FEATURE REPORT: CARDIOVASCULAR TECHNOLOGY — SEE PAGE 18

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CANADIAN
Healthcare Technology

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Clinicians are experimenting with Echo devices and the Alexa service to make living at home easier for seniors. The system enables seniors, including those with dementia, to ask questions and perform tasks.
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PHOTO: COURTESY OF THE UHN PETER MUNK CARDIAC CENTRE

Advancing the art of aneurysm repair

Dr. Thomas Lindsay, a vascular surgeon at the University Health Network's Peter Munk Cardiac Centre, demonstrates how a long graft can be inserted into the aorta of a patient, with branches for the kidneys. The innovative, team-based procedure is performed using minimally invasive methods, all through a small incision rather than open surgery. It reduces trauma to the patient and speeds up recovery times. **STORY ON PAGE 20.**

MedChart enables easier retrieval of health records

BY DAVE WEBB

NEWMARKET, ONT. – Southlake Regional Health Centre has partnered with Toronto-based startup MedChart Inc. to allow patients and authorized third parties to easily request and quickly obtain medical records online, day or night.

Southlake – a 426-bed hospital and cancer-care centre located north of Toronto – was the first hospital to join the MedChart network, in a pilot project funded partly by the Federal Economic Development Agency for Southern Ontario (FedDev Ontario).

MedChart began working with Southlake on the pilot in November 2016, and went live in May 2017.

Records retrieval is a time-consuming and ultimately expensive process for patients, says Rob Bull, Vice President of Finance, Technology and Innovation at Southlake. Previously, requests needed to be made in person during business hours, 8 am to 4 pm, Monday to Friday. This required special trips to the hospital, with time off work and parking fees.

> **Turnaround time for the delivery of patient records has been reduced dramatically.**

"That can be quite an inconvenience and amounts to an extra cost for the patient," Bull says.

For third parties, such as personal injury law firms or insurance companies, gathering records can be even more time-consuming. Those requests are typically made by mail. A health information official might have to make phone calls for clarification, requiring more mailed documentation and extra fees.

"There's a lot of mailing back and forth," says Bull.

In any case, the average request for patient records used to take 16-21 days to complete on average. However, the pilot at Southlake has reduced the turnaround time to less than two days.

And it's done online, so the patient – or his or her advocate – doesn't have to travel anywhere or use mail or fax.

In the case of Southlake, the MedChart system has been connected to the hospital's

CONTINUED ON PAGE 2

Patients and third parties able to retrieve health records more easily

CONTINUED FROM PAGE 1

electronic records systems. As a result, much of the retrieval of records at the hospital is automated.

When records are located at an outside hospital or clinic, MedChart will go out and collect the needed records for the patient.

MedChart has already been building a business on this model – doing the legwork for patients, collecting electronic and paper records for patients wherever they may be located, and centralizing them in a secure repository. Patients and their authorized designates can then access the records, anytime and from any place.

"We've retrieved health records from every single province and territory," says James Bateman, CEO MedChart. When the records are on paper, MedChart will digitize them for the patients, creating easy-to-use online copies. "There's always going to be paper information, even in a completely digital hospital," he says.

They also integrate diagnostic imaging systems, a "turnkey" process that can be accomplished in a morning and eliminates CD burning, says Bateman.

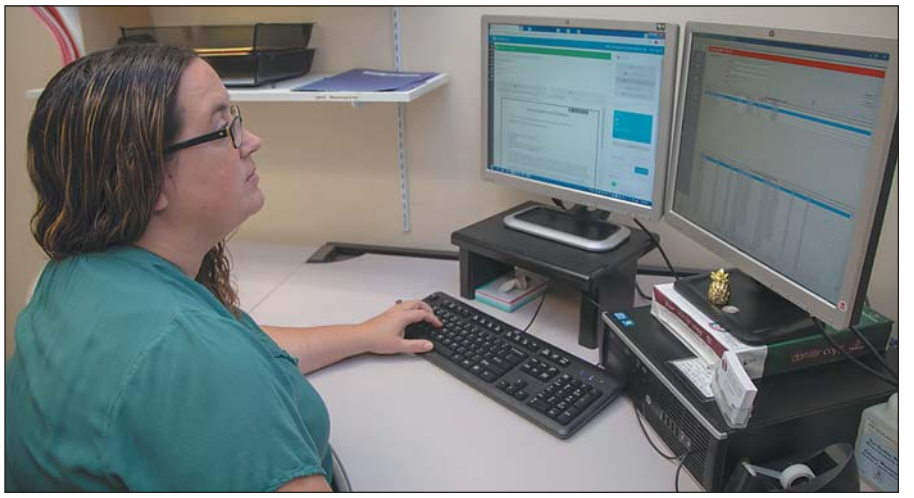
And as usage expands, information from allied health professionals – such as chiropractors and physiotherapy clinics – will also be drawn into the computerized pool of data.

Bull notes that the MedChart system automates records delivery. The retrieval work – chasing files – can still be a manual process, especially when disparate departmental systems are unconnected, or you're dealing with multiple providers and record systems.

But at Southlake, the hospital's deep integration of technology makes the job more efficient – at least for the records patients are requesting that were generated inside the hospital.

Bateman says MedChart is currently expanding its reach – he spoke from a swing on the West Coast, and is in discussions with potential B.C. users. MedChart is also working with cancer care centres on a Health Technology Fund project to provide telemedicine nurses with instant, online access to oncology patient histories. The after-hours service is run by Bayshore HealthCare.

For his part, Bateman created MedChart through a personal experience. When Bateman's father-in-law, Brian Chatland – a retired teacher, coach, referee, and member of the Canadian Rugby Hall of Fame, for whom a park in Markham is named – was dying of cancer, Bateman discovered what a struggle coordinating records retrieval from four hospitals could be.



Information clerk Jennifer Harbridge is using the MedChart system at Southlake Regional Health Centre.

"The problems aren't with the legislation. The problem is with the process," says Bateman. "There hasn't been a lot of innovation."

Bateman and fellow University of Toronto graduate engineering student Derrick Chow, now the company's chief operating officer, launched MedChart in 2015, with the support of the MaRS Discovery District commercialization hub and incubator ventureLAB. Through the MaRS Embedded Executive Program, Dennis Giokas, longtime Chief Technology Officer with Canada Health Infoway, joined MedChart as Chief Information Officer in the fall of 2017.

The MedChart implementation is now one of three dozen being developed under the Health Ecosphere banner. Billed as "An Innovation Pipeline for Commercial Health Solutions," the initiative is spearheaded by York University, Southlake and Toronto's University Health Network (UHN), and funded to the tune of $15 million under the FedDev Ontario program. It's also supplemented by $20 million from more than 30 partner hospitals, universities and technology companies.

Helping patients and third parties receive timely and confidential access to health records and related information "is vital for transforming healthcare to a patient-centred approach," says Dr. Harvey Skinner, a professor at York University and Principal Investigator of the Health Ecosphere Project. "The MedChart Platform being tested and refined at Southlake offers an incredibly promising solution to this important problem."

The scale of the problem shouldn't be underestimated. A new White Paper from MedChart shows that an estimated 300 million hours are wasted yearly in North America on inefficiencies in the release of the information process.

Compliance with the 30-day release

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1. Data on file and from public sources, 2017. **2.** Results from Friedewald, SM, et al. "Breast cancer screening using tomosynthesis in combination with digital mammography." JAMA 311.24 (2014): 2499-2507; a multi-site (13), non-randomized, historical control study of 454,000 screening mammograms investigating the initial impact of the introduction of the Hologic Selenia® Dimensions® on screening outcomes. Individual results may vary. The study found an average 41% increase and that 1.2 (95% CI: 0.8-1.6) additional invasive breast cancers per 1000 screening exams were found in women receiving combined 2D FFDM and 3D™ mammograms acquired with the Hologic 3D™ Mammography System versus women receiving 2D FFDM mammograms only. **3.** In an internal study comparing Hologic's standard compression technology to the SmartCurve™ system (18 x 24cm).

British Columbia project testing how Amazon Echo may help seniors

BY REBECCA IHILCHIK

Smart homes for seniors? The two make an unlikely match – but one project funded by the Centre for Aging + Brain Health Innovation (CABHI), powered by Baycrest Health Sciences, is evaluating how living in a smart home could improve quality of life for older adults with early-stage dementia.

Victoria, BC-based geriatrician Dr. Marilyn Malone and professor of nursing Dr. Debra Sheets are spearheading a new study called Ease e-Home.

They're developing a customizable, low-cost smart home using Amazon Echo – which connects to smart devices around the home – to support older adults with dementia and their caregivers.

"Ease e-Home has tremendous potential for people with early-stage dementia or memory loss who want to continue living in their homes," says Dr. Sheets. "Our hope is that it'll make it easier to maintain social connections and improve quality of life by helping people continue doing the activities of daily living."

Amazon Echo uses digital assistant Alexa to set reminders, make calls, play music and games, answer questions, and control lighting and motion sensors – all by voice command. Its ease-of-use makes Echo a promising option for seniors who may have trouble carrying out these kinds of tasks manually, but still want to live independently.

Smart technology to help strengthen social connections: One powerful benefit of a smart home is the opportunity for older adults living alone to preserve social connections.

Dr. Debra Sheets, professor of nursing.

Dr. Marilyn Malone, a Victoria-based geriatrician.

"People with dementia get isolated, and it's not always easy for them to figure out how to make a phone call," Dr. Sheets says. "If we can teach them to say something like, 'Alexa, call my daughter,' and they know they can reach their daughter, that's a really good thing."

A common behaviour of those living with dementia is asking repetitive questions, which can alienate friends and frustrate caregivers – but, as Dr. Sheets says, voice-assisted technology never loses its patience.

For caregivers, Ease e-Home could provide more peace of mind. In the event of a fall, they'll know their loved one can call for help immediately just by using their voice. Caregivers will also be able to monitor the actions of the older adult through the smart home system without the invasiveness of a video camera.

"Caregivers can be reassured – they'll know you got up and opened the refrigerator, or that you didn't wander out the front door in the middle of the night," Dr. Sheets says. "It allows a caregiver to do all that without having to drive across town to check on their parent."

CABHI trial to accelerate validation: Drs. Malone and Sheets are leveraging nearly $50,000 in funding from CABHI's Spark Program, which supports early-stage innovations, in order to test the project.

They'll be implementing the smart home for a four-month period in 15 homes of community-dwelling seniors with early-stage memory loss or dementia and their family caregivers.

"I really appreciate the speed with which CABHI makes innovative research happen in just a few months," says Dr. Sheets. "Other research funding cycles typically take a year."

"It's quite impressive to have this level of attention and support to ensure the project gets going," adds Dr. Malone.

The trial aims to provide scientific validation of the solution's benefits, as well as identifying any challenges and barriers affecting the caregivers and the older adults using the technology.

Drs. Malone and Sheets hope to use the results of the CABHI-funded trial to support the distribution of Ease e-Home to Canadians across the country.

"Ease e-Home could be the thing that delays older adults with dementia living in the community from transitioning to higher levels of care," says Dr. Sheets. "I think it could have a significant impact on healthcare costs."

Dr. Malone hopes that by using technology to enrich the lives of those living with early-stage dementia, Ease e-Home will help fight the stigma associated with the condition.

"You can tell a patient they have a major neurocognitive disorder and they can accept that. But once you start using words like 'dementia' or 'Alzheimer's disease,' you see this shift in how they're processing the information," she says.

"I think the use of technology to help people, and have people use technology despite having a diagnosis with stigma around it, is going to help."

Implementing the transformation project in BC's lower mainland

BY DAVE WEBB

It's been more than five years in the making, but an enterprise-wide clinical information system is finally being rolled out to hospitals and associated sites across three health authorities in the metropolitan Vancouver area.

The Clinical and Systems Transformation project (CST) – a joint initiative of Vancouver Coastal Health (VCH), Providence Health Care (PHC) and British Columbia's Provincial Health Services Authority – has now gone live at four sites: Lions Gate Hospital, Squamish General Hospital, Pemberton Health Centre and Whistler Health Care Centre.

When it's fully rolled out, CST will affect close to 40 Vancouver-area sites of every imaginable medical discipline, from urgent care to teaching hospitals, residential to cancer care. Almost 6,000 acute and long-term care beds and 35,000 staff are included in the project. It's not simply a technology overhaul; clinical content and common processes will be shared across facilities.

"It's a giant undertaking," said Ron Shewchuk, communications director of the project.

That scale is reflected in the governance strategy required to deliver what Dr. Eric Grafstein describes as "an enterprise build that has to work locally."

Grafstein is the regional head of emergency medicine and chief medical information officer for VCH and PHC. He and Dr. Alain Gagnon, CMIO of PHSA, are among the project's medical leads.

The governance structure had to accommodate three organizations that between them, cover the whole spectrum of care – surgical and emergency services, inpatient care, children's and women's hospitals, cancer care and trauma, as well as community health and residential care.

"It took a while to iron out a structure that everyone was comfortable with," Dr. Grafstein said. Even then, conflicting practices and priorities led to "pitched battles" over some issues. For example, while VCH used auto-stop, which automatically terminates prescriptions for antibiotics and opioids after five days, PHSA did not. Debate raged for two years over the issue, Dr. Grafstein said. (In the end, a consensus was reached and auto-stop was discarded, with the system left open to include other monitoring tools.)

While major decisions affecting the entire project were made by a Core Clinical Operations and Advisory Team (CCOAT), as much as possible was pushed down to representatives of the health professionals on the front-end.

"We tried to devolve the decision-making as close to the clinician as possible," Dr. Grafstein said. "Most workflows don't involve just physicians." Nursing, pharmacy, clerical, laboratory and other staff were also represented on working teams

> **It's not simply a technology overhaul; clinical content and common processes will be shared across facilities.**

to standardize processes and identify issues. To date, more than 34,000 of these processes and issues have been recorded in the Jira project management tool.

The three health authorities involved in the CST project chose the Cerner software platform for the new shared system. CST is also reliant on Cerner and other third-party experts for consulting services, noted Dr. Grafstein, adding that consulting expertise is in short supply in Canada.

"There are only so many people who have that knowledge," said Janice Manson, Cerner's senior client results executive on the project. "They're like unicorns. They almost don't exist." That's reflected in the third-party consulting market, she said.

Cerner's consulting staff is composed partly of people from a clinical background – Manson herself is a registered nurse with a masters in perinatal care – who are cross-trained in informatics and have hands-on experience with Cerner systems. Most maintain their own clinical practice outside of Cerner.

In British Columba, the rollout continues in the Vancouver area. Squamish and Lions Gate were chosen as starting points for a variety of reasons. Between them and their associated sites, they cover most of the clinical disciplines involved at most large acute care sites – Lions Gate being a recognized trauma centre with a variety of diagnostic services and equipment and one of five neurosurgery hospitals in B.C., and Squamish providing ambulatory and palliative care along with physiotherapy, laboratory and chemotherapy services. As well, their existing systems were among the oldest and most in need of replacement.

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Multi-Vendor Service agreements enabling DI department efficiencies

BY DIANNE DANIEL

When diagnostic imaging (DI) equipment at Orillia Soldiers' Memorial Hospital needs servicing, who do they call?

These days it's as easy as a simple four-digit extension: 6363 or MEND.

Two years ago, the Ontario-based hospital decided to go the route of a multi-vendor service (MVS) agreement, negotiating one large contract with GE Healthcare that covers all biomedical and DI equipment, regardless of the original equipment manufacturer (OEM). Jeff Kerk, director of Diagnostic Services, said the decision came on the heels of an extensive vendor contract evaluation and was viewed as a way to increase efficiencies and uptime while lowering costs.

"We found in our audit that there was a lot of inconsistency with the actual agreements. Vendors had different uptime guarantees, different travel costs and there were different triggers to indicate when a service call would be considered overtime," said Kerk. "The worst part from a front-line perspective was getting hold of people."

Under the new MVS agreement, whenever there's an issue with a piece of equipment – GE or non-GE – staff members dial 6363 to reach a GE Healthcare representative who has remote access to diagnostic information, including error codes, and can determine the appropriate course of action. Depending on the problem, an on-site GE technical resource can be dispatched, a GE Healthcare field service representative can be assigned, or in some instances the OEM is called. Every scenario is managed by GE Healthcare.

"Staff don't need to know the unique identifier for the equipment, they don't need to have a purchase order if it's after hours; they're instructed just to call 6363," explained Kerk.

Anne Marquis, GE Healthcare's Canadian General Manager, Service Sales, said the company invested more than $25 million over the past three years to establish a Technical Centre of Excellence in Milwaukee where field service representatives are sent for training on more than 100 non-GE imaging devices. There are roughly 180 field service representatives working in Canada alone, she added, all of whom are considered technical gurus.

"At the end of the day, no matter what equipment you have, you have to make sure that patient flow is uninterrupted and that high-end technology is functioning to the best of its ability," said Marquis, noting that GE Healthcare also has a dedicated resource in place to build solid relationships with other vendors in support of its MVS approach.

Bonnie Sipos, Niagara Health

Jeff Kerk, Orillia Soldiers' Memorial Hospital

Anne Marquis, GE Healthcare's GM, Service Sales

Negotiating an MVS agreement is a highly tailored process that takes into account factors like age of equipment, historical performance, activity level and uptime. Each MVS is unique.

Niagara Health, a multi-site hospital serving the Niagara region in Ontario, has used some form of MVS contract for the past 15 years to service its X-ray and portable units, as well as ultrasound, fluoroscopy and nuclear medicine equipment. In 2013, the organization entered into an agreement with GE Healthcare that now adds CT scan, MRI and interventional suites to the agreement as well.

Niagara Health Regional Director, Diagnostics/Laboratory/Infection Control, Bonnie Sipos said the move was largely viewed as a way to control costs. "At that point in time, service was becoming very expensive and we had a limited number of dollars," said Sipos. "It was very important to us to ensure that quality of the service and uptime would not be impacted, and to maintain our quality of patient care."

The MVS contract negotiated with GE Healthcare covers 134 pieces of equipment in what Sipos refers to as a hybrid agreement, meaning different service options are provided depending on the type of equipment covered.

Full-service contracts, including labour, parts and specialty parts, are in place for very high-end, specialized pieces of equipment like CT scan and MRI, whereas other pieces of equipment are grouped to include labour and parts, with a preferred pricing option for specialty parts.

Less complex equipment, including ultrasound and portable X-ray, is supported by a resource pool system where service calls and parts are deducted from the pool as used.

Since moving to an MVS agreement, the health system has reduced equipment downtime and freed up time for managers who no longer have to deal with service issues and repair follow-up. The equipment maintenance budget is lower and yet a very high level of service is maintained.

"It's a more organized, coordinated approach," said Sipos, noting that she receives monthly reports and also holds quarterly meetings with GE Healthcare to look at ways to manage the contract collaboratively.

At Orillia Soldiers' Memorial Hospital, Kerk said a main benefit of the MVS model is better uptime guarantee. If equipment breaks, it's back in operation very quickly. GE technicians also use remote diagnostic software to pre-empt failures.

For example, GE Healthcare recently alerted the hospital that the X-ray tube on a piece of nuclear medicine equipment needed to be replaced. The hospital was able to plan downtime for the servicing, without inconveniencing patients.

"It's worked very well for us both financially and from a quality perspective," said Kerk.

Osler opens surgical suite for vascular care at Brampton Civic Hospital

BRAMPTON, ONT. – On September 24, William Osler Health System (Osler) welcomed its first patients to a brand-new, state-of-the-art Endovascular Therapeutics Suite (ETS) at its Brampton Civic Hospital site, positioning the hospital at the leading edge of healthcare delivery for patients with vascular disease.

Made possible through a transformational donation of $5 million by Orlando Corporation, the surgical suite will serve as a space for interventional radiology, as well as an operating room – enabling Osler's vascular and endovascular surgeons and radiologists to perform life- and limb-saving procedures.

"We are thrilled to open this state-of-the-art space at Osler and provide this critical program to patients, closer to home," said Kiki Ferrari, Executive Vice President, Clinical Operations. "Through leading-edge equipment and within this innovative suite, patients who have had strokes and aneurysms will have even greater access to life-saving procedures and surgeries.

"Given the prevalence of peripheral arterial disease – a circulatory problem which leads to these conditions – as well as heart disease and diabetes in this region, the opening of this suite is excellent news for the community," added Ferrari.

Led by Dr. Varun Kapila, Osler's Chief of Vascular Surgery and Dr. David Kelton, Brampton Civic Hospital's Site Chief of Diagnostic Imaging, the surgical suite will support an innovative model of care – shared by leading vascular centres around the world – and enable clinicians to work together to provide better, more seamless care for patients.

"Osler is the first community hospital in Canada to have a joint vascular and interventional radiology program focused on providing minimally invasive procedures to patients with vascular conditions," said Dr. Naveed Mohammad, Executive Vice President, Quality, Medical and Academic Affairs.

The suite is led by both the chief of vascular surgery and the site chief of diagnostic imaging, a new approach.

"With this technologically-advanced surgical suite now open, we will be able to provide high-risk patients with even greater access to life-saving procedures, as well as a shorter hospital stay."

Leading-edge medical technology like the ETS suite is only possible because of the incredible generosity of donors. "We are profoundly grateful for Orlando Corporation's game-changing investment in Osler," said Ken Mayhew, President and CEO, Osler Foundation. "Because of their extraordinary support – which inspired unprecedented giving in our community – Osler was able to build and equip this leading-edge surgical suite at Brampton Civic, and completely transform the way we care for vascular patients."

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Precise health can be used to identify and treat at-risk populations

BY JERRY ZEIDENBERG

Earlier this year, Gary Folker battled neck cancer and won. The Executive VP of Orion Health Canada was found to be cancer-free and was given a clean bill of health from his oncologist.

However, on a subsequent trip to a doctor for a follow-up, Folker was himself taking a look at one of his CT scans when he spotted something unusual. He pointed out the peculiarity to the physician, who promptly exclaimed, "Holy Christmas, that's an aneurysm."

It was a 7.5 centimetre bulge in the abdominal aorta that was in serious danger of bursting. A few days later, Folker was on the table at hospital having the aneurysm repaired. He had a successful procedure, but it was of course a close call.

"Aneurysms are silent killers," said Folker. "They're entirely asymptomatic," meaning there's no obvious sign of them or when they might rupture.

After this harrowing experience, while chatting about it with colleagues, he learned that Orion Health had launched a groundbreaking project in New Zealand to spot aneurysms in the general public – enabling those in danger to obtain life-saving surgery.

Orion Health obtained a sample patient database, and using analytics, was able to determine which of them were at risk of an aneurysm. The project then provided CT scans to 632 of the patients. Of this cohort, an astonishing 36 were found to have aneurysms.

The point, commented Folker, is that with proactive screening and the use of analytics, at-risk patient populations could be identified and treated – before suffering death or a catastrophic incident.

"It's precision health," said Folker, noting that tying AI, analytics and databases together in this way, with the help of data scientists, is leading to breakthroughs in healthcare. And it's not only aneurysms that could be identified, but a host of ailments – such as diabetes, asthma, and other diseases.

For its part, Orion Health has been developing expertise in this form of precision health, and will be rolling out additional projects, including a few in Canada. The impact could be enormous.

With precision health, you're saving lives. You're also catching diseases and conditions before they become even more serious and costly to the healthcare system. And finally, the data can be used to help governments plan the investments they will need to treat at-risk patient populations.

However, as Folker observes, "You don't want to scan every patient for every condition. The cost would be too high."

Instead, the idea is to pinpoint indicators of disease or risk in the data, and to then test those patients for specific ailments.

"Just imagine," said Folker. "GPs could use a handheld ultrasound to check an at-risk patient for an aneurysm right in the doctor's office. It's very easy to do, and it's just one of the areas that you can target."

Still, there are roadblocks to implementing a comprehensive system of analyzing healthcare data in this way, and screening patients proactively.

There's tons of patient data in hospitals, labs, pharmacies and communities, but it's often unconnected and unshared. Next, there are privacy concerns that block the usage of the data, even if it were shared and available. That's a legislative issue to be overcome.

And finally, there's the issue of actually funding the studies, of getting data scientists to work on analyzing the information and identifying at-risk individuals.

On the bright side, some regions and provinces of Canada have "very rich databases", said Folker, and are in a position to mine them for the benefit of patient care.

Indeed, the combination of excellent databases, funding and expertise – in the form of data scientists and effective algorithms – is allowing Orion Health to start demonstration projects in certain areas of Canada. "It's an exciting area," said Folker. "It can help not only individuals, but whole populations."

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Mobile solution connects opioid-addicted patients to their caregivers

BY NEIL ZEIDENBERG

Your patient is recovering from an opioid addiction and leaves the treatment centre. He or she is not expected to return for a number of weeks, so how do you monitor their progress?

TryCycle Data Systems (www.trycycle-data.com) establishes a simple channel for opioid-addicted patients and their practitioners between appointments. "It's a digital tether between the practitioner and the patient after they leave the office," said John MacBeth, CEO.

TryCycle has three key components: an early warning system, which highlights a self-assessment (journaling); an algorithm and a clinician dashboard.

The self-assessment tool will prompt a patient to answer several questions about their emotional well-being using a one to nine scale. The system then forwards that information to the patient's treatment programs.

The clinician dashboard identifies patients at risk of relapse, and quickly notifies the practitioner that a patient is in danger and requires an intervention.

The survey questions are completely customizable to the needs of the patient. That's because there's a difference between a person suffering from opioid abuse and methamphetamine abuse, and a difference between alcohol and tobacco addiction. "The system was designed to interface and become a subject matter expert," said MacBeth.

Someone who is acute may be asked to journal up to six times a day for two weeks, whereas a non-acute patient may only need to journal once a day.

TryCycle is designed to aggregate data, which is presented in a simple format so a practitioner – based on the evidence – can make a quick decision.

The Ottawa-based company has been applying its systems mostly in substance abuse programs in the United States, due to both the size of the market and for proof of concept. In Canada, TryCycle has partnered with Royal Ottawa Hospital and University of Ottawa Medical School. It has a satellite office in downtown Toronto, sharing space with partner IBM Canada.

It's also working with Durham Regional Police for Mental Health, substance abuse, and PTSD. In fact, the company won an Ontario Centres of Excellence (OCE) award with Durham Regional Police for mental health and first responders.

TryCycle is versatile enough that a physician can use it, but the system was designed especially for the Cognitive Behavioural Therapist (CBT). "A patient will see a CBT more than they will a physician," said MacBeth. "A CBT has a good relationship with the patient and they know the resources in the community better than anybody. By giving the data to the CBT, they're in a better position to make a quick decision if a patient should seek medical assistance."

MacBeth and co-Founder, Ken House, started the company in 2012 around the time MacBeth was completing his Master's degree in Leadership Health in New Haven, Connecticut. Passionate about helping people suffering from opioid addiction and substance abuse, they developed a solution that combines human interaction with machine learning and artificial intelligence.

TryCycle can predict dangerous behaviour and identifies a patient at risk prior to them making a bad decision. "Up until now, healthcare has always been reactive, so we're treating a patient when they're already sick," said MacBeth. "What we're trying to be is proactive, and to catch the patient before they fall."

The company recently signed its first commercial partner – the fourth largest health organization in the U.S. – Hartford Healthcare, in New England.

TryCycle works with each practitioner to customize the interface to their unique audience, their demographic and jurisdiction. "TryCycle can help a practitioner that has 50 clients to effectively double that number," said MacBeth. "It allows them to care for more people, which will help deal with the pandemic of opioid use."

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Shedding light on germicidal ultraviolet systems

The systems are widely used in the United States, but just starting to emerge in Canada.

BY RICHARD DIXON

The effectiveness of ultraviolet light's ability to inactivate bacteria and viruses is not widely know and the utilization of these systems in Canada is somewhat sparse, compared to the high utilization in the United States. Canada has only 12 hospitals using UVC in patient care areas whereas the United States has over 1,200.

What Canadian healthcare infection control, facility managers and administrators may not understand is how it works. If these people don't know how it works, they may be reluctant to use it. So here is what you need to know.

Ultraviolet (UV) is electromagnetic radiation from the sun with a wavelength from 10 nm to 400 nm, shorter than that of visible light but longer than X-rays.

A nanometre (nm) is one billionth of a metre. UV is also produced by electric arcs and specialized lights, such as mercury-vapor lamps, tanning lamps, and black lights. There are principally three types of UV light and one in proximity to the accepted wavelength range.

Ultraviolet C (UVC) is the light system that is used in bacteria killing processes in water treatment plants, meat processing plants and now in healthcare facilities – laboratory clean rooms, patient rooms and patient bathrooms. The effectiveness of UVC is governed by three factors:

- Distance from the light source to the bacteria/virus
- Intensity of the light source (best at 254 um)
- Duration of light activation

When UVC light is absorbed by the DNA and RNA of microorganisms, the UVC photons causes dramatic changes in the DNA/RNA of the microorganism, rendering the microorganism incapable of replicating.

As a result, the microorganism cannot multiply, cannot cause disease and soon it dies.

Effectiveness for each type of microorganism is also dependant on the thickness of the cell wall. Influenza and adenovirus lack a cell wall and are therefore easily inactivated. Bacteria such as MRSA and VRE have cell walls but are easily penetrated, whereas C diff., when in spore form, is much more difficult to disable.

UVC is also a line of sight technology, so mobile equipment may have to be relocated a few times in a room to get at 'shadow' surfaces.

For fixed systems, more units may be required targeting high risk surfaces. There is some benefit for coating the walls with titanium dioxide, which has some mild antimicrobial properties and helps the UVC light rebound off the walls.

Here are some additional things you need to know about UVC for healthcare applications.

- UVC bulbs are manufactured to emit 85% to 90% at 254 nm, whereas only 5–10% is at 185 nm
- Quartz glass bulbs pass the 254 nm radiation level but block the 185 nm wavelength
- High quality UVC quartz bulbs do not create ozone
- Regular window glass blocks all UVC
- Safety measures must be in place to prevent exposure to UVC light to humans as it can damage the eye cornea and also can damage the skin.

- Safety measures include no patient in the room during use, machine use of motion or infrared systems to turn off the light and warning signage
- Some manufacturers sell "near UV" at 405 nm, which is not in the UV range but in the visible light range, and produces minor disinfection only.
- Near UV is useful for applications where there is the presence of people in the room and/or need of a slower acting disinfection.
- UVC applications are best used in healthcare bathrooms, as the toilet emits a fecal cloud with the flushing of the fecal material and this cloud can easily travel in air currents from the patient bathroom into their room and then into the corridor and other patient rooms.
- UVC is an accepted technology inside HVAC systems. The UVC lights inactivate bacteria and virus in the duct or at the internal coil before the air reaches the patient. Ask when your critical care area ducts were last cleaned. The answer may shock you!
- Other UVC applications include soiled utility rooms, equipment storage rooms or following standard cleaning processes in food preparation.
- Auto (fixed) UVC applications are more cost effective than portable units, which consume significant annual costs for transportation, setup and use.
- UVC light systems with sensor controls for automatic recording of light efficacy, event status are very useful for risk management.
- Next generation automated systems will use machine imaging of people in the room, as well as motion or infrared systems before activating, so they could be used in patient rooms. Patients could also activate the UVC system for their room when out for appointments or in the bathroom.
- Additional risk management features of these automated systems include the transmission of information, which can be sent via WiFi or cable along with other automated systems (i.e. hand washing compliance) to a central monitoring server.
- Bacteria and viruses are not able to become resistant to UVC light at the energy levels used for disinfection.
- Odours associated with post UVC cleaning are due to the release of cysteine molecules from the protein in hair and skin cells found in the dust or from the decaying bacteria in the air or on surfaces. Thus, education is required for equipment users, clinical staff and patients that the odour is not ozone. It is the result of UVC light when the system is functioning properly.
- More UVC applications with auto features are becoming available for Operating Rooms, Intensive Care Units, Nursing Homes and Residential Care facilities.

Keep in mind that technologies like UVC applications are enhancements to regular, infection control systems or discharge cleaning activities by environmental services staff. Recent studies indicate that environmental cleaning is less than optimal in reducing bacterial contamination and healthcare acquired infections. Here is a very good article on UVC and environmental cleaning working together:

https://www.beckershospitalreview.com/quality/the-power-of-light-how-hospitals-can-harness-uv-energy-to-reduce-hais.html

And one more tip. Before purchasing UVC equipment or other engineered infection prevention solutions, such as ozonated water or copper alloy surfaces, get the free download from the Canadian Standards Association on Evaluating Emerging Materials and Technologies for infection Prevention and Control, EXPO6-2015, via the web site https://store.csagroup.org

Richard Dixon is Deputy Chair, CHAIR (Coalition Healthcare Acquired Infection Reduction) Canada.

Ultraviolet Radiation Ultraviolet Radiation Ultraviolet Radiation

Name	Abbreviation	Wavelength (nm)	Photon Energy (eV)	Notes
Ultraviolet A	UVA	315 - 400	3.10 – 3.94	Long wave, black light, not totally absorbed by the ozone layer, used in tanning beds, can damage skin cells and can cause skin cancer
Ultraviolet B	UVB	280- 315	3.94 – 4.43	Medium wave, mostly absorbed by the ozone layer, source of skin sun burn and can cause cancer"
Ultraviolet C	UVC	100 - 280	4.43 - 12.4	Short wave, germicidal, completely absorbed by the ozone layer and atmosphere, can be harmful to the skin and eyes; needs to be manufactured
Near Ultraviolet	NUV	400 – 300	3.10 – 4.13	Visible to birds, insects and fish, in the visible range and not in the highly effective range

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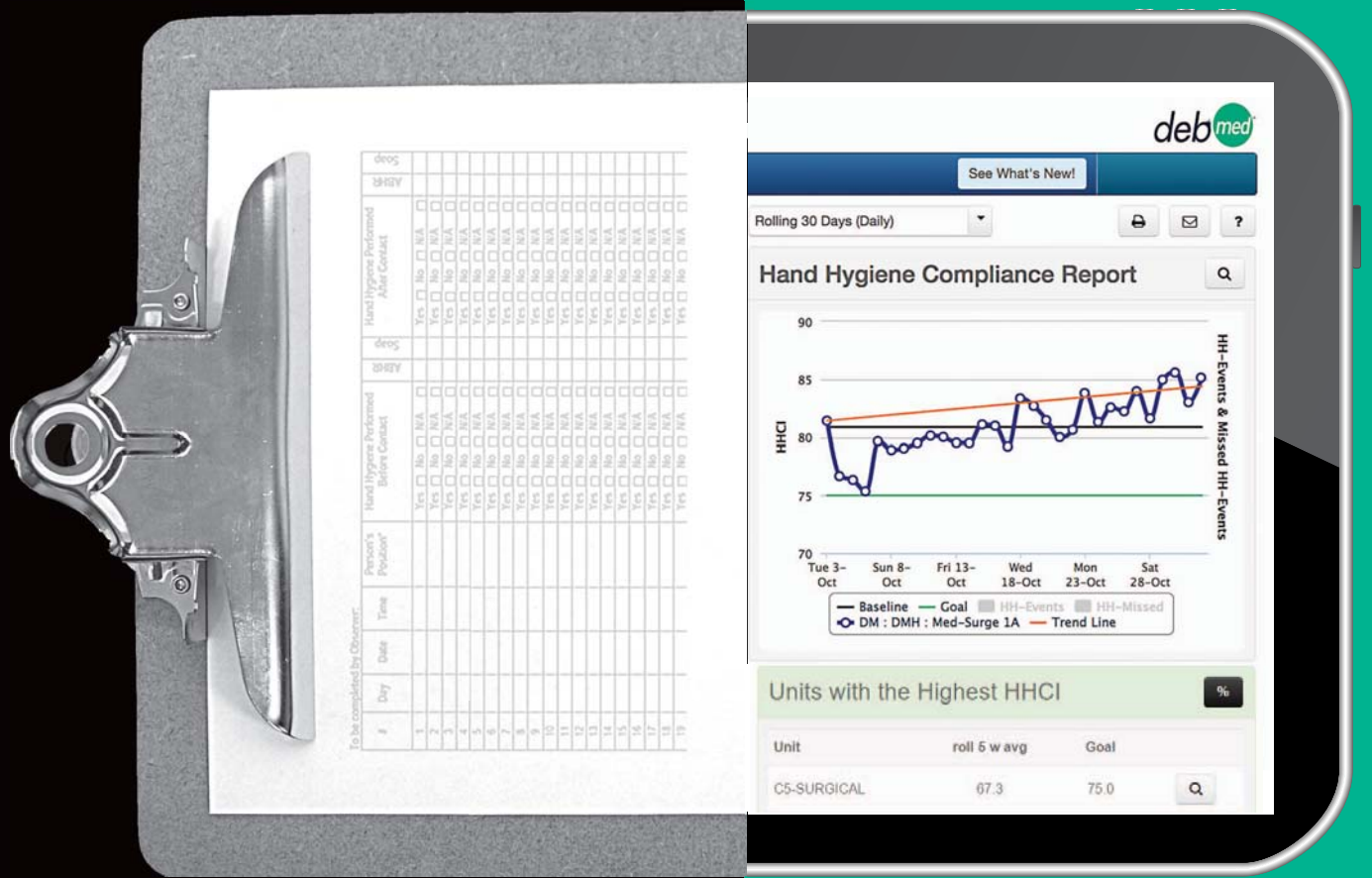

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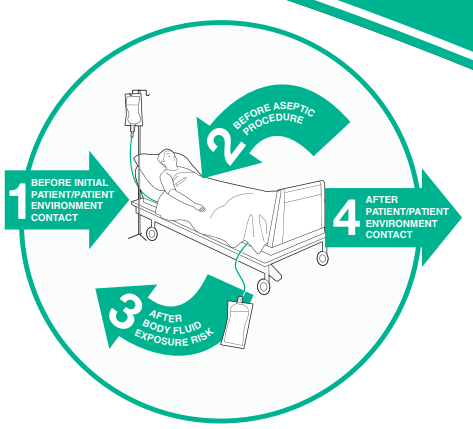

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[1]. Kelly J, Blackhurst D, McAtee W, Steed C. Electronic hand hygiene monitoring as a tool for reducing healthcare-associated methicillin-resistant Staphylococcus aureus infection. Am J Infect Control 2016;44:956-7. [2]. Robinson N, Boeker S, Steed C, Kelly W. Innovative use of electronic hand hygiene monitoring to control a clostridium difficile cluster on a hematopoietic stem cell tranplant unit. Poster presentation: Association of Professionals in Infection Control (APIC) Annual Conference; June 2014; Anaheim, CA. [3]. 4 Moments for Hand Hygiene, adapted by Public Health Ontario from the World Health Organization WHO Guidelines for Hand Hygiene in Health Care Geneva World Health Organization 2009. DebMed® is the healthcare division of Deb Group. In 2015, Deb Group was acquired by SC Johnson, a privately held, family company and one of the world's leading manufacturers of household cleaning products and products for home storage, air care, pest control and shoe care. GD1641/0918

Safe prescribing through EMRs is helping to address the opioid crisis

It is no secret that Canada is experiencing an opioid epidemic. According to the latest numbers published by Health Canada, more than 3,800 people died from opioids in 2017 compared to 2,978 in 2016. That is an increase of 28 percent over one year!

And a report published by Health Quality Ontario showed that one in seven Ontarians filled an opioid prescription. The most prescribed forms of opioids were codeine (47%), oxycodone (27%), and hydromorphone (13%). In 2016 alone, 1.3 million new opioid prescriptions were filled.

While these numbers are alarming, there are ways that clinicians can help to safely prescribe opioids to their patients through their Electronical Medical Record (EMR).

OntarioMD has partnered with Health Quality Ontario (HQO) to provide Ontario clinicians with resources, tools and support from our experienced Peer Leaders and Practice Advisors to help clinicians better manage patients' chronic pain, emphasize the safe use of opioids, and get people the care they need.

How do EMRs help address the opioid crisis? It is important to remember that opioids can still have a role in pain management and there are opioid guidelines to support prescribing decisions.

The EMR has become a helpful digital tool that enables clinicians to better understand their patients. Every patient is different, and many have complex care needs. EMRs give clinicians the whole picture for each patient, and help them tailor a care plan that fits that picture.

An EMR search will show clinicians how many of their patients take opioids and the number of different drugs prescribed along with their dosages. EMRs help clinicians identify patterns of high risk for addiction prescribing.

By learning more about their patient demographic, clinicians can conduct a more thorough analysis and take preventive measures to help prevent addiction and overdoses.

Clinicians can create reminders and alerts within the EMR for patients on high doses to better monitor their health. Using a narcotics contract between the clinician and patient can help reduce the risk of addiction and further harm by opioids.

Patients prescribed opioids for longer than 30 days should be placed on a contract combined with an assessment for addiction risk. Using all these EMR features, clinicians can monitor their patients for high-risk drug combinations, recalls for follow-up, those lost to follow-up, those without narcotics contracts and patients up for contract renewal.

OntarioMD is also leading a proof of concept initiative with OSCAR EMR and TELUS Health Solutions Inc. to demonstrate improved clinical value to Ontario clinicians through an EMR Quality Dashboard framework.

The dashboard will help clinicians better manage their patient populations, including those who take opioids. EMR-connected clinicians get a user-friendly visual view of their EMR data, using widely recognized primary-care indicators from Health Quality Ontario, the Canadian Institute for Health Information and the Association of Family Health Teams of Ontario.

The indicators allow clinicians to manage opioid-related risk by showing which patients have been prescribed opioids, along with the dosage range. The proof of concept will include up to 500 participating clinicians, and will focus on scalability so new data quality, practice, and clinical indicators can be easily integrated into the dashboard.

While EMRs are the cornerstone of managing patient care, clinicians can support each other to understand the diversity of needs and challenges faced by patients with opioid addictions.

The OntarioMD Peer Leader Program is a network of physicians, nurses, and clinic managers across Ontario who are proficient EMR users. They are available to consult with clinician practices on more efficient EMR use and workflow, and optimization of existing EMR functions.

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VIEWPOINT

Decentralized care: The rise of virtual care teams and medical office e-scribes

Today, patients want care to come to them, as opposed to having to seek it on their own.

BY DR. SUNNY MALHOTRA

Healthcare in the United States has traditionally been based on a series of independent silos – hospitals, insurance companies, pharmacies, medical device makers, etc. Patient satisfaction can be negatively affected by having follow up with multiple disciplines to obtain the necessary care, drugs, or devices.

Today, patients want care to come to them, as opposed to having to seek it on their own. Healthcare providers can reduce some of the patient workload by extending care "virtually" to the consumer – through telehealth and virtual platforms. We can also help by sharing patient data across the healthcare delivery chain; by doing so, patients don't have to start from scratch with every new provider they visit.

Consumers also want more value, attention, and personalized care. For example, physicians are putting in an estimated 785 hours per year into data collection through electronic medical records (EMRs), according to the journal Health Affairs.

Consumers no longer tolerate what they see as wasted time, and they want their physicians to literally "see" them versus turning their backs to enter data into an EMR. Improved patient engagement has been a top priority for improving the patient experience.

Thankfully, there are new technologies and services such as Augmedix, a scalable service that uses smart glass technology to securely capture physician/patient interactions and remotely scribe the outcomes of the visit into an EMR system.

Scribes have traditionally been present in the visit to document and alleviate documentation workload. Innovations such as this can reduce costs, clinical space, and overhead, while improving the patient experience and ensuring service consistency.

PwC's Health Research Institute predicts that healthcare providers who embrace the new, decentralized, "virtual" ecosystem model will profit, while those that remain siloed will falter.

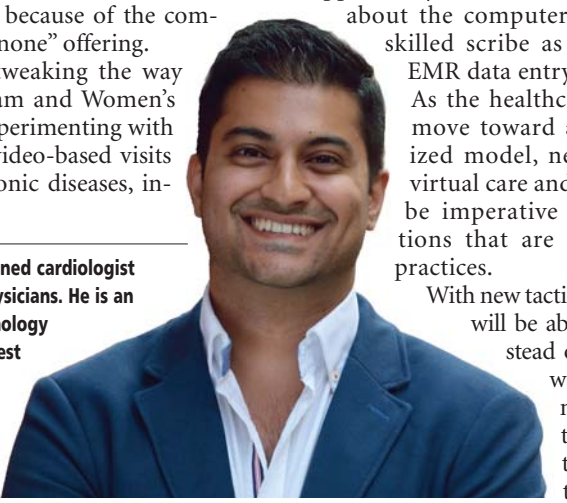
HRI found that the markets in the ecosystem that are positioned to exploit the shift to value-based care – diagnostics and therapeutics, platforms and support, and wellness – will likely experience the most growth over the next decade.

> **Hospitals in Canada and the United States are experimenting with virtual visits. They're connecting patients to clinicians by using video technologies.**

Decentralization, says Harvard Professor Clayton Christensen, is causing a fundamental problem for traditional hospitals: diminishing returns.

In a typical hospital, overhead accounts for 85 to 90 percent of total costs because of the complexity of a "one size fits none" offering.

Some, however, are tweaking the way they deliver care. Brigham and Women's Hospital, in Boston, is experimenting with virtual care by offering video-based visits for outpatients with chronic diseases, including diabetes.



Dr. Sunny Malhotra is a US trained cardiologist working at AdvantageCare Physicians. He is an entrepreneur and health technology investor. He is the winner of Best in Healthcare - Notable Young Professional 2014 and the national Governor General's Caring Canadian Award 2015. Twitter: @drsunnymalhotra

Hospitals are also consolidating systems, moving from dedicated front desk assistants to centralized call banks and putting physician's assistants and other mid-level professionals front and center.

Decentralization and consumerism also are spurring the emergence of innovative new technologies that reduce overhead and increase the value, personalization, and convenience of care. In diagnostics, companies such as Medtronic offer connected medical devices that allow consumers to send data to their clinicians and monitor services from their homes, cars, or grocery stores.

Physicians, too, are providing more personalized, attentive care by adopting technologies from companies such as Augmedix.

Says Cynthia Fiacco, family nurse practitioner for Dignity Health: "My favorite part of being in healthcare is working with patients. The transition to the EMR was very difficult due to extensive, time-consuming data entry. Augmedix gives me the opportunity to interact with the patient and forget about the computer because I can rely on a skilled scribe as my partner to complete EMR data entry for me."

As the healthcare industry continues to move toward a value-based, decentralized model, new technologies enabling virtual care and increased efficiencies will be imperative for healthcare organizations that are seeking to create robust practices.

With new tactics and technologies, facilities will be able to transition to value instead of volume-based care. They will keep up with increasing needs for patient data monitoring, and shift administrative work such as data entry to unlock efficiency gains.

Getting more innovation in healthcare procurement

In an earlier column in this space, I described the Competitive Dialogue as a form of innovation procurement that allows hospitals to generate more value from their procurements. The Competitive Dialogue's procedure allows a hospital to hold separate but contemporaneous negotiations with several qualified parties. The hospital and each participant collaborate in real-time to devise a solution that truly meets the needs of the hospital. Perhaps best of all, the Dialogue typically results in a much lower price tag.

The Dialogue, which is supported by the Ontario Centers of Excellence (OCE) within the context of its REACH (Resources for Evaluating, Adopting and Capitalizing on Innovative Healthcare Technology) program, brings something new and positive to the procurement landscape. REACH funding enables procurements that might otherwise never happen, and the Dialogue techniques help to extract more value from procurements. No wonder those who come to know the Dialogue embrace it.

But is the Dialogue and other innovation procurement models a truly powerful driving force for innovation? Maybe not. The Canadian procurement rules generally apply equally to all participants in the procurement process: the laws are complex, the details voluminous, and the process burdensome. Not so surprising then that the smaller companies are significantly disadvantaged when it comes to bidding on public sector projects. They don't carry in-house the level of procurement expertise enjoyed by the larger companies.

Sadly, some smaller Canadian companies more easily sell abroad than in Canada. That was the case with the members of the Trillium Medical Technology Association in the late 2000s. The Association would lead regular pilgrimages to hospitals in China because selling in Ontario was becoming overly complicated for smaller medical technology companies.

Denis Chamberland

Yet, smaller companies often outinnovate the bigger players. So what kind of procurement model would unleash small-business health innovation on a scale never seen before? The answer is in 'set-asides'. Set-asides are a form of preferential procurement designed to achieve specific policy objectives. Set-asides have generally been roundly shunned in Canadian procurement on the grounds that public procurement shouldn't meddle in broader social policy objectives.

Many countries have had a different view on this, including the United States. Under the federal Small Business Act of 1953 (SBA), an independency agency is specifically dedicated to helping small businesses get business from the federal government's procurement activities through set-asides. Set-aside programs allow government agencies to limit competition for certain contracts to small-business bids only. The current set-aside tar-

CONTINUED ON PAGE 22

SeamlessMD tackles the opioid crisis with app and machine learning

BY BEN WINN

There is currently an opioid crisis in both Canada and the United States. How did we get here? Opioids are painkilling drugs that are usually obtained in one of two ways: doctor-prescribed for acute or chronic pain, and those gotten illegally on the street – like heroin or fentanyl, for example.

In 2016, Canada saw 8.8 opioid-related deaths for every 100,000 people, and the United States saw 21.3 opioid-related deaths per 100,000 people. For the United States, this represents a 533 percent increase over 14 years, and for Canada, it represents a 416 percent increase in the same time period.

Even more alarming, additional data shows that 75 percent of opioid abusers began using doctor-prescribed opioids for their recovery post-surgery.

Where does SeamlessMD come in? SeamlessMD is a Toronto-based health-tech startup that provides an Optimal Care delivery platform for hospitals in Canada and the United States. The technology includes a patient-facing application which works on web, iOS, and Android, as well as a provider-facing dashboard that allows hospital care teams to gain patient insights that were previously unavailable.

This enables healthcare teams to monitor their patients more effectively, in and out of the hospital.

Concerning opioid prescriptions, one data point that providers can now track is daily opioid consumption – which they can view on an individual patient basis, as well as in aggregate form across their entire patient population.

How is SeamlessMD approaching opioid management? Before SeamlessMD, the only way physicians could track patient opioid consumption outside of a formal study setting was by asking patients a series of questions – either over the phone or at a post-op visit. Because of the time-consuming nature of this process, a lot of the data was inaccurate and did not represent a clear, full picture for every patient.

SeamlessMD has changed this process entirely: Patients are asked every day (via email, text, and push notification) to enter the number of pills they've taken. This allows physicians to see consumption levels on a daily basis as well as the trend for each surgical episode.

Diving deeper, SeamlessMD also collects other information from patients each day; such as pain levels, anxiety levels, nausea, etc., and combines all of the data points together to provide a better understanding of the factors affecting usage patterns.

This gives physicians a data-driven approach to the number of pills they should be prescribing, and tells them which patients may be more vulnerable to addiction.

As an end-to-end solution, SeamlessMD also delivers education to patients in a dynamic way – according to the individual needs of each patient. Since the app knows which pills the patient has been prescribed, tracks daily usage, and knows how many pills each patient has remaining, each individual experience is personalized. For example, education pertaining to opioid addiction, proper disposal of pills, and how to wean off opioids can be pushed to patients who exhibit early signs of prolonged use.

Finally, the patient data that is collected throughout the surgery episode is input into various machine-learning models that can predict (based on a large number of factors) which patients are more at-risk of opioid addiction.

Past studies have shown that smokers and diabetics face a greater risk of opioid addiction, but with the vast number of data points collected by SeamlessMD (beginning weeks or even months in advance of the surgery), machine learning models can provide actionable insights that further personalize patient care. This means every patient receives the right care, at the right time, and hospital care teams are able to address any concerns as soon as they arise.

Regional hospitals providing leading-edge cardiac care to their communities

Community hospitals have also invested in new software, enabling easier access to information.

BY DIANNE DANIEL

Complex cardiac care in Ontario is no longer limited to major urban teaching hospitals. New technologies and management techniques – coupled with strong partnerships – are strengthening advanced regional programs, bringing excellent care closer to where cardiac patients live.

Royal Victoria Regional Health Centre (RVH) in Barrie launched its regional cardiac program in partnership with Newmarket's Southlake Regional Health Centre in January, enabling its cardiac team to perform angiograms and percutaneous coronary intervention (PCI or angioplasty). The program is supported by 10 cardiologists, a dedicated seven-bed coronary care unit, two catheterization labs (cath labs) accompanied by a 16-bed recovery unit, and a 32-bed cardiac/renal unit for general cardiac care.

Planning for advanced care delivery began in 2012 and was based on a strong vision to create a comprehensive, centralized electronic system specifically for cardiac care. "We really felt our solution needed to describe the patient's cardiac journey, and that journey should be available essentially anywhere in the world a physician would need it, if they needed access to that information," said Selma Mitchell, operations director of the Simcoe Muskoka Regional Heart Program & Regional Renal Program.

To streamline workflow throughout its cardiac care program, RVH partnered with Philips, implementing the IntelliSpace Cardiovascular image and information management solution, along with supporting applications for nursing documentation and patient monitoring. Physicians log-in to see all patient test results, including echocardiograms, electrocardiograms, cath lab exams and Holter monitors, and the system is integrated with RVH's existing Meditech electronic health record system.

As Mitchell explained, it's not only the diagnostic report that's available, but the live image too. "Our patients love it. We pull this up at the bedside, after the patient has had the procedure, and their physician will show them what their angiogram looked like," she said. "It's really interesting for them to see their images in real life."

The advanced system is accessible beyond the walls of RVH. If a patient is transferred to Southlake for a more complex procedure or surgery, for example, the treating physician there is able to access and view all prior diagnostic testing.

"You can't just deliver a hardware system," explained Mitchell. "You need to be able to connect it to the patient and the software piece is integral … that was probably the most important aspect for us, having a system where we could connect all of the dots."

The "dots" are also being connected between RVH and the smaller regional hospitals within its catchment area in the North Simcoe Muskoka local health integration network (LHIN). Recently, RVH integrated its electronic cardiac system with the Huntsville District Memorial Hospital site of Muskoka Algonquin Healthcare, enabling physicians there to share images and reports with cardiologists at RVH.

"A few years back, if a patient had to be referred to another physician, we would have had to taxi a CD down to that partner hospital, which took time," said RVH Cardiac IT team member Stef Keown. "Now they can access it in seconds versus hours."

By 2020, the new regional program will operate 24/7, with paramedics transporting North Simcoe Muskoka heart attack patients directly to RVH for treatment, providing lifesaving intervention within 90 minutes for most patients. In the meantime, the plan calls for a cautious, phased ramp-up of cardiac services, supported by ongoing partnerships with Philips for infrastructure and Southlake for tertiary and quaternary services, including advanced cardiac surgery and heart rhythm interventions.

Janice Allen, director of Southlake's Regional Cardiac Care Program, said the most important objective of the regional focus is to deliver excellent cardiac care while reducing patient travel. "It truly is one program with two sites," said Allen, adding that the Southlake cardiac surgery team conducts satellite clinics at RVH as needed for complex patients. "It's

really great from a regional perspective to be able to offer this cutting-edge care closer to home for our patients. Otherwise they would have to be travelling to academic centres," she said.

In February 2018, Southlake completed a redevelopment of its cardiac labs, providing more efficient care for patients in need of complex cardiac interventions across the region. The third largest cardiac centre in Ontario, it now operates three cath labs outfitted with state-of-the-art imaging systems for diagnostic angiograms, angioplasty and structural heart procedures, and three dedicated electrophysiology suites for heart rhythm diagnostic studies, ablations and implantable devices such as pacemakers and defibrillators. The new equipment – which includes the latest in 3D imaging and mapping – creates opportunities for future growth, said Allen.

Since inception, the centre's Regional Cardiac Care Program has treated more than 160,000 patients, completing 93,370 diagnostic tests and exams last year alone. In addition to more than 6,000 diagnostic catheterization procedures, 1,000 surgeries, 752 electrophysiology studies and 687 cardiac ablations, the centre performed 71 transcatheter aortic valve implants (TAVIs) in 2017 and is awaiting approval from the Ontario Ministry of Health and Long-Term Care to add mitral valve clipping procedures.

"The other procedure we're looking at doing is left atrial appendage closure for patients who have Afib (atrial fibrillation), who are at high risk of bleeding on an oral anticoagulation therapy," said Allen.

Remote monitoring of patients is another part of the regional program which is contributing to fewer hospital readmissions and reduced lengths of stay. Patients who receive pacemakers or implantable cardioverter defibrillators (ICDs) and who provide consent for remote monitoring are able to download information from their devices daily for review by nurses. Monitoring is also provided for congestive heart failure patients, who track their weight, oxygen saturation levels, heart rate and blood pressure.

"If patients are trending in the wrong direction – if their weight is going up or their oxygen saturation is trending down – they may not be symptomatic at that point, but our team can pick up on that and call them," she said, noting that the same monitoring service is provided to elderly patients who reside in long-term care settings.

An added advantage of the regional program is that Southlake is able to bundle contracts with industry partners and vendors into one "innovative procurement with multiple streams," Allen said. Innovative procurement means vendors don't simply sell products, they work with the hospital to improve quality performance indicators such as readmission to hospital, length of stay and mortality rate. "It was a lot of work," she said. "We're very proud because we were able to deliver benefits to our patients through a procurement strategy. We haven't seen that before."

St. Mary's Hospital in Kitchener is also aiming to use innovative procurement to support its strategy for a new regional cardiac program. As Chief of Cardiovascular Services Dr. Brian McNamara described, the approach is more about outcomes than widgets.

"Traditionally, hospital procurement has been 'we use 2,500 stents per year, we promise to buy them

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Getting to a state-of-the-art stage of minimally invasive vascular surgery

BY ANA FERNANDES

Thomas York points at the tiny scar on his left shoulder. The cut of less than one centimetre made way for a sophisticated procedure that restored his peace of mind.

"I was walking around with a bomb in my chest that could blow up at any time," he says.

At 71 years of age, Thomas was living for the past five with an aortic aneurysm. The repair to this condition is one of the most complex and delicate procedures in vascular care. And, in York's case it was also a remarkable achievement of minimally invasive technique in Canada.

A silent and often fatal disease, an aortic aneurysm is an enlargement of this major artery that carries blood from the heart to the rest of the body. An aneurysm usually causes no symptoms, but it weakens the wall of the aorta which can lead to a sudden rupture and massive internal bleeding.

York's "bomb" was disarmed by a surgery called endovascular thoraco-abdominal aneurysm repair. Surgeons from the Peter Munk Cardiac Centre (PMCC), UHN, inserted a custom-made graft that has branches for his bowel and kidney arteries in his aorta.

This graft is a flexible synthetic tube that basically works as a new aorta in the area that is enlarged. The branches are then attached to the four bowel and kidney arteries with short bridging grafts inserted from above – through an artery under the collar bone.

His surgery is believed to be the first totally percutaneous aneurysm repair in Canada for this specific type of aneurysm. Thomas had a thoraco-abdominal aneurysm, which stretches from the chest all the way down to the lower abdomen.

"I woke up with this tiny cut and it's just like magic," says York. "I could hardly believe the surgery was done. It really blew my mind that they could do something with this level of precision like this."

Dr. Thomas Lindsay, vascular surgeon at the PMCC who led Thomas York's case, says the recent advances don't impress only the patients.

After witnessing the evolution of vascular repair from open surgery to a state-of-the-art minimally invasive procedure like this over the last two decades, Dr. Lindsay says he can barely believe how far medicine has come.

"My generation, we were trained to do repairs for this type of aneurysm in open surgery," says Dr. Lindsay. "Something like this was a pipe dream when I was training."

Today, that dream is very real and requires a lot of engineering, technology and teamwork to put together.

The graft is custom-made for each patient, designed in the United States and produced in Australia. In the OR, you have a highly specialized team of surgeons, anaesthetists, radiologists, nurses, radiologist technicians, spinal cord technicians - all trained to do a very precise job.

The device that carried Thomas York's graft was over 60 centimetres long, but only 8.5 millimetres wide. It also counted four 6 to 8 millimetres wide branches.

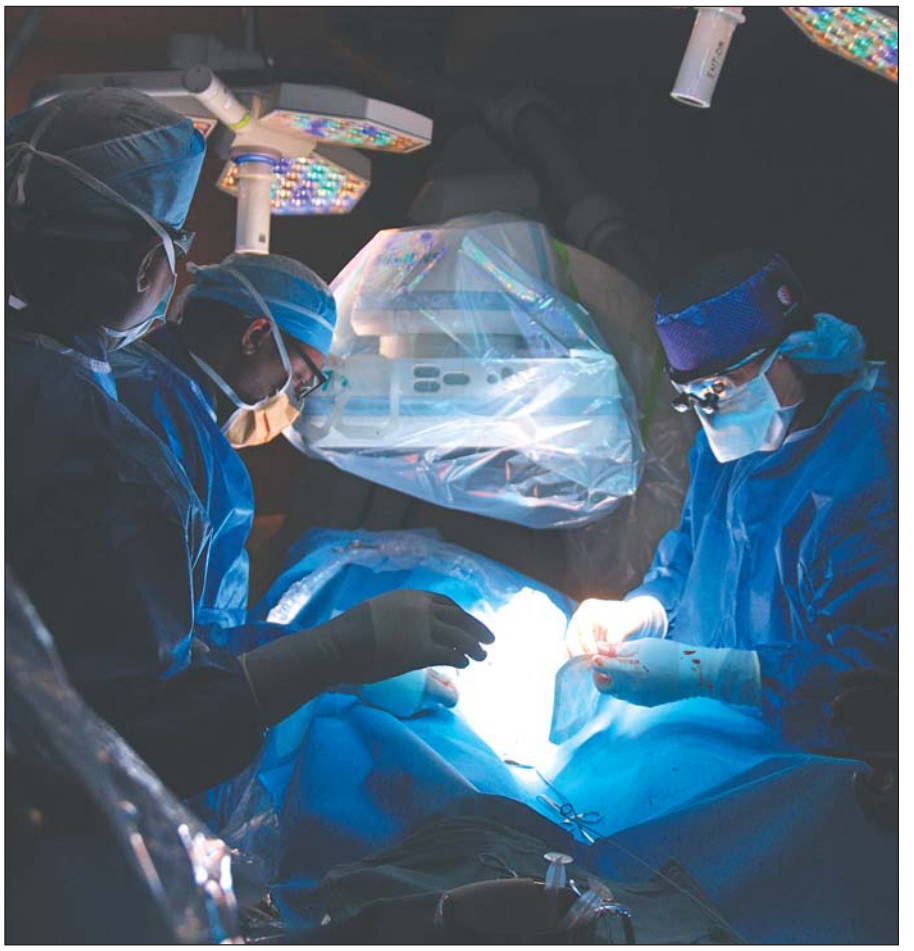
The tube comes in collapsed, and it really takes a talented team to get it in the right position and have each branch open at the exact location – and all through that small cut.

Such an effort allows for a decline in risk of mortality and of complications like paralysis or kidney failure. It also allows for faster and safer recovery.

"In the past I thought we could never achieve something like this," says Dr. Lindsay. "These advances in medicine are all about moving the needle forward to cause less trauma to the patient and hopefully achieve better outcomes."

In York's case, the minimally invasive procedure allowed him to leave the hospital only seven days after his surgery. He's now back in his hometown, Belleville, Ont., enjoying a second lease on life with his wife, son and grandchildren.

"Now that this load is literally off my chest, I feel like I can do anything. And I still have lots to do," he says.



Dr. Thomas Lindsay, right, works with a team to insert an innovative graft in a patient with an aneurysm.

'Frozen elephant trunk' procedure used in Kingston

Kingston Health Sciences Centre (KHSC) has become the first in North America to offer a unique surgical procedure to treat patients with a complex aortic disease known as an aortic dissection, a life-threatening condition in which the largest artery in the body splits or breaks.

Repairing the aorta, especially at its upper arch – the curved segment where the neck vessels branch off to provide blood to the brain – is challenging and risky, and can be further complicated because the damage can extend further down, into the chest portion of the artery.

The KHSC team, led by cardiac surgeons Dr. Gianluigi Bisleri and Dr. Darrin Payne, in collaboration with the Department of Anesthesia and the Perfusion Team, recently completed a complex reconstruction of the aortic arch and repair of the descending aorta using new vascular technology, successfully correcting two serious problems in one surgery. It's known as a 'frozen elephant trunk' procedure.

"Treating the complete aortic arch is not very common given that it is one of the most complex surgeries," says Dr. Bisleri, who is also a Clinician-Scientist and Associate Professor of Surgery at Queen's University. "The multi-branch vascular graft that we used (Lupiae graft) allowed us to reconstruct the arch and its neck vessels in a more anatomical fashion. At the same time we also deployed a new, hybrid stent into the aorta (Evita Open System). This enabled us to perform extensive repairs, using improved devices, in a novel way, for the first time in Canada, the United States or Mexico."

It's the first time the specialized technique has been used in Canada, the United States or Mexico.

In the past, patients would have required two separate, invasive surgeries, completed about two months apart, requiring opening the chest in the front and on the left side, leading to extremely invasive procedures and a slower return to routine activities for patients.

"Those surgeries also required a significant cooling of the patient's body temperature to almost 18C, which could have potential negative impacts on the body," says Dr. Bisleri. "This new approach instead ensures blood flow in the most important organs at all times, allowing more normal temperature to be maintained during surgery. It is a considerable improvement in the surgical approach that can make this complex treatment more feasible, while minimizing the complications and reducing the patient's recovery time."

"This innovative surgical option allows us to expand the treatment of a very complex population, especially for those patients who suffered an aortic dissection" says Dr. Bisleri.

"We're extremely proud to bring this specialized level of care to the people of Southeastern Ontario and our province in general," Dr. Bisleri says. "This is another example of the excellent cardiac program we have in Kingston and how KHSC and Queen's University have been supporting the adoption of innovations in areas of unmet needs such as complex aortic arch disease, integrating new technologies and techniques to benefit the patients in our area and beyond."

Patients able to easily retrieve health records

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window has also been an issue. The White Paper estimates compliance at 62 percent in the existing system, with an average wait of 20 days for records release. Using MedChart, Southlake boasts 99 percent compliance, and an average turnaround of less than 48 hours.

Those "cost-curve bending" efficiencies will only become more important as patient volume increases, says Bull. Southlake currently receives 110,000 emergency room visits a year, and also provides cardiac, oncological and other specialty clinical services.

Uptake of the MedChart system by patients and third parties has been significant, as most of the institution's requests for personal records each month are now being made online. Southlake has saved 74 percent in material costs for these requests. One surprise from the pilot: 73 percent of requests for information were made after business hours, a savings of time and money for patients and families, says Bateman.

UHN researchers find untapped pool of data to help predict outcomes

BY ANA FERNANDES AND JEFF JURMAIN

While working on a project to centralize data systems, researchers at the UHN's Peter Munk Cardiac Centre (PMCC) stumbled upon a gold mine of a previously untapped pool of information. They had found a computer that had a complete set of information from routine exercise tests done with heart failure patients between 2001 and 2017.

According to Cedric Manlhiot, the scientist who leads the Ted Rogers Centre efforts in using and analyzing data at PMCC, tests done on treadmills and bicycles generate dense data that was not being used, other than the summary data. Now, with advances in artificial intelligence (AI) and machine learning, there are tools to use this kind of information and benefit patients.

"We must resist the urge to oversimplify data and discard information so that it's easier for us to understand," says Manlhiot. "Most machines are programmed to reduce complex data to easy numbers for human consumption, and when this is used by medical staff you are throwing away so much valuable knowledge."

Before AI, exercise test results were simplified. The system was capturing 60 indicators on the patients' every breath. In a session that would generate thousands of data points, 95 percent of that information was being thrown away in order to make the information digestible to humans.

Manlhiot and his team realized they now had the means to analyze all the information that was sitting in that computer and compare it to medical outcomes observed over that time period. This would allow them to understand the value of the data and if it could represent any advantage to patient care.

Dr. Heather Ross and scientist Cedric Manlhiot are using artificial intelligence to gain additional insights.

In a world-first study, the researchers at PMCC were able to hone in on breath-by-breath data, discovering that they delivered a far clearer picture of someone's health status than the simplified metrics we use today. It means that we now have clinically relevant machine learning models that can predict a heart failure patient's status one year from now.

To achieve that, the team created software using a machine learning method that's called a convolutional neural network. This means instead of only comparing a few variables at a time – the traditional human way of looking at data – the AI software used "neural layers" to cross information from multiple variables at once.

As of now, Manlhiot and the team can use the software to predict with 85 percent accuracy when a heart failure patient is at the verge of running into trouble. And they are tweaking it to get above the 90 percent mark. The traditional use of exercise test results could only get to the mid-70 percent accuracy.

"With deep learning technology, our software is capable of analyzing this dense data and identify clinical and subclinical markers that are associated with clinical outcomes," explains Manlhiot. "We are now perfecting this technology so we can start using it with patients."

Cardiologist Dr. Heather Ross, Director of the Ted Rogers Centre of Excellence in Heart Function at the PMCC, and one of the lead authors in this study, explains it is crucial to be able to identify that precise moment when a heart failure patient is about to start deteriorating.

"This technology can represent a great advance in helping us catch the early signs that the patient is getting worse, so we have more time for treatment planning," says Dr. Ross.

"We want to intervene on the right patient at the right time. Improved accuracy allows us to avoid unnecessary treatments in patients that don't yet need them, and to ensure we don't miss an opportunity to intervene on a patient before it is too late."

Heart failure is a disease that has stages in which the heart muscle progressively pumps less blood to the organs. The progression however isn't linear and not always apparent. AI models like this one can have a big impact in helping physicians monitor the disease.

"We're confident this will be a very valuable clinical tool, for heart failure and potentially many other conditions," says Manlhiot.

"This technology can make a real difference in getting a patient a heart transplant or a ventricular device at the right moment. Ultimately, it really is artificial intelligence with the potential of saving lives."

How medical-grade wearables are changing the face of cardiac care

BY WAQAAS AL-SIDDIQ

Wearable devices are increasingly being touted for their health diagnostic and treatment capabilities, to the detriment of the public's understanding of what actually constitutes a medical-grade wearable device.

Apple recently announced that it has received FDA clearance for two new features for the Apple Watch Series 4. One is an EKG app that monitors the electrical activity of the heart, and the second is an app that has the ability to detect and notify the user of an irregular heart rhythm, or arrhythmia. However, the FDA clearance letters for both apps have made it clear that they are "not intended to replace traditional methods of diagnosis or treatment."

So, what exactly does this mean? In short, the new Apple Watch is not a medical device, so it can't be used for diagnosis or treatment because it will not produce medical-grade data.

Patients, however, can benefit from Apple's health tracking device – especially when used as a first step in the possible identification of a heart problem that might have gone previously unnoticed.

This is especially helpful for detecting atrial fibrillation, which is a condition that affects between 2.7 and 6.1 million people in the US, according to estimates by the Journal of the American College of Cardiology, and is one that many are not even aware they suffer from.

So, if a user wearing the new Apple Watch is getting an arrhythmia alert repeatedly, they should take that as a sign to see a physician and obtain a professional diagnosis and prescribed treatment of care that often involves a medical-grade patient monitoring device.

Next generation medical-grade wearable devices produce clinical-grade data that is accurate to within 90-95 percent or higher and are prescribed by physicians to support diagnoses and treatment plans. They allow physicians to remotely monitor their patients, providing real-time access to health data.

In conjunction with software and mobile apps, such as the Sugar.IQ app for diabetics, they can offer predictive capabilities that allow patients and healthcare professionals to identify early signs of disease and help prevent exacerbations.

Increasingly, medical wearables are being designed with usability in mind, for both physicians and patients. Device data is collected wirelessly through cellular transmission, making it easy to assimilate into a physician's workflow. These devices are not only enhancing the diagnostic process, they are also insurance reimbursable.

For patients, enhanced usability translates to small, portable devices with a simple user interface that is easy to navigate and understand.

Medical wearables are also starting to incorporate deep data and artificial intelligence (AI). On the diagnostic side, deep data and AI can review, analyze, and synthesize data obtained from a medical device in a meaningful way through an interface that identifies data trends and pinpoints important information from which actionable insights can be gleaned.

> **The Apple Watch, while not medical grade, is still a first step in identifying possible heart problems.**

Post-diagnosis, as AI collects individual patient data and begins to learn how patients react differently to feedback, it can begin tailoring feedback that is personalized and predictive to encourage patients to make empowering health and lifestyle choices.

Perhaps the most exciting development in medical wearables are implantable devices that are placed inside the body or under the skin to collect vitals and monitor a patient's condition.

These embedded technologies may collect biometrics for the purpose of diagnosing disease, and they might also dispense medication and thereby actively "treat" a patient. The challenge lies in creating invasive technology that is nevertheless safe and undetectable for humans without sacrificing the accuracy or reliability of collected data.

In fact, the future of wearables might well translate to "implantables" that blend technology with humans to improve our quality of life.

Waqaas Al-Siddiq is Founder and CEO of Biotricity, a biometric remote monitoring solutions company. He is a serial entrepreneur, a former investment advisor and expert in wireless communication technology. He has vast experience through executive roles within start-ups, mid-sized companies, and non-profits. For more information visit https://www.biotricity.com

Regional hospitals

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from you at this price,'" he said. "This is more about 'we want to have a lower stent thrombosis rate, or a shorter door to balloon time or a shorter length of stay. How can you help us do that?'"

The hospital will meet with local technology companies and leaders in October to provide them with an outline of its plan for a Waterloo Wellington Regional Cardiac Program – an expansion strategy that is supported by the Waterloo Wellington LHIN and is currently seeking funding approval by the Ontario Ministry of Health and Long-Term Care. Dr. McNamara said the need for additional services is "irrefutable."

Over the past 15 years, St. Mary's Hospital has grown its cardiovascular services to the point where it is now completing more than 6,000 cath lab procedures each year. Nine years ago, the centre performed 900 PCIs per year; this year it completed more than 1,800. Yet the underlying infrastructure hasn't changed, meaning the two existing cath labs are used around the clock, straining equipment and resources.

"A few years back St. Mary's leadership and the Board instituted a Lean management strategy to try to extract the most value from the resources we have – both physical and financial – and those efforts have squeezed absolute maximum capacity out of the existing infrastructure," he said.

Services provided by St. Mary's include pacemaker and ICD insertions, coronary artery bypass and valve surgeries, catheterizations and PCI procedures, Transcatheter Aortic Valve Implantation (TAVI) and diagnostic coronary angiography. There is a very busy pacemaker and ICD and CRT Program. The Cardiac program is supported by 18 cardiologists, four surgeons, five cardiac anesthetists and a dozen nurse practitioners. According to a 2017 national report on quality outcomes at Canada's 38 cardiac centres, St. Mary's is performing better than the national average and is among the top three.

"For a small place, we do PCI and cardiac surgery at a level that's commensurate with the top three places in the country and some of our metrics are better," said Dr. McNamara. For example, Canadian average mortality rates following cardiac procedures range from 1.3 to 2.3 percent whereas St. Mary's rate ranged from 0.5 to 1.6 percent. The average readmission rate following PCI was 7.4 percent; St. Mary's was 5.8 percent.

In addition to the hospital's strong cardiac performance, the community is now better served thanks to changes in outpatient care delivery. The cardiologists are aggregated together into one, large outpatient clinic. Before, family doctors would fax referrals and send consult requests all over the Kitchener-Waterloo region. Now the entire service is staffed by one clinic and each cardiologist leaves a few openings in the weekly schedule to treat emergency patients.

"It's much more responsive to the community and it has completely transformed outpatient cardiology access," said Dr. McNamara.

Moving forward, the expanded plan includes developing a "hub and spoke" model for advanced cardiac care delivery, with St. Mary's Heart Function Clinic as the main resource for guidance, order sets and care of the highest risk and sickest patients in its catchment area. The "spokes" will be satellite services provided in smaller communities, but under St. Mary's guidance, he explained.

St. Mary's Hospital, in Kitchener, Ont., is performing better than most cardiac centres and is among the top three in Canada.

St. Mary's regional cardiac program serves over 20 hospitals in a geographic rectangle stretching from Simcoe to Tobermory, along the coast of Lake Huron to Goderich and east to Guelph. One of the goals of the expanded Waterloo Wellington Regional Cardiac Care program – which includes the addition of an electrophysiology lab to treat advanced heart rhythm disturbances as well as remote cardiac rehab – is to develop a comprehensive digital strategy.

Concurrent with its strategic plan to expand regional cardiac care services, St. Mary's is in the midst of a large Cerner electronic medical record implementation in conjunction with Grand River Hospital. Dr. McNamara expects the new system will enhance the flow of information between satellite sites so that a physician at one location can get an ECG in front of an on-call cardiologist at St. Mary's in a secure manner that protects patient privacy.

"It's one of those Tower of Babel situations. The hospitals we work with all use different platforms for diagnostic imaging, records; it's difficult to talk to each other," he explained. "The hope is one EMR will enhance the to and fro of information to our partner hospitals in a more seamless way."

Thunder Bay partners with Peter Munk Cardiac Centre

A full cardiovascular surgical program at Thunder Bay Regional Health Sciences Centre is expected to be up and running in 2020. That's welcome news, as the burden of cardiovascular disease in Northwestern Ontario is well above the provincial average.

Meeting the acute care needs of patients in the region means providing cardiac and vascular care close to home. Capital planning is now under way, bringing the hospital one step closer to launching the new program.

Thunder Bay Regional has partnered with the Peter Munk Cardiac Centre (PMCC), which is part of the University Health Network located in Toronto and one of the world's leading cardiac and vascular centres.

The unique "one program two sites" model will bring safe, quality cardiovascular care to patients in Northwestern Ontario. Under the guidance of the PMCC, patients at the Hospital in Thunder Bay will receive the same high-quality cardiovascular care as they would in Southern Ontario, but without the added stress and expense of having to travel.

It also enables patients living in Northwestern Ontario to receive the life-saving procedures they need in a community that is more sensitive to their needs and more familiar with their circumstances.

Arlene Thompson, Senior Director of Cardiovascular Program Development and Implementation, looks over expansion plans for the hospital's new Cardiovascular Surgical Program.

"We are excited to be making significant progress, in collaboration with the University Health Network's Peter Munk Cardiac Centre," said Arlene Thomson, Senior Director, Cardiovascular Program Development and Implementation. "We are working closely with the Capital Planning Branch at the Ministry of Health and Long-Term Care to ensure our facility is ready to offer these new, much needed services."

The new program will require more beds, specifically for cardiovascular patients. The Hospital is also working with architects and planners to identify appropriate locations for the new areas that will be needed for this program.

This includes 19 additional patient beds, a new surgical suite and related renovations, new vascular lab, renovations to Ambulatory Care and Central Processing and other updates as required.

"Right now, our goal is to build within our Hospital walls where possible. An expansion of our current hospital is likely, and will be done within accordance of Ministry guidelines and in such a way that will support our ability to provide quality patient care across all clinical units," said Thompson.

The Ministry of Health and Long-Term Care has committed to funding 90 percent of the construction costs associated with the project. It will be up to the Thunder Bay community to cover the remaining 10 percent of the construction costs plus 100 percent of the capital equipment costs.

To learn more about cardiovascular care at Thunder Bay Regional Health Sciences Centre, please visit www.tbrhsc.net.

Denis Chamberland

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get in U.S. federal procurement calls for 23% of all federal contracts to go to small firms.

The 23% rule allows for direct contracting with federal government agencies, but it also allows for direct involvement with large bidders who are mandated to piggy-back the 23% rule. According to Dan Wasserman, founder and CEO of Mammoth Health Innovation, a Canadian company that helps companies commercialize health innovations and is well versed in the minutiae of the SBA, this program greatly contributes to innovation and increases the rate of commercialization and the degree of commercial success.

Back here at home, there's been some progress in the direction of preferential procurement. In Ontario, for example, the provincial government launched its Aboriginal Procurement Program three years ago, which allows Ministries to use set-asides with aboriginal contractors. Of broader application, the City of Toronto launched its Social Procurement Program in 2016. The Program aims to "equalize access to the City's procurement processes for diverse suppliers, including social purpose enterprises, who experience inequitable barriers to accessing City competitive procurement processes." The Program is oriented towards what the City describes as "equity-seeking communities", which are generally groups having been traditionally underrepresented.

Smaller health IT companies in Canada could use a boost to their commercialization efforts through set-asides.

As the president of the American Small Business League once noted, "Set-asides are like boxing where you have a middleweight and a heavyweight class – Congress knew the average small business couldn't compete head-to-head with General Motors." Not all big companies are as big as General Motors. But most smaller health IT companies in Canada could use a boost to their commercialization efforts through health sector set-aside contracting. The laws now allow for it. Hospitals can initiate their own program and do what they can to spur health IT innovation while contributing to their own success.

Denis Chamberland is a public procurement law specialist with extensive IT and trade law experience in the healthcare sector in Canada and Europe. He is currently working with a central government in Europe on a large health IT project. He can be reached at dac@chamberlandlawcorp.com, or at 416.277.3081.

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