Your Impact on Research and Innovation

January to December 2023

NORTH YORK
GENERAL
FOUNDATION

I'd like to express my deep thanks for your incredible support of our Research and Innovation (R&I) Program at North York General Hospital (NYGH).

The aim of our applied research is to translate the learning and the tools the researchers develop into improved care, safety and health outcomes for patients and families at our hospital and beyond. One of the advantages of having our research program in our hospital is that it fosters collaboration between our clinicians and researchers, encouraging them to address challenges together.

This year, our report is sharing highlights of pressing problems that we are solving thanks to your generosity – from preventing and detecting hidden health issues to improving support for patients in and out of hospital, and more.

Make no mistake, this research has the power to change lives. Each of the Chairs brings a different lens and expertise to our R&I program. I'm always inspired by their vision and their work.

This past year, the program bid farewell to Dr. Michelle Greiver, *Gordon F. Cheesbrough Chair in Family and Community Medicine*, as her term ended. We celebrate the 10 years in which Dr. Greiver's family practice research and study of Electronic Medical Records has helped to improve primary care, seniors' care, and end-of-life care. We are grateful for the passion and leadership she brought to the position, and the hospital has initiated an exciting search for a new Chair.

Thank you again for your commitment to applied research. I hope when you read highlights of our research this past year, you feel fulfilled in bringing the future of care to the communities we serve.
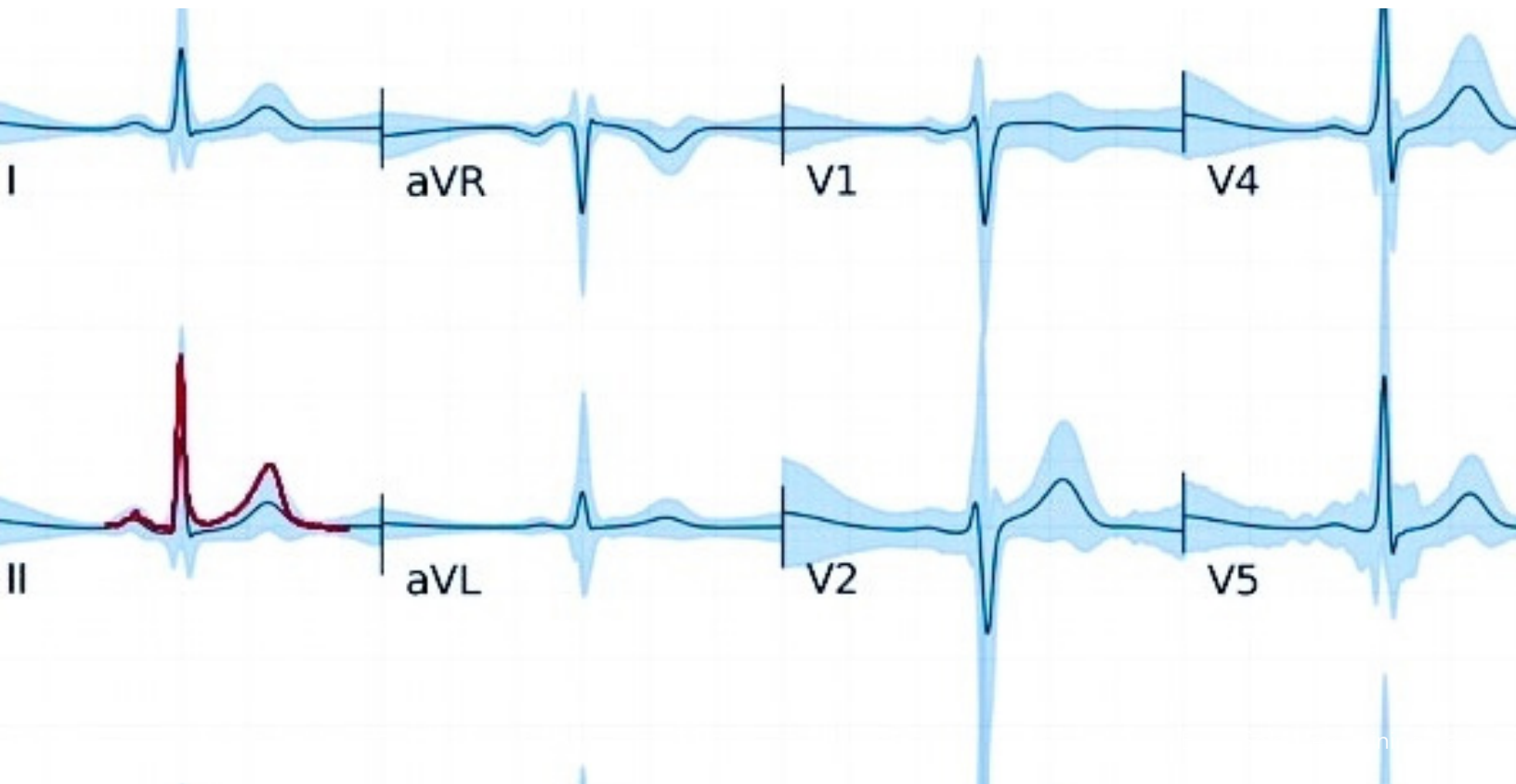
Warmly,

Seanna Millar
President & CEO
North York General Foundation

Preventing and Detecting Hidden Health Issues

Not all health issues are easily detectible. These research projects are leveraging the power of Artificial Intelligence (AI) to help identify and in some cases even prevent hidden health issues.


Detecting Hidden Heart Attacks

In collaboration with researchers from the University of Pittsburgh, Dr. Ervin Sejdić, Research Chair in Artificial Intelligence for Health Outcomes at NYGH and TD STEPP Lab Director, has undertaken a project that leverages AI to identify patients who have had a hidden heart attack. While doctors can easily diagnose some types of heart attacks using an electrocardiogram (ECG), others are more difficult to detect. An ECG measures a heart's electrical activity, and an ST elevation (a spike in tracing) indicates a severe or complete heart blockage. However, the ECG does not show this elevation in all patients who have had heart attack. In this case, precious time may be lost in restoring blood flow to the heart. The team has developed an AI tool that can analyse complex combinations of ECG tracing features to detect patterns that indicate heart blockage, other than the classic ST elevation. To train the AI tool, the team used data from over 7,000 patients who had chest pain but not the obvious ST elevation. Now that the team's AI tool can accurately detect heart blockage, the next step is to run a pilot study to test the tool for real-time clinical use.

Using Smartphones to Help Prevent Falls

Many of the 20% to 30% of seniors who experience a fall each year seek out care after the event in the emergency department, yet we still need a practical tool to assess future risk. The standard method is having a patient walk on a special treadmill while wearing a bulky backpack, which is extremely cumbersome, to gauge the patient's risk for a future fall. Supported by the Exploration Fund and the *TD Laboratory for Smart Technologies for Early Prediction and Prevention*, Dr. Sejdić's team is working on an application that draws on the built-in accelerometer in smartphones to identify people at a high risk of falling. The accelerometer sends data to the app, which uses advanced machine learning algorithms to predict potential falls in patients. The team is testing the app on elderly patients in the *Charlotte & Lewis Steinberg Emergency* at NYGH and collecting data to build and refine the model, which will predict the risk of a fall and possibly reveal underlying medical conditions. During the last year, the smartphone app significantly outperformed the standard method of predicting recurring patient falls. The findings are being presented through manuscripts and at international conferences, with the aim being to incorporate the app into clinical practice at NYGH and other hospitals.
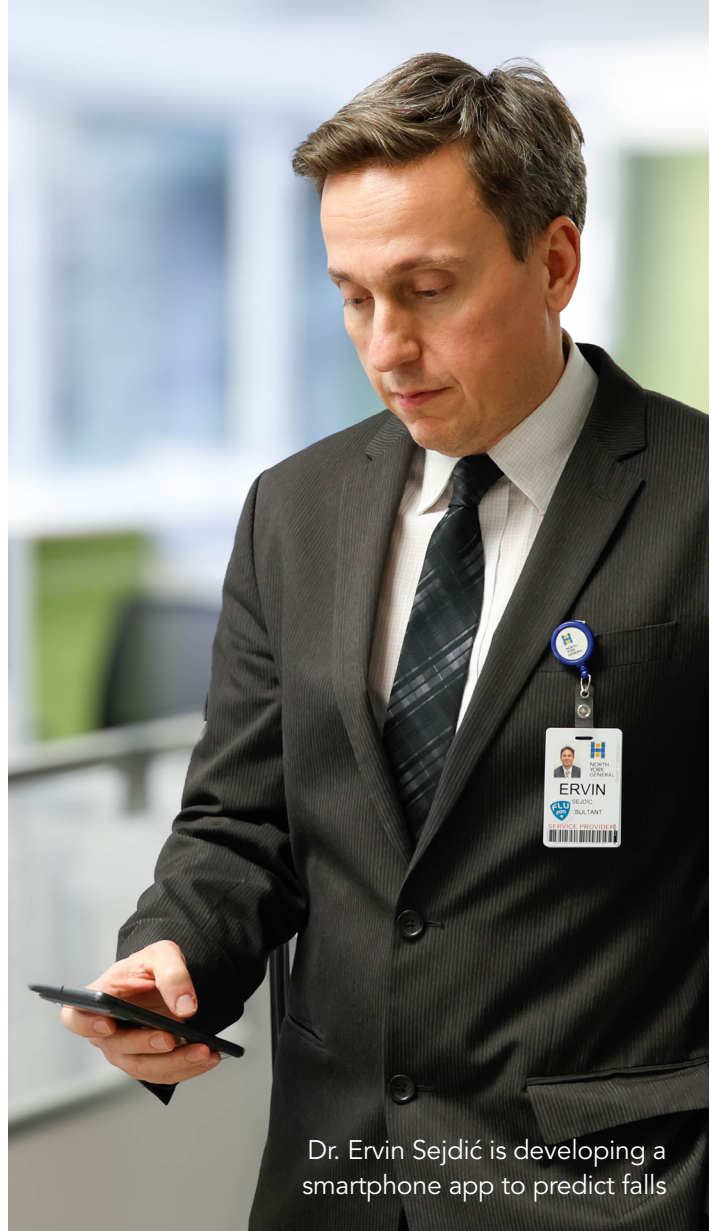
Dr. Ervin Sejdić is developing a smartphone app to predict falls

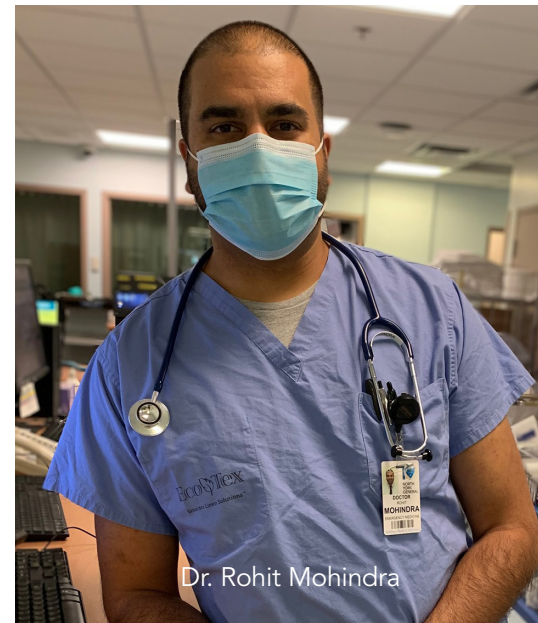## Donor Spotlight: The TD Laboratory for Smart Technologies for Early Prediction and Prevention

Thanks to a transformational $1 million gift from TD Bank Financial Group, plans are underway to create a dedicated lab within the R&I space at NYGH called the *TD Laboratory for Smart Technologies for Early Prediction and Prevention*. Within the lab, Dr. Sejdić and his team will continue their research to create wearable, non-invasive technologies that will remotely monitor issues experienced by elderly Canadians – including swallowing and gait difficulties. Dr. Sejdić is interested in exploring solutions to these two issues prevalent in elderly Canadians to help improve quality of life and life expectancy and will build on his previous investigations. For swallowing research, Dr. Sejdić and his team have developed a small device that includes a sensor and microphone to record vibrations and sounds during swallowing. A patient wears this small device on their neck and the data collected is transmitted to machine learning models for analysis (comparing it with radiological data from X-rays) to determine whether a patient's swallowing is safe. The next phase of the research will include building prototypes and finalizing clinical trials. The other area of initial focus studies gait difficulties using a smartphone. (Read *Using Smartphones to Prevent Falls* above for more information.)

Improved Support for Patients and Families

NYGH is always striving to implement knowledge and new tools to ensure that patients have the support they need while in the hospital and after discharge to help them on their healing journey.

Exploring the Experience of Refugee Patients in the Emergency Department to Improve Care

Refugee patients come to the *Charlotte & Lewis Steinberg Emergency* at NYGH each day for care, and given their cultural background and life experiences, they may perceive and experience care differently from patients who grew up in Canada. Emergency medicine physician Dr. Rohit Mohindra was interested in exploring how we could better deliver culturally sensitive care to these patients, so he teamed up with Dr. Katie Dainty, Chair in Patient-Centred Outcomes, to study their experience in the Emergency Department. During the summer of 2023, two medical students from the University of Toronto interviewed refugee patients who visited the Emergency Department and asked them what brought them there, how they felt interacting with staff, how well they understood their diagnosis and more. The team is currently analyzing the data and Dr. Mohindra will be sharing the results of this study with the ED team at NYGH, as well as other EDs across Canada, to optimize care for this patient population.

Dr. Rohit Mohindra

A Digital Health App to Support Cardiac Arrest Survivors, Families and Lay Responders

For cardiac arrest survivors, families and lay responders (individuals who are not health professionals but initially respond to a medical emergency), life following the event can be fraught with fear, anxiety, depression, and other challenges. Dr. Dainty connected with a group of these individuals to look for a solution that would support them following discharge from the hospital (or the event for lay responders). Together, they decided to design an app. Last year, Dr. Dainty's team (including those with lived experience of cardiac arrest) worked on the app's development with the Centre for Therapeutics at University Health Network and students at the Engineering, Wellness and Health Enhancement Engineering Lab (WHEEL) at the University of Toronto. The app will allow users to receive information, track appointments, and symptoms such as anxiety, depression, fatigue, and caregiving burden (for a family member) and connect with other survivors. If there is a concerning trend, users will receive a notification to make an appointment with their health provider. Currently, the team is in the end-user testing phase, after which they will develop a prototype for implementation. She anticipates being able to test the prototype this year with cardiac patients who are discharged from the Critical Care Unit at NYGH. Once the app is finalized, the aim is to share it with patients at our hospital and beyond.

Dr. Monika Kastner (left) and Dr. Katie Dainty (right) in discussion

Innovative Self-Management Tool to Support Older Adults

Dr. Monika Kastner, Chair in Knowledge Translation and Implementation, and her team have developed an online self-management tool to support older adults living with multiple chronic health conditions called KeepWell. The tool has been evaluated in a randomized controlled trial with approximately 400 older adults across Canada. Findings indicate that the KeepWell tool significantly increased physical activity, quality of life and e-health literacy. Dr. Kastner will now be applying for further funding for the next stage of the research, which is to partner with the North York Toronto Health Partners to implement and evaluate KeepWell in primary care practices within our catchment. The goal is to make KeepWell available within primary care practices as an option for providers to prescribe alongside any clinical care that older adults receive for their chronic conditions, as a coordinated lifestyle intervention. Unlike apps that focus on one or two diseases, KeepWell includes lifestyle advice tailored to any combination of the most common chronic health conditions with which older adults may be living. When primary care physicians begin prescribing KeepWell, thousands of older adults will be able to benefit.

Dr. Kastner looks at KeepWell online

Using Simulated Video Chat to Reduce Agitation in Patients with Delirium

Hospitalization can be a stressful experience for patients, particularly for those with dementia who commonly experience delirium. Delirium, which is a state of confusion brought on by medical illness, often causes patients to become distressed and agitated. Dr. Nihal Haque, a Geriatric Medicine Physician and Hospitalist, is leading an innovative project to address this issue with funding through the Exploration Fund. The fund provides seed grants for NYGH physicians and staff to explore new ideas for better health care delivery. His team is using an AI application that takes input from photos, audio and video of family members to create an artificial video chat for patients on a mobile device. Through the program, patients receive orientation to their surroundings, comforting messages and cognitive stimulation through interesting trivia. The patients can ask questions and the app will respond using preset answers, which makes it seem as if they are having a conversation with a loved one. When a family member is not able to be with a patient, these simulated chats are designed to reduce agitation by providing patients with a sense of familiarity and comfort. The research is in development stage and the app is being finalized for a pilot study.

Video chat helps to reduce patients' agitation

Increasing Surgical Safety

These research projects focus on optimizing safety when patients undergo surgery and reduce the possibility of clinical errors.

Black box research helps increase surgical safety

New Black Box Research Identifies Factors in Surgical Safety

With initial donor funding and a multi-year grant from the Canadian Institutes of Health Research (CIHR), Dr. Patricia Trbovich, *Badeau Family Research Chair in Patient Safety and Quality Improvement*, and her team are continuing research on the *Steinberg Surgical Safety Program*. While the team analyzes NYGH operating room (OR) Black Box recordings to identify safety issues leading to surgical errors, this past year they took a closer look at surgical resilience – or how surgical teams respond to unexpected challenges (e.g. if there is more bleeding than expected) and how to adapt and avoid safety issues. Findings revealed solutions including calling in a specialist, changing surgical tools or repositioning the team in the operating room for better visibility. The review of recordings also showed that nurses often increased their backup behaviour to support their colleagues, and surgical trainees voiced concerns if they were unsure about a technique, which prompted senior surgeons to provide supportive guidance. Collaboration and psychological safety both help to reduce clinical errors. This new research has just been published in the *Annals of Surgery* journal. Moving forward, Dr. Trbovich and her team will be launching a pan-Canadian survey in the summer of 2024 to assess the prevalence of risks identified from the OR Black Box analysis in other hospitals.

Implementing the Improved Surgical Safety Checklist at NYGH

Surgical Safety Checklists have been used in (ORs) around the world for over a decade to provide a safe standard of practice. In 2022, Dr. Trbovich and her team conducted an analysis of OR Black Box recordings at NYGH to examine factors that influenced the completion of the Surgical Safety Checklist at the three "pause points": pre-surgery, before the first incision, and post-surgery. Then Dr. Trbovich's team led three workshops with surgical team members (including anesthesiologists, nurses and surgeons) about how to improve the checklist. Based on these discussions, her team streamlined and reformatted the Surgical Safety Checklist to encourage all surgical staff to fully engage with it. In 2023, the redeveloped checklist was implemented in all the ORs at NYGH. The checklist was printed in larger, easy to read format and positioned on the OR doors. A handheld version and a reference card attached to a computer provided surgical teams with other ways to view the checklist. Observations of over 180 surgeries showed more team members participated in the checklist review at each pause point and the number of items reviewed increased by 29%. These positive results represent enhanced safety for patients in the OR, which will lead to better health outcomes.

Moving Research into Practice Faster

It can take up to 17 years for research to make its way into practice, but the field of knowledge mobilization and implementation can reduce this time to one to five years.

Translating Diabetes Research into Practice Sooner

This past year, Dr. Kastner and her research manager, Julie Makarski, have been leading the Diabetes Action Canada (DAC) Network's Knowledge Mobilization (KM) Program, aimed at building capacity and capability to translate DAC's research findings into practice more efficiently – which in turn will benefit those living with diabetes sooner. To this end, Dr. Kastner and Ms. Makarski developed resources for DAC, including five plain language educational videos covering the basics of knowledge mobilization, and a consultation service, which provides one-to-one support for DAC researchers and trainees on how to practice knowledge mobilization and implementation tailored for their project needs. DAC researchers and trainees have embraced the learning opportunities, with the videos garnering hundreds of views on DAC's various social media platforms. Users of the consultation service have also successfully received grant awards. Dr. Kastner and Ms. Makarski are planning to enhance the DAC KM Program's resources this coming year. Even more promising is the potential for the DAC KM Program model to be scaled and used at North York General and other hospitals to translate research into practice faster, and ultimately to make a positive impact in the lives and health of patients and the public.

Knowledge Mobilization Basics Video Series

Want to learn the basics of knowledge mobilization? Our "Knowledge Mobilization Basics Video Series" includes five short videos explaining the WHAT/WHY, WHO, HOW, WHERE and WHEN of KM in a simple and easy to understand way.

By the Numbers (January to December 2023)

$3 million+ in new awards from federal, provincial and other external sources, to fund new research projects. (Research chairs and other R&I scientists)

86
peer-reviewed publications
(for Research Chairs and Exploration Fund)

131
researchers including research staff and students

41
principal author publications
(for Research Chairs and Exploration Fund)

1,605
citations
(how many times the Research Chairs' publications have been cited by others)

68
presentations at national or international conferences, symposiums, or podcasts
(for Research Chairs and Exploration Fund)

49
mentions in the media
(for Research Chairs and Exploration Fund)