

Making the Connection

This issue of the Catalyst will focus on the subject of technology in health care. Because this is a broad subject, I want to take this opportunity to focus on two areas that will have a great impact in the delivery of health care: the commercialization of technology and the use of data analytics.

The ability for our community to tap into investment in research development from the private sector is growing. For example, CAHO hospitals over the last year have brought more than 70 health technology commercializations to market and made approximately 270 intellectual property disclosures. These are significant numbers. The private sector is investing in our community because it sees the commercial potential of our research. We need to take advantage of this opportunity as commercialization can play an important role in enabling access across the health care system to technologies and solutions that will increase the quality of care for our patients and reduce costs. However, navigating the introduction of new technologies into the health care market is not always easy.

Through initiatives such as MaRS EXCITE, the CAHO community is collaborating with government, industry and research partners to evaluate medical technology pre-market and using the results of the evaluation to accelerate market adoption of health products and devices. The EXCITE program offers the opportunity to accelerate the adoption of medical technology through a single, harmonized, pre-market, evidence-based process. For both entrepreneurs and the CAHO community, this is an opportunity to align technology innovation with health system demands, while improving the quality of technologies before they are introduced to the market and ready for application. As the stewards of the health research enterprise and as leaders in the delivery of specialized care, CAHO hospitals serve as an appropriate environment to assess the viability of new products in an effort to provide better quality care.

The use of data analytics holds great potential in the way we understand and solve complex issues now, and in the decades to come. The scale, scope and complexity of data circulating in our hospitals and across the system are immense. Analytics can help bring meaning out of this complexity. By interpreting data more effectively, the opportunity exists to teach our providers a new way of treating routine and complex procedures, and may be able to drive greater efficiencies in how we organize resources within our institutions.

Eventually, analytics may enable hospitals to predict courses of treatment for specific populations and create more personalized health care. An example is DyNeMo, used at Mount Sinai. It is software technology that analyzes breast cancer tumours to determine a woman's best treatment options. The sequencing done by DyNeMo allows scientists to analyze the activity of an individual patient's genes. The data is analyzed to identify protein networks that are altered by the cancer. The ARTEMIS project partnership being tested at Sick Kids, featured in this edition, is another intriguing example of how better use of data can improve care.

The use and development of technology in the health care system is greatly impacting the way CAHO member hospitals provide health care. As the CAHO community continues to work with key stakeholders such as government, industry and research partners, through the MaRS EXCITE program and in developing new technology commercial ventures, the potential benefit to patients and Ontario is immense. By focusing on the development and use of technology, our member hospitals are positively contributing to an innovative health care system and attracting the best and brightest to work in Ontario creating the environment needed to sustain and build on what has already been created.

In the Spotlight

Terry Donaghue is Director, Technology Transfer and Industrial Liaison for Mount Sinai Hospital and its Samuel Lunenfeld Research Institute, a position he has held since 1995. He is responsible for identifying, evaluating, protecting, marketing and licensing research discoveries with commercial applications. As well, he is responsible for developing alliances with pharmaceutical, biotechnology, medical device and other companies to obtain industry sponsorship for basic and clinical research programs. Building on a life-long interest in science and its impact on society, he has over 20 years experience at Mount Sinai Hospital in the field of technology transfer.

Mr. Donaghue is a former Vice-President, Canada for the Association of University Technology Managers (AUTM) and a former AUTM Trustee. He has served on the executive of the Toronto chapter of the Licensing Executives Society, is a former Vice-President of the Toronto Biotechnology Initiative (now Life Sciences Ontario) for which he also served as a co-chair of its Public Interest Forum; a former member of the board of OnSETT, the Ontario Society for Excellence in Technology Transfer; former Chair of the BioDiscovery Toronto Technology Advisory Group; past Chair of the Alliance for Commercialization of Canadian Technology (ACCT Canada) Professional Development Committee; past Chair of the Board of ACCT Canada and has served as a board member or board observer for a variety of start-up companies spun out of Mount Sinai Hospital. He is currently a member of the Board of ACCT Canada.

CAHO Catalyst recently sat down with Terry and asked him to reflect on his career and the current challenges facing the adoption of technology in Ontario's health care system.

1. To date, you have extensive experience in the field of technology transfer. What does this mean and what are you most proud of?

I've had the advantage of seeing the field of technology transfer and industry-academic interactions evolve over twenty-five years, or so. Much has changed with changes in the business/ economic environment, science and perceptions of the field within the academic environment, governments at all levels and the private sector.

One thing has remained constant - the science and technology is the "raw material" we work with, but it's really all about people. I've had the pleasure of working with a wide variety of very smart, creative, interesting people in science, industry, finance and those working at the interface all passionately using their talents to make a difference in the world. I'm proud that I've helped an extraordinary group of scientists move their research programs forward and proud to be associated with the Lunenfeld and Mount Sinai Hospital. I am certainly proud that I have been able to play a leadership role in my professions over the last few years.

Perhaps what I'm most proud of hasn't quite happened yet and that's the role I've played in helping bring to the market perhaps in the next 12 months, or so, a technology for the early diagnosis of preeclampsia, one of the major complications of pregnancy. I will look back in great pride if I have been able to play a role in improving the health of mothers and babies.

2. What do you see as the biggest challenges in your current role?

Three things: budget, budget, budget – budget for staffing with the right skills and experience, whether internal staffing or retaining outside expertise (and the procurement directives of the Province of Ontario complicate this significantly for me); budget for legal and patent expenses; and budget for proof-of-principle/ validation studies to advance projects. Particularly in the health sciences where product development times from discovery to marketplace are long, the latter two are a major challenge.

I've enjoyed strong support from Mount Sinai Hospital and the Lunenfeld, but budget pressures in the health care sector keep growing. We've benefited from a number of federal and provincial granting programs and organizations such as MaRS Innovation and the Centre for Commercialization of Regenerative Medicine, but overall it is a continuing challenge to manage and fund promising health care technologies to the point that industry or investors are ready to buy in. It's a risky and expensive but important business we're in.

3. As Director of Technology Transfer and Industrial Liaison for Mount Sinai and the Lunenfeld Research Institute, why is the adoption and application of technology important to the health care system?

There are far too many conditions for which we have, at best, a limited understanding of the underlying biology that is the root cause of the condition in a particular individual from complications of pregnancy to chronic complex diseases of adulthood and the aging. As a result, our interventions too often have limited efficacy and too many unwanted side effects or are economically inaccessible to too many people around the world. Effective and cost-effective adoption and application of technology is critical for the continuum of discovery, research and development and clinical application of the prognostic, diagnostic, approaches, therapeutics, medical devices, software tools and other approaches needed for an effective and sustainable health care system.

But it's not just technology in the form of fancy pills or shiny machines – there is equally a need for innovation that addresses the human/social elements of the determinants of health and health care delivery. Moreover, if we can be innovative in effectively leveraging CAHO members' research and clinical capabilities in collaboration with the right industry, entrepreneur and other partners – build a powerful health innovation engine in Canada – we can also begin to realize the potential of academic health centres in addressing the economic health of Canada, without which the sustainability of our healthcare system and our quality of life is at risk. As discoverers of new technology, experts in working with others to develop and test their new technology and as consumers/implementers of much of products of this innovation, CAHO members play a unique and critical role in this.

4. Where do you see technology in health care going in the next decade and beyond?

Clearly personalized medicine – using diagnostic and prognostic innovations to understand an individual patient's specific condition at a molecular level and applying therapeutic approaches appropriate for that underlying biology is rapidly emerging as a "this decade" reality for many diseases. Diagnostic and prognostic tools are emerging rapidly. The challenge here is in the discovery, development and economics of therapeutics with the required specificity. We need to learn how to do drug development faster/smarter/cheaper than the "traditional" drug development paradigm. Many of the needed discovery, research and development technologies are now a reality.

Secondly the field of regenerative medicine is blossoming and shows tremendous promise in the near-term for restoring or replacing damaged tissues and organs. Whether through stem or other multi-potential cells, use of growth factors or potentially small molecule therapeutics to stimulate the body's own repair processes or a variety of bioengineering approaches, we will see remarkable advances coming into use in the very near future. And of course ICTs (information and communication technologies) are playing a profound new role across the health care system from better imaging to smartphone tools for caregivers and patients to administrative systems. An integrated cross-platform electronic medical record will have enormous impact on the quality of care, patient safety and efficiency of health care delivery.

5. Can you share with CAHO Catalyst some of the priorities of Mount Sinai and the Lunenfeld Research Institute when it comes to the development and application of technology?

An overarching priority is development and application of processes, tools and technologies that give reality to the promise of personalized medicine, with emphasis in the hospital's areas of focus in women's and infants' health, particularly the complications of pregnancy, and complex, high-incidence, adult diseases such as diabetes, arthritis and cancer.

Regenerative medicine is another priority building on our long-standing expertise in stem cells and developmental biology. From the perspective of my office, we are taking a three-pronged approach: engaging with industry partners in highly collaborative, large-scale research projects, spinning out companies when we have a sufficiently robust technology platform and licensing out to industry partners with the capability to aggressively move a promising technology to the market.

6. When you are not at work, what do you like to do in your spare time?

Gardening, fly-fishing and music – I play lead guitar in a band called Vintage Debris which describes both the band members and our repertoire. We'll never make the Rock & Roll Hall of Fame, but we have a lot of fun.

CAHO News

MaRS EXCITE makes a second call for innovative, pre-market medical technologies

Since 2005, the MaRS Discovery District has provided a hub and rallying point for Ontario's innovation clusters by delivering a range of programs to link innovators with markets and investment. One of these initiatives, created in 2011, is the MaRS Excellence in Clinical Innovation and Technology Evaluation (EXCITE) program.

EXCITE acts as a facilitator to the complex health technology market. Launched in 2011, the program helps medical technology developers by providing a single, harmonized, pre-market, evidence-based process.

Through this process innovators can engage the health system earlier, and better understand current and future health care system needs. Data generated by the program supports both the Ontario Health Technology Advisory Committee (OHTAC) and Health Canada technology reviews. The harmonized process allows for quicker technology adoption and approval without compromising quality and patient care. The second call for innovation is complete and is now in the consultation stage.

CAHO is a partner in the MaRS EXCITE program. This is a natural fit given our members' unique role as the creators and early adopters of innovation, our stewardship of the health research enterprise in Ontario, and leveraging this to grow Ontario's knowledge-based economy.

"We are excited to work with MaRS EXCITE and find innovative medical technologies and devices that can support our commitment to providing the best care possible to our patients," says CAHO Executive Director, Karen Mitchell. "The CAHO community can identify high-priority issues facing the health care system, and with this knowledge our hospitals can provide a unique perspective in finding the technologies that will have the greatest impact on the patient care we provide."

For this second call, 10 applications were received and five were short-listed for product evaluations. The scope of the new technologies range from in-vitro diagnostics to at-home self-administered diagnostics and inexpensive devices that help reduce costs to the health care system. Each submission has the potential to be a breakthrough, with high-impact.

"The ability to educate innovators and put them in touch with important players in the health care system is very important," says Monique Albert, Manager, MaRS EXCITE. "Navigating the system can be challenging, especially for first-timers or single-product companies. The EXCITE process, and opportunity to work with our stakeholders, gives them better insight to maximize the potential impact of their products."

Selected companies are then matched up with methodological centres. These are academic centres that have demonstrated experience and excellence in clinical trials methodology, health technology assessment and in conducting complex, multi-centre trials with proven capacity for data collection, synthesis and reporting. This results in a protocol on the product's use.

Initiatives such as MaRS EXCITE offer the CAHO community a unique opportunity to provide input, test and build capacity for the development and introduction of disruptively innovative medical technologies within the health care system. As the early adopters and creators of technological innovation, CAHO member hospitals show their continued leadership in this area by working with industry, academia and government to ensure the best possible care is provided to patients.

CAHO News

Using data analytics to transform health care

Hospital data in general, have access to more data now than at any other point. How to use this data to model, predict patient outcomes based on real-time patient data, and prescribe tailored care will be one of the most important questions facing the future of the health care system in Ontario, Canada, and globally.

Data analytics can process vast amounts of unstructured data quickly to highlight useful information and support decision-making processes. In a hospital environment, data analytics can assist with predicting patient outcomes, potentially before an emergency occurs, and offers the tools and technology needed for clinicians to make more intelligent and effective decisions when prescribing and treating patients in hospitals.

While the use of data analytics within the health care system is still in its infancy, the possibilities for this use are unlimited. Developments from initiatives undertaken by our community have the opportunity to greatly impact the most complex care provided to patients, while making the system more efficient and effective.

One example of the use of data analytics to anticipate care needs currently exists at the hospital for Sick Children (SickKids) with Artemis. At SickKids, the Neonatal Intensive Care Units (NICUs) deploy state-of-the-art medical devices to monitor and support premature babies; however, neonatologists are not able to process the vast quantities of both manually charted data and data collected from a variety of uncoordinated medical monitoring equipment. The challenge for NICUs is a system to detect subtle warning signs of complications, giving clinicians greater insight into the moment-by-moment condition of patients.

Artemis has been developed jointly by the University of Ontario Institute of Technology (UOIT) and SickKids, with support from IBM's First of a Kind global research program. According to IBM, Artemis is a first-of-its-kind platform developed to capture and analyze real-time data from medical monitors, alerting hospital staff to potential health problems before patients show clinical signs of infection, or other issues. This platform is able to interface with a broad set of medical devices and can store the raw data it collects at the rate it is generated - 1,259 data points per patient per second.

Artemis has been in use since 2009 in SickKids NICUs as part of a clinical research study for late onset neonatal sepsis. Initially, data from two bed spaces was collected, but in 2013 new equipment will enable Sick Kids to collect data from all 40 patient beds in the NICUs. To date, the study has enrolled approximately 350 babies and the data collected approximates 10 patient years.

In addition, SickKids has implemented a second installation of Artemis to further refine a clinical rule for earlier detection of late onset neonatal sepsis, and has been successfully demonstrated. With the success of the program, hospitals in the United States and China have begun sending data from premature babies back to Canada for analysis.

A system like Artemis has the potential to: continuously process data in real-time; reduce time and effort of clinicians in assessing health data from multiple sources and allow clinicians to use data and clinical alerts to enhance care within unique environments.

The value of being able to process, analyze and synthesize real-time patient data using computing is immense. Data analytics is an increasingly viable tool to increase patient safety, reduce costs, improve efficiency and enhance quality across the health care system. The Artemis project speaks to the role of CAHO members role as early creators and adopters of technology and innovation. This project is among the first in the world to demonstrate the high potential of intelligent data in a clinical environment to improve care. Rightly so, it has expanded globally and speaks to the global innovation leadership that is occurring in CAHO hospitals.

[top of page](#)



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