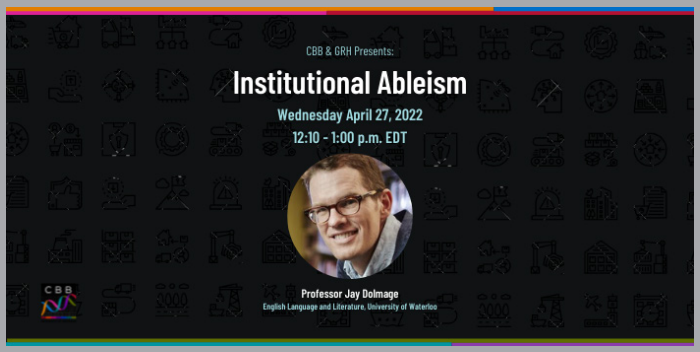


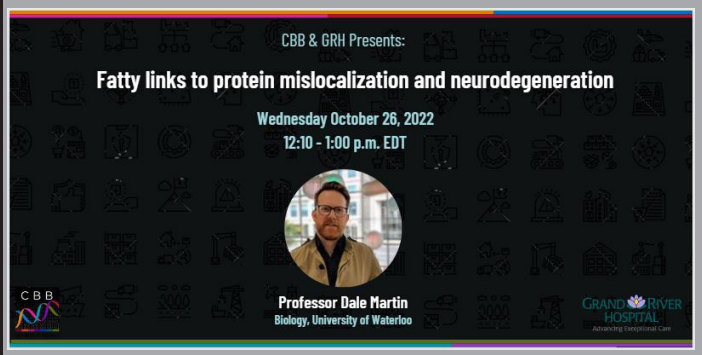
CONSULTATION, COLLABORATION, AND PARTNERSHIPS

Graham Seed Fund: Launched in 2022, The Graham Seed Fund is a Transformative Health Technologies initiative designed to encourage the collaboration of health system partners. This new funding opportunity saw a significant increase in new partnerships explored between UW researchers and GRH staff/clinicians. In support of the grant launch, Manager Research & Clinical Trials provided a presentation on opportunities for collaboration within healthcare and participated as a resource to the grant award committee. Four collaborative teams submitted to the award committee with two teams awarded funds.

Profs Present: We are pleased to continue joint engagement between GRH and UW through our monthly research education speaker series. Six events were hosted in 2022 through virtual presentation. GRH staff who are unable to attend sessions due to clinical activity have access to review video archives of the sessions via the hospitals intranet.

Our continued thanks to Carly Turnbull, Manager, and Takudzwa Mudzongo, Communications Assistant, both with the Centre for Bioengineering & Biotechnology, for their ongoing support to coordinate these speakers and preparing communication materials for these events.





INTRODUCTIONS: A number of new facilitated introductions between University of Waterloo Researchers and GRH staff/clinicians regarding potential future collaborative partnerships. While not formalized into specific project work at this time, these introductions provide a means for exploration of common areas of interest and expertise:

- Kerstin Dautenhan, Electrical and Computer Engineering & GRH Mental Health Program
- Veronika Magdanz, System Design Engineering & GRH Lab and Nephrology Physicians
- Nikolas Knowles, Kinesiology and Health Sciences & staff from the Office of Innovation & Research
- Richard Nuckols, Systems Design Engineering & staff from the Office of Innovation & Research

Innovation Arena: The Office of Innovation & Research was pleased to submit an Expression of Interest to be a Member in Residence of the Innovation Arena. We see this as a unique opportunity to work side-by-side with other members to facilitate early consultation and engagement with GRH clinicians. We envision ongoing opportunities for collaboration during pre-clinical testing and simulation lab testing in the arena in advance of formal research and clinical trials within the hospital setting.

Donation of Medical Equipment: A collaboration developed previously between the Biomedical Engineering team at GRH and Systems Design Engineering Assistant Professor Nima Maftoon sees equipment that has reached its end of life within the clinical space donated to UW as learning tools for biomedical engineering students. Students benefit from being able to apply theory to application by giving them hands-on experience with various pieces of medical equipment. This past year saw the donation of a microscope and two ventilators

INNOVATE AND TRANSFORM HEALTHCARE DELIVERY

STRATEGIC PRIORITY: GRH will leverage the collective talents and strengths of GRH, our community and our partners to innovate and accelerate the transformation of healthcare delivery by building a culture of innovation and research that encourages a spirit of curiosity, discovery, and improvement; and, positions GRH as a preferred destination for learners in order to prepare for, and inform, future health care delivery. To that end, GRH is pleased to have partnered with UW on a number of initiatives that spark the spirit of curiosity and allows students from UW to turn learning into action.

TURNING LEARNING INTO ACTION

CREATE: Centre for Bioengineering and Biotechnology NSERC grant for the CREATE program is the first "needs-first" graduate program in Canada, in which trainees learn to directly interact with end-users and stakeholders in the patient, medical, and biotechnology industry communities to co-discover technology problems and solutions. The program's long-term objective is to produce high-quality personnel capable of thriving in a biomedical technology career.

The CREATE program spreads its learning requirements across three key objectives: Design Training, Biomedical Commercialization, and Professional Soft Skills.

Fall Prevention: Fourth-year Ph.D. candidate Nargess Heydari Beni is the second UW student to complete an internship at GRH under the CREATE program. Beni's internship focused on falls in select in-patient adult units at GRH and received mentorship from Chantelle Archer and Sandra Paleczny, co-leads of the GRH Corporate Falls Prevention and Harm Reduction committee. The project aimed to provide possible interventions to reduce harm from falls. There have been many interventions and products introduced previously to mitigate patient falls, however, many advanced technologies have failed because they do not address the needs of end-users properly. This is where the critical role of the Engineering-Healthcare relationship becomes evident: to design products that address the real needs of patients, healthcare providers and the healthcare setting. It highlights the value of the collaboration between GRH and UW toward developing healthcare-friendly technologies.

Pictured: Nargress Heydari beni, fourth year Ph.D. candidate

Pictured (Left to Right): Chantelle Archer, Sandra Paleczny, and Victoria Crowder-Bansen

CREATE Summer School and Bio-Hackathon: The goal of the annual Summer School and Bio-Hackathon is to bring together trainees, educators, and end-user stakeholders to co-design testable solutions that address a specific healthcare problem. In this year's event, 27 trainees, 4 healthcare professionals, and 7 University of Waterloo educators worked together to address the important issue of falls, which are the leading cause of injury among older adults in Canada. In preparation for the event, Nargess Heydari Beni presented her research on falls prevention, completed during her CREATE internship, which inspired this year's summer school theme. Participants were grouped into teams and received mentorship from Victoria Crowder-Bansen, RN, DN, Chantelle Archer, RN, and Sandra Paleczny, RN from Grand River Hospital, who graciously shared insights into the end-user experience of their possible solutions. This process allowed teams to re-evaluate their concepts and validate them through the mentorship provided by these clinicians. All the teams' hard work culminated during the pitch competition on the final day of the event. The pitch competition was judged by CBB Executive Director, Professor Clark Dickerson, GRH Research Administrator, Sarah Laferriere, and Waterloo Associate Vice President of Entrepreneurship and Commercialization, Professor Karim S. Karim.

Drug Diversion and Pharmaceutical Waste: With support from CREATE, current work is ongoing to plan for two interns in 2023 who will be matched with our the hospital's pharmacy program to research and develop and plan for a pharmaceutical waste solution program that address best practices with respect to destruction of controlled substances.

CAN HEALTH NETWORK

Grand River Hospital is proud to be one of the Ontario Edges in the CAN Health Network.

As one of the Edges, Grand River Hospital will provide a space where the most promising Canadian health-tech companies will have access to real health care environments. Here, their products will receive the support they need for widespread adoption, helping companies scale first locally, then nationally and finally internationally. The CAN Health Network will allow promising companies to work directly with health care organizations to understand their needs and commercialize health technologies to meet those needs and scale up their companies. Through this, small and medi-um-sized enterprises and leading start-ups will be able to work with early adopter institutions to collaboratively innovate, research, develop, and refine Canadian medical technologies to make them market-ready.

Our collaborative program with The University of Waterloo Accelerator Centre (AC), called AC Med, was renewed in 2022. The program aims to identify and support companies who are ready to scale, meaning those who have solutions that have been successfully adopted in a medical environment, as well as those who are near-scale and require additional support of the innovation community in their final push to get their solu-tions into the Canadian market. This partnership also helps to ensure that new technologies and solutions to enhance patient care are supported to benefit local patients sooner.

The program combines the expertise of the hospital's Office of Innovation and Research with the AC's deep startup support system to provide researchers and clinicians the opportunity to work with entrepreneurs on ground-breaking studies that advance exceptional care, with the ultimate goal of connecting high-potential startups into the federally funded CAN Health Network's innovative procurement program.

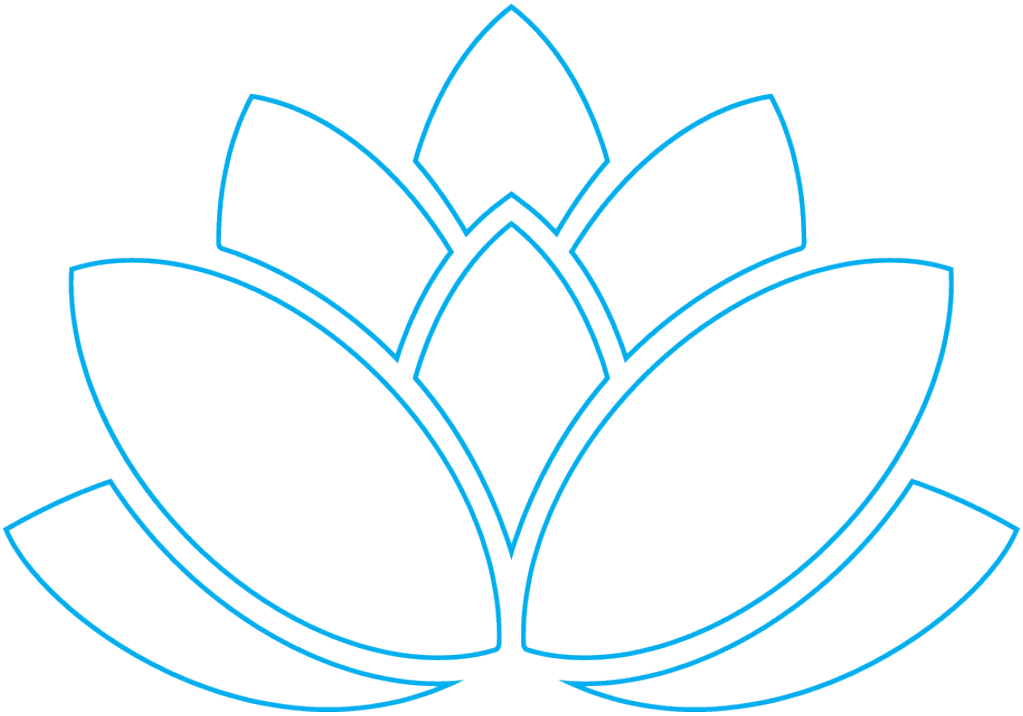
Entrepreneurs within the program will work with the AC and GRH on a customized, short-term roadmap to build their team, navigate regulatory requirements, and prepare for consideration as a CAN Health Network project where they will gain access to staff, data, clinicians, and other resources through 3-12 month pilot projects. Startups can then move into CAN Health's innovative procurement processes with the health sys-tem to get innovative solutions adopted into the health system faster and support startups as they scale their company across Canada and globally.

In addition, AC will be working with GRH to host a three part series of innovation foundation workshops to identify pain points and/or healthcare related issues that may be solved through a med-tech innovation. Leveraging the results of these workshops has the potential to lead to further CAN Health projects.

CONCLUSION

It has been another great year of many successes through the ongoing collaboration between Grand River Hospital and the University of Waterloo.

With enthusiasm, we eagerly look forward to all that 2023 has in store.



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