Date:	March 17, 2017
Agenda Item:	University Waterloo & Grand River Hospital Research Agreement Year-Two Review
Purpose:	Information
Prepared by:	S. Laferriere, Research Office Administrator
Reviewed by:	L. Copp, Associate Director, FANS, UW T. Mah, VP Planning, Performance Management & Research, GRH

As year two of the University of Waterloo (UW) and Grand River Hospital (GRH) joint research partnership comes to a close, we look back on the successes of the past year. Eight (8) joint studies between GRH and UW received Administrative Approval in 2016, this represents forty percent (40%) of all studies that were initiated in the calendar year.

JOINT RESEARCH STUDIES IN 2016

WatLX©: A Measure of Patient Experience for the Rehabilitative Care Outpatient/Ambulatory Setting: Pilot Study - A joint research endeavor between Dr. Josephine McMurray, Wilfred Laurier, Heather McNeal, UW PhD Student, and Andrea Guth, Program Director Integrated Stroke GRH. Over the previous two years, researchers at the University of Waterloo and Wilfrid Laurier University worked with providers and patients, and their Rehabilitative Care Council in the Waterloo Wellington LHIN, to develop a valid and reliable instrument, called WatLX©, that will measure rehabilitative care patients' experience across the care continuum. The purpose of this study is to complete psychometric testing of WatLX© and test out the study protocol of a larger, provincial pilot study.

Determination of Electroencephalogram (EEG) Signatures of Gait Initiation and Imagination for a Brain Computer Interface (BCI) for Rehabilitation of Freezing of Gait in Parkinson Patients – Dr. Ning Jiang, Systems Design Engineering UW and Dr. Abhishek Narayan, GRH, have partnered on a study which aims 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.

Cerebellar Contributions to Spatial and Sustained Visual Attention – Dr. James Danckert and Dr. Britt Anderson, both from the UW Psychology Department have partnered with Diana Brodrect, Team Lead Medical Imaging. The study hypothesizes that patients with damage to the cerebellum will show significant deficit in sustained and spatial attention when compared to age-matched controls. Additionally, the team hypothesizes that these attentional impairments may result from area-specific damage to the cerebellum, and that different kinds of attentional impairments may correlate with damage to different areas of the cerebellum.

Impact of Patient-Specific Multi-Strategy Interventions on Adherence to Antiepileptic Medications Among Patients in Primary Care: A Pilot Study – Dr. Tejal Patel, School of Pharmacy has partnered with Dr. Scott Sloka. This is an exploratory pilot study, designed to determine the effect size of a multi-strategy intervention to address adherence 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 patient's 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 will be used to determine sample size in a larger study design to investigate the effectiveness of this strategy. Finally, the results from this study will also inform the feasibility to conduct a large study to investigate the clinical effectiveness of the specific multi-strategy adherence intervention.

User Evaluation of Modeling and Control of Human-Robot Rehabilitation System for the Upper Extremity – Dr. John McPhee and Borna Ghannadi, PhD Student, both from Systems Design Engineering have partnered with Ellen Richards, Clinical Manager Stroke. 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. Both quantitative and qualitative data will be recorded. Quantitative data will consist of: i) standard assessment results from pre- and post-treatment, ii) system evaluations with the robot during all therapy sessions, and iii) the total time of each treatment. Qualitative data will include: i) patient interviews, ii) therapists' feedback, and iii) in-person observations and video analysis. 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. This will optimistically improve motor control, muscle strength, and range of motion in a systematic approach.

Patient Decisions Regarding Dialysis: A Review of Factors Associated with Survival and Attrition in Dialysis Patients: A retrospective study – Dr. Helen Chen, School of Public Health and Health Systems has partnered with Peter Varga, Program Director Renal. The purpose of this study is to complete a retrospective analysis of dialysis patient characteristics and their corresponding treatment outcomes. Observing the attrition and survival of chronic kidney disease (CKD) patients at GRH will allow future patients some insight to historical trends of past and current patients. 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.

Predicting Aggressive Behaviours of Cancer Cells from the General Blood Circulation. Dr. Mala Bahl, Medical Oncologist, GRRCC, has teamed with 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. As a result of this study the researchers hope to be able to identify features of the circulating tumor cells that will provide information in terms of the future prognosis and treatment of cancer. 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.

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, GRRCC, is working with Prof. 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 at Grand River Hospital (GRRCC/GRH) 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 facility 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.

UPCOMING FOR 2017

Care of Frail, Acutely Ill Older Persons: Making Health Care Work Like a System. (interRAI Acute Care Pilot Subproject) – Dr. John Hirdes, School of Public Health and Health Systems and Chantelle Archer, Clinical Nurse Specialist Medicine, will partner on a study 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) and once admitted, what determines their long term function and how they recover from acute illness. Further, 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.

Toolkit for Assessing Human Balance and Mobility – Collaborators Dr. Bill McIlroy, Kinesiology, Dr. Don Cowan, Computer Science and Dr. Doug Dittmer, Medical Director Rehabilitation are undertaking a project that 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, in collaboration with 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.

KA Imaging – Under development is a project in Medical Imaging in partnership with KA Imaging. Karim Karim and his partner, Amol Karnick, at KA Imaging, a University of Waterloo spin-off company, received one of six $1 Million Grand Challenges Canada awards in July 2016. This significant financial support is to continue development and testing of an innovative low-cost, high resolution digital X-ray imager for use in developing countries to improve global health. Results demonstrated that the KA Imager achieve the same level of accuracy as conventional imagers, at a lower X-ray dose and cost. This funding will enable KA Imaging to build and test their prototype.

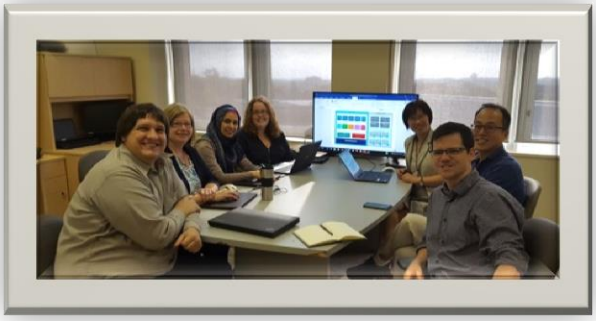
OTHER INITIATIVES

Non-Human Research Activities - **Biodistribution and Efficacy of Gold Nanoparticles for Prostate Cancer Targeting**. Project Leads: Dr. Ernest Osei and Mr. Andre Fleck, both from GRRCC Medical Physics Department, Dr. Shawn Wettig, School of Pharmacy, Dr. Tony Mutsaers, Ontario Veterinary College. 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 ready to move from the petri dish to in-vivo trials in real prostate cancer cases in mice. In the near future, the team members hope to offer the treatment to canine patients that have terminal prostate cancer. A successful treatment of the canine patients will then help translate the model to the human population.

2016 saw the launch of our "**Pizza with the Profs**" lunch and learn sessions. Pizza with the Profs are held the second Wednesday of the month to promote the exchange of information between the clinical and academic communities. UW researchers are eager to learn about clinical problems from the GRH community. Clinical staff have the opportunity to provide input on academic research to address their clinical needs. Seven sessions were held in 2016, with an average of 40 participants at each session. For 2017, we will track individual participant attendance and issue a "Certificate of Participation" at the end of the calendar year for clinicians to include within their professional development portfolio.

A list of the 2016 'Pizza with the Profs' speakers and topics are noted below.

Speaker	Topic
James Tung, PhD Assistant Professor, Mechanical and Mechatronic Engineering	Wearable Sensors for Fall Prevention: Promises and Pitfalls
Chekema Prince, PhD, Project Manager Center for Bioengineering and Biotechnology	Lower Limb Compression Therapy: Current Techniques and Future Improvements
Shi Cao, PhD, Assistant Professor, Systems Design Engineering	Virtual Reality Applications in Medical Rehabilitation
Jesse Hoey, PhD, Associate Professor, David R. Cheriton School of Computer Science	Understanding Identity in Alzheimer's Disease: Emotional Intelligence for Cognitive Assistive Technologies
Kathryn Zuj, Postdoctoral Fellow	Space to Earth: How Spaceflight Research Helps with Fall Prevention
Borna Ghannadi, PhD Candidate, Systems Design Engineering and John McPhee, PhD, Canada Research Chair in System Dynamics Systems Design Engineering	Stroke Rehabilitation Robot: Modeling and Control
Ning Jiang, PhD, Systems Design Engineering	Brain Computer Interfaces for Motor Rehabilitation



As a part of the memorandum of understanding, **dedicated research office space** was arranged for both the KW and Freeport campuses. Researchers and staff/physicians from UW and GRH now have access to private and secure work stations with double-lock storage in the "University of Waterloo Research Center". Located on the 9th floor of the KW main hospital and second floor of Village Center at the Freeport campus, the private space offers work stations for six and four, respectively. The space is equipped with internet access, telephones, meeting table, and storage lockers. Our first users began to occupy the space in 2016.

The GRH Research Office was invited to participate as panel members for an event sponsored by the Center for Bioengineering and Biotechnology (CBB). The panel discussion entitled "**Engaging Hospitals in Research Projects**" focused on guiding UW researchers on how to engage with hospitals and how to succeed with clinical/academic partnerships. The discussions centered on an overview of best practices when engaging hospitals, what clinicians are looking for in terms of collaboration, and how to obtain approvals in order to activate a research study. Panel speakers from GRH included Tina Mah, VP Planning, Performance Management & Research, Sarah Laferriere, Research Office Administrator, and Claudette DeLenardo, Executive Direction Common System Implementation. Representing UW was Leslie Copp, Associate Director Office of Research, Julie Joza, Senior Manager Office of Research, Catherine Burns, CBB Director, and Helen Chen, Assistant Research Professor, School of Public Health and Health Systems.

An introductory meeting was held with Vlad Loutchenok, **Foundation/Public Sector Liaison Officer** to better understand the role of the Liaison Officer and how our two positions have the potential to work collaboratively to develop research partnerships. Mr. Loutchenok was provided with an overview of our joint research agenda, highlighting the areas of research GRH is keenly interested in advancing and provided a tour of the dedicated space for researchers at the KW campus.

The GRH research office supported a number of **grant applications and letters of support** in 2016.

- Elizabeth Irving, School of Optometry and Vision Sciences has submitted a grant proposal to Collaborative Health Research Projects (CHRP) for a project entitled "Development and clinical validation of a miniaturized wearable eye-tracker (MWET) for use in medical diagnostics and assistive devices for individuals with communication challenges." Pamela Andersson, Clinical Team Lead Speech Language Pathologist, and Jacqueline Chin, Occupational Therapist Communication Technology Clinic, will participate as collaborators on this project.
- Samantha Meyer, School of Public Health & Health Systems has submitted a grant proposal to CIHR for the project "Development of a conceptual framework and valid scale for measuring Canadian's trust in healthcare." Sabrina Lalji, Director Quality and Performance Management will participate as a Knowledge User.
- A letter of support was issued to the University of Waterloo to endorse the renewal application for the Center for Bioengineering and Biotechnology as a University of Waterloo research center. We were pleased to hear CBB received renewed funding for five additional years, to October 2021.
- Heather Keller, Schlegel-UW Research Institute for Aging & Department of Kinesiology has submitted a grant application to the Ontario Ministry of Agriculture and Rural Affairs for the project "Quality Food in Hospitals". Hannah Marcus, Registered Dietician will support the research as the local responsible investigator and participate on the projects Advisory Board.

Our office was also contacted to **provide a reference** to a potential professor recruitment activity. As UW attempted to recruit an assistant professor from another facility, the research relationship established between GRH and UW was used to highlight the benefits of working at UW. The candidate contacted our office to better understand the research relationship between our organizations. The connection highlights the value that UW faculty feel our research partnership is providing. I'm happy to report that the candidate did accept a position at UW and has since engaged with the hospital to begin to develop a research partnership.

Work is also beginning on the development of a streamlined process for **student research projects**. The process will be an abridged version of the administrative approval process with the intent of expediting students who are working to complete projects within a semestered school timeframe.

Facilitated Connections in 2016 – throughout the year inquiries are made to the research office for facilitation of connections with hospital clinicians. The following linkages were made between Waterloo units and hospital programs, it is hoped that these new acquaintances lead to fruitful research partnerships:

University of Waterloo Units	Grand River Hospital Program
Management Sciences	Medical Physics
Center for Bioengineering & Biotechnology	Surgery

Additional inquiries were made in which GRH was unable to facilitate connections. These queries related to heart valve modeling and sleep specialists.

A number of inquiries were also received from current students of UW looking for volunteer or co-op opportunities in the field of research. At this time, GRH does not have an established process to support these queries. Potential consideration could be explored in future years to develop a process related to volunteer and/or co-op work terms related to research activities at the hospital.

OUR PARTNERSHIP GROWTH BEYOND RESEARCH

Our developing **relationship with CBB** is increasing interest in opportunities for student observations. Our office has been used on a number of occasions to help establish connections with clinicians who have interest in providing an observation opportunity to UW students. Seven (7) UW students completed clinician observations in 2016.

Rehabilitative Care Grand Rounds occur at our Freeport Campus on a monthly basis. During 2016, four of the guest speakers were professors from the University of Waterloo. Drs. Heather Keller, Lora Giangregorio, Stuart McGill and Kelly Grindrod presented at Rehabilitative Grand Rounds. In addition to the formalized grand rounds, Professor Richard Hughson provided a guest lecture opportunity for staff and clinicians to participate at.

YEAR END SUMMARY OF ALL ACTIVE & CLOSED STUDIES

ACTIVE STUDIES: In addition to the new studies noted above, the following studies initiated in previous years continue to be active at GRH

GRH Researcher	UW Researcher	Study Title
Hilda Pope	Dr. James Dankert	Neural Correlates of Boredom and mind wandering and their relation to aggression in traumatic brain injury
Dr. Robert Stevens	Dr. Paul Spaguolo	Examining the anti-leukemic properties of natural health products
Andrea Guth	Dr. Paul Stolee	WatLX©: A measure of patient experience for the rehabilitative care outpatient/ambulatory setting

CLOSED STUDIES: The following studies concluded in the 2016 calendar year

GRH Researcher	UW Researcher	Study Title
Hilda Pope	Dr. James Danckert	Examining the neural correlates of updating internal represnetations
Dr. Tina Mah Claudette DeLenardo	Dr. John Hirdes	Pilot testing of the interRAI subjective quality of life survey in complex continuing care and mental health and addictions program