YEAR END REPORT

2018

Connecting University of Waterloo researchers and Grand River Hospital clinicians to further health-related transformational research

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As we reflect on 2018 it was an excellent year for ongoing partnership with the University of Waterloo. At the end of 2018, six new studies had been brought forward to Research Committee for Administrative Review, there continues to be active work on nine ongoing studies and six studies have come to conclusion.

A highlight of the year has been the addition of our social media presence for the Office of Research & Innovation (ORI). ORI has relaunched its external website, and has begun the use of social media platforms Twitter and LinkedIn. The addition of a 0.3FTE Stakeholder Engagement Specialist within ORI has allowed for the office to better engage with our community and tell others about the great research and innovation work that is being conducted jointly by our two organizations. Within the reports, the studies that have been profiled to-date via social media will be indicated.
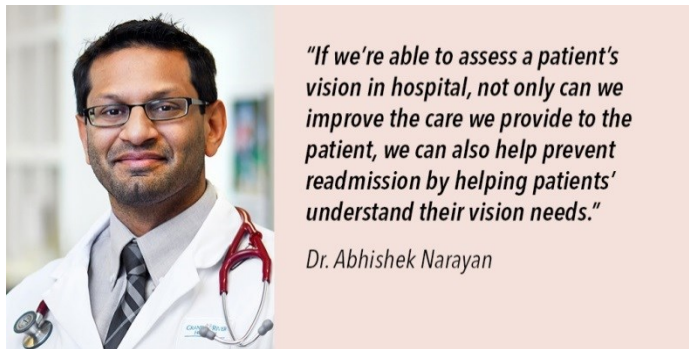
APPROVED STUDIES:

During 2018, six new studies were brought forward for administrative and ethics approvals, some after many months of engagement and planning with clinicians. We are excited to hear about the outcomes of these projects. The studies approved for activation at GRH were funded either through granting agencies ($123,000), industry sponsorship ($10,000), or in-kind contributions from both the University of Waterloo and Grand River Hospital. A portion of these funds, $16,000, will be used to support GRH specific participation in these approved studies. Below is a brief summary of each of the new studies and any social engagement that has resulted from the project work. Summaries of ongoing studies (nine total) and closed studies (six total) can be found in appendix A and B respectively.

ASSESSING THE VISION NEEDS OF THE GRH FREEPORT CAMPUS INPATIENT POPULATION
Dr. Abhishek Narayan, Chief of Complex Continuing Care and Rehabilitation, GRH
Dr. Susan Leat, School of Optometry and Vision Science, UW

"If we're able to assess a patient's vision in hospital, not only can we improve the care we provide to the patient, we can also help prevent readmission by helping patients' understand their vision needs."

Dr. Abhishek Narayan

Vision loss is a risk factor for falls and poor health outcomes, but vision is not routinely measured on hospital admittance. Knowing the vision loss and eye care needs of patients will enable staff to take precautions, potentially reducing falls within the hospital, improving recovery and increasing functional independence back into the community.

The study aims to determine the prevalence of unmanaged/undiagnosed ocular disorders, vision care requirements and current levels of vision among inpatients at Grand River Hospital - Freeport Campus. To complete this, the study team will implement an oral questionnaire and a brief vision screening assessment with patients. The study will also establish the value and most effective components of a screening tool to identify patients who 1) would benefit from eye care in a potential out-patient eye clinic, 2) for whom precautions should be used to prevent falls during their hospital stay 3) may benefit from vision rehabilitation.

Both GRH and UW shared website and social media stories highlighting the study.

NEURAL CORRELATES OF SENSORY-SPECIFIC REACTIVATION IN EPISODIC MEMORY RETRIEVAL OF DRAWN, WRITTEN, AND SEMANTICALLY ENCODED WORDS
Diana Brodrecht, Medical Imaging Technician, GRH
Dr. Myra Fernandes, Department Psychology, UW
Melissa Meade, Student, UW

In recent work, the researchers have shown that drawing boosts memory relative to writing, listing characteristics, and visualizing an item, indicating that drawing information leads to a very robust memory trace. The team suggests that drawing might lead to the integration of multiple memory traces, specifically, a visual imagery trace, motor trace, and further, drawing may also promote a deeper level of semantic processing. Other research (Vaidya, Zhao, Desmond, & Gabrieli, 2002) has demonstrated that when remembering information studied in a picture format, neural activity related to processing of pictorial information is greater than when remembering words.

The study hypothesizes that the various memory traces involved in drawing become reactivated when retrieving drawn information and thereby support and facilitate the retrieval process relative to other types of encoding tasks such as writing and listing words. Examining the neural activity associated with retrieval of information studied using various tasks (drawing, writing, and listing words) will advance scientific understanding of the mechanism by which different encoding methods benefit memory performance.

The study team will recruit healthy subjects to participate in the study through recruitment at the University. Grand River Hospital will conduct functional MRI imaging on behalf of the study team.

FEASIBILITY OF SINGLE EXPOSURE DUAL ENERGY SUBTRACTION WITH A MULTI-ENERGY DIGITAL RADIOGRAPHY DETECTOR FOR LUNG LESION DETECTION
Dr. Vikram Venkatesh, Radiologist, GRH
Dr. Karim Karim, Electrical and Computer Engineering, UW, and Chief Technology Officer, KA Imaging

"Partnering with Grand River Hospital is a tremendous opportunity to trial this innovation at home in the Waterloo Region. We look forward to continuing our partnership with GRH, working together to improve patient care in our region."

Amol Karnick,
President and chief executive officer
KA Imaging

The KA Imaging and GRH research study team

To improve current medical imaging technology of visualizing lung lesions with X-ray, a Multi-Energy digital flat panel detector for Single Exposure Dual-Energy Subtraction radiography has been developed by KA Imaging Inc. to provide images with enhanced tissue differentiation. The technology allows the visualization of anomalies such as pulmonary nodules which are usually not well distinguished on regular x-ray and require more comprehensive imaging tools like CT.

A feasibility study will investigate the imaging characteristics captured by KA Imaging's detector. Study participants, recruited by GRH will undergo testing by KA Imaging's detector and the current standard of care MRI. A GRH radiologist will evaluate the dual-energy images qualitatively against the CT image to determine the differences in image characteristics.

A successful outcome to this research will mean an improvement on the accessibility to better quality of healthcare as it can establish the feasibility of Single Exposure Dual-Energy Subtraction with Multi-energy radiography detector for lung lesions imaging and reduce the necessity of redundant CT exams.

Both GRH and UW shared website and social media stories highlighting the study. Excellent media coverage from a number of local outlets was also seen (CBC, CTV News, Canadian Healthcare Technology).

PUTTING QUALITY FOOD ON THE TRAY: PATIENT SATISFACTION OF FOOD IN ONTARIO HOSPITALS
Karen Gosine, Dietitian, Nutrition and Food Services, GRH
Dr. Lisa Duizer, Department of Food Science, University of Guelph
Dr. Heather Keller, Kinesiology, University of Waterloo

"The University of Waterloo's work with Grand River Hospital is a natural collaboration. The hospital's expertise and strength of clinical experience goes hand-in-hand with UW's research expertise. We have a powerful and positive relationship."

Heather Keller
Schlegel Research Chair, Aging and Nutrition
Professor, Department of Kinesiology
University of Waterloo

The overall aim of this project is to raise awareness of the importance of the quality of food served in Ontario hospitals to food satisfaction and intake of food. Patient satisfaction in food, food waste, and perceptions of food quality and challenges to serving quality food will all be measured by 19 participating hospitals.

A key anticipated outcome of this work will be that food is recognized as a contributor to health and well-being of Ontario hospital patients. Hospital patients will be invited to participate in a hospital food satisfaction survey. Nutrition and food services staff will be invited to participate in focus groups or individual interview sessions.

GRH, UW, and UoG have planned release of website story and social media release during nutrition week, March 15, 2019.

PREDICTING RESOURCE USE OF COMMUNITY MENTAL HEALTH SERVICES AT THE TRANSITION FROM IN-PATIENT PSYCHIATRY
Ben Windling, Decision Support, GRH
Dr. John Hirdes, School of Public Health & Health Systems, UW
Ken (Nam) Tran, PhD Candidate, Health Informatics, UW

As a retrospective review of health records, the objective of the study is to examine the relationship between the resource use of community mental health services and the needs of clients discharged

from in-patient psychiatry. Data from both Grand River Hospital and the Canadian Mental Health Association-Waterloo Wellington will be used to explore this relationship and answer the following questions: 1) Who will subsequently use community mental health services and what are their clinical characteristics; 2) Does the system for classification of in-patient psychiatry (SCIPP) predict the resources use in community mental health services 3) Do characteristics of acute psychiatric clients at discharge predict their usage of community mental health services?

THE INCIDENCE AND PREVENTION OF GASTROINTESTINAL BLEEDING IN ONCOLOGY PATIENTS
Michael Collins, Pharmacist, GRH
Dr. Tom McFarlane, School of Pharmacy, UW
Connor Prince, BScPharm (Candidate), UW

As a student lead project, a retrospective review of health records will be conducted. The study aims to discover the incidence and risk factors for gastrointestinal (GI) bleeding in hospitalized oncology patients and if there are remitting factors that may prevent GI bleeding from occurring.

UPCOMING STUDIES:

DIGITAL PATHOLOGY: COMPUTATIONAL PEER REVIEW THROUGH IDENTIFICATION AND CAPTIONING OF GIGAPIXEL DIGITAL PATHOLOGY SCANS
Dr. Adrian Batten, Pathologist, GRH
Dr. Hamid Tizhoosh, System Design Engineering, UW and Director of KIMIA Lab

"We are quite excited about this project that will give us the opportunity to be directly exposed to the evolving field of digital pathology. This work will help develop sophisticated computer methods for digital image search and identification and introduce this technology to pathology residents; helping shape care for the next generation of physicians."

Dr. Adrian Batten
Joint Chief of Laboratory Medicine
Grand River Hospital and St. Mary's General Hospital

With an expected duration of five-year, the study team will be provided with access to hundreds of pathology images that will be digitized using a scanner provided by Huron Digital Pathology. Dr. Tizhoosh will then use the digital images to develop an image search engine base on artificial intelligent software. The scanned digital images will also be pared the anonymized pathology reports. Dr. Batten will validate the results of the search engine to determine if the results are correct, meaningful and useful.

GRH, UW, and Huron Digital Pathology shared website and social media coverage of the grant announcement and partnership.

GRANT APPLICATIONS AND FUNDING AWARDS

Our office was pleased to facilitate a number of collaborative discussions regarding potential future research partnerships. On behalf of the studies teams, a number of Letters of Support were generated to accompany grant application processes. We look forward to hearing about application success and initiation of project work.

Applications:
- Dr. Brian Laird, Assistant Professor, School of Public Health and Health Systems applied to CIHR to support his ongoing research in environmental contaminates and their impact to nutritional markers. As a partner in the study, GRH would provide laboratory services analyzing frozen plasma samples for various vitamins and minerals.
- Dr. Marina Mourtzakis, Associate Professor Department of Kinesiology and Associate Chair of Applied Research, Partnerships and Outreach for the Center for Community, Clinical and Applied Research Excellence (CCCARE) Center applied to the Canadian Institute of Health Research (CIHR) to support a project entitled "A multimodal approach to assessment of metabolic health in breast cancer patients". Dr. Nadia Califaretti, Oncologist, will partner on the project. The project aims to characterize body composition and metabolic phenotypes in newly diagnosed breast cancer patients using a multimodal approach and evaluate changes in muscle health during nutrition and exercise therapy. Consultation on study design and performance metrics will be provided by a team of GRH dieticians and GRH physicians and staff will work closely to support patient screening for study eligibility, patient recruitment, patient consent and data collection.
- Dr. Sarbast Rasheed, Systems Design Engineering, after an unsuccessful grant application in 2017, re-submitted a project entitled "Development of a novel electromyography (EMG) system for clinical practice" to the spring CIHR grant competition. Both GRH neurologists and EMG technicians will participate as collaborators for the project. If successful, the results of the research could have major positive impacts on the cost and time needed to provide EMG services.
- Dr. Paul Stolee, Professor and Interim Dean, Faculty of Applied Health Sciences, has explored two granting opportunities with GRH. The project entitled "Improving Care Transitions for Older Rehabilitation Patients: The Info Rehab Model" is strongly supported by the Rehabilitation program at our Freeport Campus. Letters of support were submitted to both The Canadian Frailty Network Catalyst Grant competition and to the CIHR grant competition.

Awards:
From previous grant application processes that occurred in 2017 and early 2018, we are happy to report that three studies received new or additional funding and are in the processes of activating at GRH.

"I am very thrilled about this program and the evolution of our partnership with the University of Waterloo. This program has great potential to further advance technical solutions that will directly or indirectly impact the delivery of care to our patients, while also providing a unique opportunity to support biomedical engineering students to thrive in a clinical setting."

Navid Zohouri
Manager, Biomedical engineering
Grand River Hospital

- Dr. Catherine Burns, Center for Bioengineering and Biotechnology had submitted a grant proposal to NSERC CREATE for a

project entitled "Training in Global Biomedical Technology Research & Innovation". The CREATE proposal focuses on the training of biomedical engineering graduate students from a 'needs first' clinical perspective. Dr. Burns was successful and work is underway to further refine the focus of the project work in consultation with GRH's biomedical engineering program.

- Dr. Hamid Tizhoosh, System Design Engineering, submitted a grant proposal to the Ontario Research Fund: Research Excellence for a project entitled "Computational Peer Review through Identification and Captioning of Gigapixel Digital Pathology Scans". The grant application was an academic, clinical, and corporate partnership between Dr. Tizhoosh, Dr. Adrian Batten, GRH Medical Director for Laboratory Medicine, and Huron Digital Pathology. The grant application was successful and work is underway to being planning for implementation of the study, including administrative and ethics reviews of the research study.

- Dr. Don Cowan, David R. Cheriton School of Computer Sciences and Dr. Bill McIlroy, Department of Kinesiology have an ongoing research relationship with Dr. Doug Dittmer, Medical Director for the physical medical program at our Freeport Campus. The team was successful in a 2017 grant opportunity through the Centre for Aging + Brain Health Innovation (CABHI) Spark program to support their research project entitled "Toward an inexpensive integrated toolkit for assessing cognition, balance and mobility in the frail and elderly". A letter of support was prepared for a second grant request to CABHI during the 2018 competition which saw the team successful in their application. The additional funds will be used in part to support a second round of consultation regarding the toolkits functionality with clinicians at the Freeport campus.

CONSULTATIONS AND POTENTIAL PARTNERSHIPS

While not formalized into project work at this point in time, the ORI has facilitated meetings/introductions with the following UW professors, alumni, or institutes who have expressed interest in research collaborations:

- Dr. Morteza Ahmadi, QIDNI Labs (a Velocity company), research interest: implantable renal replacement therapy
- Dr. Daphne McCulloch, Professor, School of Optometry and Vision Science, research interest: Infant Retinal Health
- Dr. John Hirdes, Professor, School of Public Health & Health Systems, research interest: Mental Health
- Omar Ramahi, Professor, Electrical and Computer Engineering, research interest: early breast cancer detection
- Dr. Steven Fischer, Assistant Professor, Department of Kinesiology, research interest: patient handling and in-patient bed design
- Dr. Ben Thompson , Professor, School of Optometry & Vision Science, exploration of a shared MRI
- Research Institute for Aging – a number of conversations have been held with RIA regarding research alignment as well as program design

Additional Activities

Network of Networks (N2)

The Office of Research and Innovation has established membership with the Network of Networks (N2), a not-for-profit incorporated organization and alliance of Canadian research networks and organizations working to enhance national clinical research capability and capacity. As a member of N2, GRH has

access to best-in-class tools, and a forum to share experience, expertise and best practices, and standard operating procedures (SOPs) which bring higher quality standards to how we conduct clinical research. N2 SOPs have been developed to be a national standardized set of operating procedures that are applicable to any clinical area in any hospital.

Regulatory authorities require that clinical research sites like GRH use SOPs to ensure that research is conducted in manner that protects the rights and safety of study participants and the integrity of the research data collected. While our cancer clinical trials department has been a long-time adopter of N2 SOPs, this new partnership will extend SOP access to all clinical trials conducted throughout the hospital. And clinical trial conducted in partnership with UW will follow the standards established through these SOPs.

WATCO

A number of productive meetings were held with WatCo through 2017 in order for GRH to learn about its service offering, discussing with the leadership matters of how our two institutions would intersect with respect to patents and commercialization efforts, and beginning the work to layout an understanding of points of necessary communication, agreement processes, among many other detailed steps in the management of intellectual property and commercialization. The benefit of this introductory work was invaluable to the development and finalization of the first research commercialization agreement between UW researchers and GRH clinicians in 2018.

Waterloo-Wellington Clinical Research and Quality Improvement Symposium

May 2018 was the fifth annual Waterloo-Wellington Clinical Research and Quality Improvement Symposium. The yearly symposium is devoted to research and quality improvement in the Waterloo-Wellington region. It brings together local students, clinicians, professionals and researchers who are working to improve clinical care in the region. Keynote speakers for this year's event was Dr. Kelly Grindrod, Associate Professor, University of Waterloo School of Pharmacy, who discussed her research examining how pharmacists and physicians can better engage patients in making decisions about medications and presented the developed Pharmacy5in5.ca educational platform. The event included four oral presentation sessions and a poster presentation times. The University of Waterloo was represented during seven of the 14 oral presentations and nine of the 32 poster presentations. Sarah Laferriere, GRH Administrative Officer once again participated as a member of the planning committee.

University of Waterloo Hack4Health
Hosted by the University of Waterloo Faculty of Applied health Sciences and the Murray Alzheimer Research and Education Program, GRH VP Research and Innovation was once again invited to participate

as a judge for the hackathon over the weekend of September 28-29, 2018. It was an exciting opportunity and experience to see the process of the hackathon, interact with the diverse group of participants those with lived-experience, UW students, and other health care providers.

PIZZA WITH THE PROFS

Staff and clinicians were invited to participate in eight educational sessions highlighting the research work of a number of University of Waterloo professors and companies that have emerged from the Accelerator program. Events this year were held at both the Freeport and KW campuses (6 and 2 respectively). Over 115 individuals participated in the lecture series, with an average attendance of 35 at the Freeport hosted session. Unfortunately, attendance at the KW campus was as a challenge. It was noted that with the unpredictability of patient volumes and acuity, staff were unable to leave their units during the scheduled sessions. In order to circumvent this issue, and continue to maintain access to the lecture series by staff and clinicians at the KW campus, testing has begun on the use of Ontario Telemedicine Network (OTN) equipment to video record and archive the event. A number of technicalities are being address to enable this process (e.g., consent of presenters, technical integration of OTN equipment with presentation equipment, and access to the archived series through the hospital's intranet). The goal for 2019 will be to have the full lecture series available to staff to view on-demand.

Speakers	Speaker Affiliation	Topic
	Mary Pat Hinton CEO & Founder, Emmetros Accelerator Center Company **Jennifer Krul** Chief Experience Officer, Emmetros Accelerator Center Company	Supporting independent living for people with cognitive impairments
	Dr. Arash Arami Assistant Professor Mechanical and Mechatronic Engineering	Personalized assistive and rehabilitation robotics
	Dr. Heather Keller Professor Kinesiology Schlegel Research Chair Nutrition & Aging	Malnutrition in hospital: Time to tackle food
	Dr. Kathryn Zuj Post-Doctorate Fellow Kinesiology	The second heart: active compression for the maintenance of blood pressure and brain blood flow in the elderly
	Dr. Plinio Morita Assistant Professor School of Public Health and Health Systems J.W. Graham Information Technology Emerging Leader Chair in Applied Health Informatics	The new age of population level surveillance: IOT, wearables, and zero effort technologies
	Dr. Sean Peterson Associate Professor Mechanical and Mechatronic Engineering	A talk about talking: How modeling human phonation can aid diagnosis of voice disorders

	Dr. Kelly Grindrod Assistant Professor School of Pharmacy	Simplifying the tough stuff: Building Pharmacy 5N5
	Dr. Ning Jiang Assistant Professor System Design Engineering Director, Waterloo Engineering Bionics Lab	A brain control interface for motor function rehab following cerebral stroke

CONCLUSION:

The ongoing collaboration between our two institutions is a point of pride for GRH. The success of our partnership only continues to grow year-over-year as we seek new and renewed engagement between researchers and clinicians. Our office remains committed to actively nurturing partnerships and pursue forward the vision of excellence in care that is brought to fruition by research engagement.

APPENDIX A

ACTIVE STUDIES

Determinants and outcomes of psychiatric youth readmission (DETOUR)
Dr. John Vanderkooy, Psychiatrist
Dr. Mark Ferro, School of Public Health & Health Systems

The main research question aims to understand the determinants and outcomes associated with psychiatric readmission among youth. The researchers will recruit a cohort of youth aged 10-16 years who are currently inpatients for a first psychiatric hospitalization at McMaster Children's Hospital and Grand River Hospital. Youth will be followed for 12 months after discharge and tracked for readmission by collecting data from youth and their guardians during their first hospitalization and again at 1, 3, 6, and 12 months post-discharge. The utility of the primary data will be enhanced by linkage to provincial health records. The myEXP mobile app will capture patients' perspectives on hospitalization(s). This will allow the researchers to more comprehensively identify at-risk youth, inform services offered during hospitalization and at discharge, and improve coordination of care in an effort to reduce psychiatric readmissions and system burdens.

User Evaluation of Modeling and Control of Human-Robot Rehabilitation System for the Upper Extremity
Ms. Ellen Richards, Clinical Manager Stroke
Dr. John McPhee, Systems Design Engineering
Dr. Borna Ghannadi, post-doctoral student

The objective of this research is to improve the performance of the upper extremity stroke rehabilitation robot with novel controllers. These results are pertinent to modern-day rehabilitation of stroke survivors in a clinical environment. The long term goal of this research is to elicit motor recovery of the shoulder and elbow joints of post-stroke patients by repetitive programmed exercises. The benefits, should this innovation bear the anticipated results, would include improved motor control, muscle strength, and range of motion in a systematic approach. This study has taken a significant amount of time to prepare for activation. While the GRH administrative approval process occurred in a four-week period, the joint ethics review between THREB and UW ORE requested that the human-robot rehabilitation system undergo a safety review that, as we understand, took longer than anticipated to complete. In addition, staffing changes within the ORE inadvertently delayed the normal review and approval process. In January 2018, the study team has reconnected with the GRH team with the aim of moving forward with study activation.

Toolkit for Assessing Human Balance and Mobility
Dr. Doug Dittmer, Medical Director Rehabilitation
Dr. Bill McIlroy, Kinesiology
Dr. Don Cowan, Computer Science

The project will test a toolkit for assessing human balance and mobility at the Freeport Campus outpatient rehabilitation clinic. The toolkit was one of 31 projects to receive funding from the Canadian Centre for Aging and Brain Health Innovation, operationalized through Baycrest Health Sciences through its Spark program. Using a tablet and wearable technologies, the toolkit will allow health care professional to capture data from each session with a patient for analysis. The system samples and

synchronizes from multiple inexpensive wearable devises and generates a patient assessment and possible actions to improve the health of the patient. The system will also produce a large data set of clinical results (big data) that can be analyzed for further insights into frailty and other medical conditions related to balance.

First approved in 2017, the study received additional funding in 2018 to re-survey physiotherapists regard the newest version of the toolkit.

Care of Frail, Acutely Ill Older Persons: Making Health Care Work like a System (interRAI Acute Care Pilot Subproject)
Ms. Chantelle Archer, Clinical Nurse Specialist Medicine
Dr. John Hirdes, School of Public Health and Health Systems

The study aim is to better understand the trajectory of care (what makes older persons vulnerable and what are risk factors for admission to hospital and intensive care units) once admitted, what determines their long term function and how they recover from acute illness. It is anticipated that the study will yield strategies to provide evidence to assist clinicians in discussing treatment choices and plans of care for frail older persons. The study will also provide insights about predictors of alternate level of care (ALC) status that can be identified in the emergency department or on admission to an inpatient bed. This study is part of a pan-Canadian study funded by the Canadian Frailty Network. The results from this study will identify those individuals at higher risk of requiring an acute hospitalization, predict the need for nursing home resources after an acute episode of hospitalization and define the added value of a standardized geriatric assessment to predict outcomes after an acute care hospitalization.

At the end of the first year of the study, 270 patient participants had completed the contact assessment and 88 patients had completed the acute care survey. Data collection will continue until 350 contact assessments are completed and 109 acute care assessments are completed. A retrospective review of records is being conducted to compile data on completion of AUA screeners during the same time period. Focus groups with staff were also scheduled during the year. Dr. Hirdes presented preliminary study findings to clinical leaders at the hospital in September.

A Pilot Study of a Nurse and Pharmacist Led Ontario Telemedicine Network (OTN) Based Clinic for Management of Prostate Cancer Patients on Oral Therapy
Dr. Stacey Hubay, Medical Oncologist
Dr. Tom McFarlane, School of Pharmacy

The team of researchers has developed a randomized, open label study to evaluate a nurse- and pharmacist-led clinic conducted remotely from Grand River Regional Cancer Centre (GRRCC) using OTN teleconferencing as a platform for patients with metastatic prostate cancer receiving oral chemotherapy agents. The primary outcome will be a comparison of patient satisfaction with overall care utilizing a validated scale between the group of patients using the OTN clinic and a matched group of control patients receiving conventional care at GRRCC. The secondary objectives will be to examine the feasibility of use of the OTN platform with a semi-structured interview conducted with patients in the OTN cohort at the conclusion of the study, and to present a descriptive analysis of toxicity-related interventions made in patients on the trial. The measurement of the effectiveness and acceptability of the use of the telemedicine modality between clinicians and patients will inform future decisions on the feasibility of this modality to increase accessibility to care for patients. To date, 30 of the total 80 patients have been recruited to the study with 15 patients randomized to the OTN arm of the study.

The study was presented by Carla Girolametto at the Waterloo-Wellington Clinical Research & Quality Improvement Symposium, at the Society of Clinical Research Associated (SOCRA) Conference and at the Canadian Association of Nurses in Oncology conference. Dr. McFarlane also provided a poster presentation at the Clinical Oncology Society of Australia (COSA) conference in Perth Australia

Predicting Aggressive Behaviours of Cancer Cells from the General Blood Circulation
Dr. Mala Bahl, Medical Oncologist
Dr. Jonathan Blay, School of Pharmacy

The team is studying the potentially aggressive behaviours of cancer cells that are circulating in the peripheral blood of colorectal and breast cancer patients. These behaviours will be detected by providing the cells with protein factors that favour their vascular capture and development into metastases. Twenty patients diagnosed with stage IV Colorectal or Breast Cancer are being recruited by the medical oncologists at Grand River Regional Cancer Centre, the blood collection occurs at Grand River Hospital, the blood is then transferred to Dr. Blay's Lab at the UW School of Pharmacy for purification and analysis of the circulating cells. As a result of this study the researchers hope to be able to identify features of the circulating tumor cells that will provide information with respect to patient prognosis and treatment of cancer. To date, 26 patients have been recruited to the study and recruitment will continue throughout 2019.

Preliminary study results have been presented at three key conferences in cancer research and biotechnology in 2017 (Canadian Association of Pharmacy in Oncology, Banff, AB; Cancer Research Symposium of the Institute for Comparative Cancer Investigation, Guelph, ON; University of Waterloo Biotechnology and Bioengineering Conference, Waterloo, ON). Thus far, isolation of the circulating cells has been successful and the team is investigating the features of these cells that might provide information or useful biomarkers for prediction of courses of disease.

Biodistribution and Efficacy of Gold Nanoparticles for Prostate Cancer Targeting
Dr. Ernest Osei and Mr. Andre Fleck, Medical Physics Department
Dr. Shawn Wettig, School of Pharmacy
Dr. Tony Mutsaers, Ontario Veterinary College at the University of Guelph
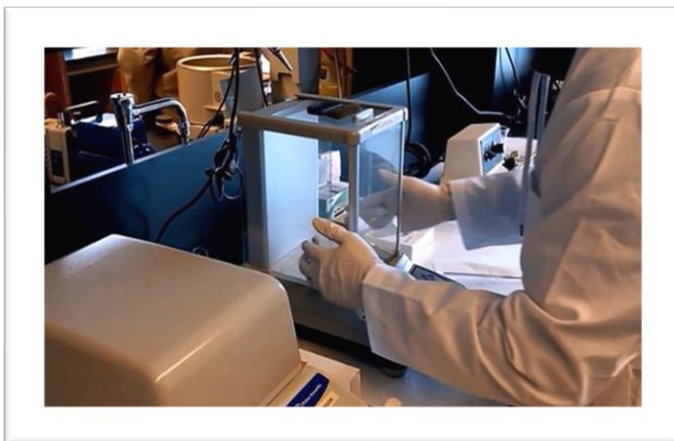
Through a research partnership between GRH, the University of Waterloo, and the Ontario Veterinary College, a team of researchers are fine-

tuning a treatment to use gold nanoparticles to target prostate cancer. The project is now completing a bio-distribution and toxicity studies in mice. In the near future, the team members hope to offer the treatment to canines that have terminal prostate cancer. A successful treatment of the canine will then help translate the model to the human population. An abstract of this research was presented at the Canadian Organization of Medical Physicists (COMP) 2018 annual conference.

Imaging Guided Radiation Therapy
Dr. Runquing Jiang, Medical Physicist
Mark Servos, Department of Biology

The research project aims to improve the CT imaging and radiotherapy (via sensitization) of tumor tissue to further the efficacy of image guided radiation therapy (IGRT) for precision prostate cancer treatment.

Quantum Physics and Cancer
Dr. Ernest Osei, Director of the Medical Physics department at Grand River Hospital
Dr. Raymond LaFlamme, Mike and Ophelia Lazaridis "John von Neumann" Chair in Quantum Information and Director of the Canadian Institute for Advanced Research (CIFAR) Quantum Information Processing program at University of Waterloo.

The purpose of this research is to initiate the exploration of the potential interactions between Quantum Physics and Cancer and how Quantum Physics tools could be utilized to improve the treatment/diagnosis of cancer. A few areas being explored amongst others are: a comprehensive literature review of quantum applications in cancer treatment/diagnosis; the feasibility of increasing precision in targeting cancer tumors in radiation treatment delivery by using both amplitude and phase control; the study and application of machine learning techniques to historic treatment planning information stored at Grand River Regional Cancer Centre (GRRCC) and the utilization of the outputs in choosing the optimal radiation treatment route.

APPENDIX B

CLOSED STUDIES

Determination of Electroencephalogram (EEG) signatures of gain initiation and imagination for a brain computer interface (BCI) for rehabilitation of freezing of gait in Parkinson Patients
Dr. Abhishek Narayan, Chief of Complex Continuing Care and Rehabilitation
Dr. Ning Jiang, System Design Engineering

The study aimed to determine potential electroencephalogram (EEG) signal modalities or signatures associated with gait initiation and imagination of gait initialization in healthy elderly participants, in people with Parkinson's Disease (PD), and in PD with Freezing of Gait (FOG). FOG is characterized by the inability to initiate gait (walk from standing), and stand from sitting. From an EEG signal baseline in healthy subjects, algorithms will be developed to detect gait initialization intention of participants in real time. The recorded EEG signals will be compared to signals for PD patients during gait initialization (either actual movement or attempts). The EEG signatures will be used in future research of a brain-computer interface (BCI) for a lower-limb robotic exoskeleton that will be used to retrain the neuromotorsystem to perform walking steps to reverse FOG and restore normal walking.

During the first year of this study, the team had noted difficulty in recruiting patients that meet the study inclusion criteria. In an effort to increase the success of study recruitment, the study team had initiated discussions with a neurologist at GRH to help identify appropriate patients for inclusion in the study. Unfortunately, the study came to a closure in October 2018 after a shortfall in recruiting study participants.

Cerebellar contributions to spatial and sustained visual attention: Neural correlates of sensory-specific reactivation in episodic memory retrieval of drawn, written, and semantically encoded words
Diana Brodrecht, Medical Imaging Technologist
Dr. James Danckert, Psychology

The purpose of this project was to test a group of patients with isolated cerebellar brain damage to determine its effects on different aspects of attention. In addition, to examine which specific regions of the cerebellum were involved in different aspects of attention by conducting alesion analysis. The team was able to collect data from 15 patients with isolated cerebellar damage, as well as 24 healthy age-matched control subjects on a variety of different spatial and non-spatial attention tasks. The data analysis for each of these tasks are still in the early stages, the team is already have some very interesting findings that feel will make an important contribution to the field of cerebral function.

Preliminary study results have been presented as a poster presentation at the Cognitive Neuroscience Society, in San Francisco.

Impact of patient-specific multi-strategy interventions on adherence to anti-epileptic medication among patients in primary care: a pilot study
Dr. Scott Sloka, Neurologist
Dr. Tejal Patel, School of Pharmacy

As an exploratory pilot, the study was designed to determine the effect size of a multi-strategy intervention to address adherence to a medication regime among patients with epilepsy. Non-

adherence to antiepileptic medications can result in loss of seizure control and therefore has several implications on morbidity and mortality. Tackling non-adherence requires an approach that tailors adherence improvement strategies to patients' needs. This pilot study is designed to determine the effect size of a multi-strategy adherence intervention in improving adherence. The effect size from this study was to be used to determine sample size in a larger study design to investigate the effectiveness of this strategy. The results from the study will also inform the feasibility to conduct a large study to investigate the clinical effectiveness of the specific multi-strategy adherence intervention.

The study noted significant challenges in terms of recruitment. Of the anticipated recruitment strategy of 125 participants, only five were recruited and only three remained when the study came to a conclusion. As a result of poor recruitment, only preliminary sub-group analysis of baseline data was able to be conducted.

WatLX©: A measure of patient experience for the rehabilitative care outpatient/ambulatory setting: A pilot study
Andrea Guth, Director of Quality
Dr. Josephine McMurray, Assistant Professor, Wilfrid Laurier University,
Heather McNeil, PhD. Candidate, Geriatric Health System Research Group

The objective of the study was to evaluate the internal consistency, and test reliability, construct validity and feasibility of the WatLX©, a measure of the experience of patients in rehabilitative care settings. Participants were administered WatLX at two separate points in time (immediately following completion of their rehabilitation program and two-weeks later). The WatLX™ measures six concepts, previously identified as key to outpatient rehabilitative care patients' experience, and include: ecosystem issues, client and informal caregiver engagement, patient and healthcare provider relations, pain and functional status, group and individual identity, and open-ended feedback. The study results indicate that The WatLX™ is a parsimonious question set that is feasible for administration in ambulatory rehabilitative care settings, and which shows promising psychometric properties.

A manuscript of the study has been submitted by the researchers for journal consideration.

Neural correlates of boredom and mind wandering and their relations to aggression in traumatic brain injury
Hilda Pope, Medical Imaging Technologist
Dr. James Danckert, Psychology

The study aimed to explore the neural substrates of boredom and mind wandering, as well as their relationships to aggression in healthy and traumatic brain injury participants. To examine boredom and mind wandering, participants will watch a boredom induction video, and perform a sustained attention task, along with receiving thought probes will an fMRI is being conducted. Participants were also asked to complete a questionnaire to assess aggression in order to examine the neural networks involved in the experiences of boredom and mind wandering. The research aimed to help understand how the experiences of boredom and mind wandering manifest at the neural level and if they are related to aggression, enable a better understanding of the dynamics of cognitive and emotional deficits that are present in traumatic brain injury.

In total, 21 participants were recruited to the study. In the healthy control subjects, the research findings replicated that of previous work published by Danckert & Merrifield in 2014, the default

networks were active when people were bored. However, the results from four participants with traumatic brain injury were highly variable and inconclusive. As a result, not publication work resulted from the study.

Patient Decisions Regarding Dialysis: A Review of Factors Associated with Survival and Attrition in Dialysis Patients: A retrospective study
Kim Hendrick, Program Director Renal
Dr. Helen Chen, School of Public Health and Health Systems

The purpose of this study is to complete a retrospective analysis of dialysis patient characteristics and their corresponding treatment outcomes. The objectives of the study are: i) To determine the attrition rate and factors associated with discontinuation of dialysis; ii) To establish a survival model for CKD patients, iii) To identify determinates that influence patient treatment and survival outcome; and iv) To promote a more informed decision making process for patients in planning dialysis care. Observing and quantifying the attrition and survival of chronic kidney disease (CKD) patients at GRH through the analysis of historical utilization, enable increasingly reliable forecasting and consequently improved resource planning for future patients.

A total of 723 charts were reviewed as part of the study. The study showed age, cardiac disease, hypertension and dementia are significant predictors related to dialysis withdrawal in chronic dialysis population. The findings may help in identifying patients who are susceptible to dialysis withdrawal at the start of dialysis. Future researchers and nephrologists should design and conduct intervention studies focusing on strategies controlling the severity of comorbidities (cardiac disease and hypertension), regular assessment and monitoring of the progression of dementia, and other dialysis program changes to decrease dialysis withdrawal rates in chronic dialysis patients.

The second objective of the study was to estimate the survival rate of dialysis patients in Grand River Hospital (GRH), compare the survival outcome of Peritoneal Dialysis (PD) and Hemodialysis (HD) patients and assess the factors affecting survival outcome. The results showed median survival time in this population was 39.8 months. Estimated 1-, 3- and 5- year survival rates were, 0.8, 0.54 and 0.34, respectively. This research showed comparable survival rates for incident chronic dialysis patients receiving care in GRH, similar survival experience of HD and PD patients and protective impact of hypertension on survival outcome. Long-term survival outcome results were similar between both groups; however, PD patients had an improved survival outcome during the first 18 months of the study.

The study team in is process of preparing a manuscript for publication.